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SESSION I: COMPUTING AND BUSINESS APPLICATIONS

SESSION 2: ICT AND BUSINESS APPLICATIONS

SESSION I: COMPUTING AND BUSINESS APPLICATIONS

THEORY OF ORDERED SEMIGROUPS FROM A CATEGORICAL PROSPECT

Aida Shasivari[1], Elton Pasku[2]
[1]Polytechnic University of Tirana
Faculty of Mathematical Engineering and Physical Engineering, Department of Mathematics
E-mail:aida.shasivari@yahoo.com
[2] Tirana University, Faculty of Natural Sciences, Department of Mathematics
E-mail: elton.pasku@fshn.edu.al

Abstract.
It is long known that a *po*-semigroup embeds into a *le*-semigroup but the embedding map lacks the property of preserving joins that might exist in the domain. The first aim of this paper is to correct this anomaly by redefining the *le*-semigroup into which the *po*-semigroup embeds. Secondly, we give a categorical answer to the old question on why the theory of *po*-semigroups based on ordered ideals and the theory of *le*-semigroups based on ideal elements are similar to each other, by showing the existence of an adjunction between the respective categories and proving in addition that *le*-semigroups are T-algebras over *po*-semigroups where T is the monad defined from the adjunction.
Keywords: *po-semigroup, le-semigroup,* $\vee$*-preserving homomorphism, adjunction,* T*-algebra.*

1. Introduction

It is known from [1] that a *po*-semigroup $(S,\cdot,\leq)$ embeds into a *le*-semigroup $(\sum,*,\subseteq)$ whose elements are lower subsets of S and the embedding map sends each $x\in S$ into the lower interval $(x]$ but this embedding map lacks the property of preserving joins that might exist in the domain. The first aim of this paper is to correct this anomaly by redefining the *le*-semigroup into which the *po*-semigroup embeds. This is done by replacing $\sum$ by $\boldsymbol{P}^{\downarrow}(S)$ whose elements are lower intervals $(C(A)]$ where $A\subseteq S$ is nonempty and $C(A)$ contains all the elements of A together with all possible superiors of subsets of A that might exist in S.

Secondly, we give a categorical answer to the old question on why the theory of *po*-semigroups based on ordered ideals and the theory of *le*-semigroups based on ideal elements are similar to each other, by showing the existence of an adjunction between the respective categories and proving in addition that *le*-semigroups are T-algebras over *po*-semigroups where T is the monad defined from the adjunction. The categories we consider here are: $\vee-$**sgrp** the category whose objects are *po*-semigroups which are $\vee$-complete and with morphisms all homomorphisms that preserve ordinary joins, and $cd-$**lesgrp** the category

whose objects are *le*-semigroups which are $\vee$-complete, $\wedge$-complete and distributive and with morphisms all homomorphisms that preserve ordinary joins. We prove that $cd-\mathbf{lesgrp}$ is a reflexive subcategory of $\vee-\mathbf{sgrp}$ and to this end we prove that the inclusion functor $K: cd-\mathbf{lesgrp} \to \vee-\mathbf{sgrp}$ has a left adjoint $\boldsymbol{P}^{\downarrow}: \vee-\mathbf{sgrp} \to cd-\mathbf{lesgrp}$ which maps S a $\boldsymbol{P}^{\downarrow}(S)$. Finally, to prove the claim that *le*-semigroups are T-algebras over *po*-semigroups we apply the Beck's theorem for the monad arising from the above adjunction.

2. Related work

Kehayopulu, Tsingelis and Pasku in [1] and Kehayopulu and Tsingelis in [2] have proposed different methods to embed a *po*-semigroup into a *le*-semigroup. Kehayopulu in [3] has discussed through examples the similarity of the theory of *po*-semigroups based on ordered ideals and the theory of *le*-semigroups based on ideal elements. The Ph.D thesis of E. Manes has many motivating examples which show how an algebra of a special type arises as a T-algebra over another algebra of a more general type.

3. The subject of your work

This work combines results of category theory and semigroup theory with the intent to study relationships that exist between several classes of ordered semigroups such as *po* and *le*-semigroups.

4. Proposed method

We propose to use the apparatus of the theory of categories to study certain aspects of the theory of ordered semigroups.

5. Results and discussion

The embedding methods proposed in [1] and [2] are improved in the following way.

Let $(S,\cdot,\leq)$ be a *po*-semigroup which contain a zero element which is at the same time the least element of S and say for short that such semigroups have a zero element. Also we impose a further property to our *po*-semigroup, that of distributivity: If $X,Y\subseteq S$ and $\underset{x\in X}{\vee} x$ and $\underset{y\in Y}{\vee} y$ exist in S, then $\underset{xy\in X\cdot Y}{\vee} xy$ exist too and $\underset{xy\in X\cdot Y}{\vee} xy=\left(\underset{x\in X}{\vee} x\right)\cdot\left(\underset{y\in Y}{\vee} y\right)$.

We will define lower sets as follows. If $A\subseteq S$ is nonempty, then consider $C(A)$ the subset of S which contains A together with all the joins of subsets of A that might exist in S. In other words, $\alpha\in C(A)$ if and only if there is $A'\subseteq A$ such that $\alpha=\underset{a'\in A'}{\vee} a'$. Obviously, for any $a\in A, a=\vee\{a\}$, hence $A\subseteq C(A)$. It is also clear that $C(C(A))=C(A)$. Now define

$$P^{\downarrow}(S) = \{(C(A)] : \varnothing \neq A \subseteq S\}$$

where

$$(C(A)] = \{s \in S : \text{ there is some } \alpha \in C(A) \text{ such that } s \leq \alpha\}.$$

We can make $P^{\downarrow}(S)$ a semigroup by defining

$$(C(A)] \circ (C(B)] = (C(A) \cdot C(B)]$$

This operation is well defined and is associative since associative is the operation $\cdot$ involved.

The following lemma is easy to prove.

Lemma 3.1 *For every nonempty* $A, B \subseteq S, (C(A) \cdot C(B)] = (C(A \cdot B)]$.

Further we define an order relation $\leq$ in $P^{\downarrow}(S)$ as follows

$$(C(A)] \leq (C(B)] \text{ iff } (C(A)] \subseteq (C(B)],$$

or in other words, $\leq$ is nothing but $\subseteq$ which is obviously an order relation. We show next that with this order relation, $P^{\downarrow}(S)$ is a complete lattice with a zero element which is the least element too.

Let $(C(A_i)]$ be a family of elements with $i \in I$. We prove that

$$\underset{i \in I}{\vee} (C(A_i)] = (C(\underset{i \in I}{\cup} A_i)] \quad (1)$$

Indeed,since for each

$i \in I, A_i \subseteq \underset{i \in I}{\cup} A_i,$ then $C(A_i) \subseteq C(\underset{i \in I}{\cup} A_i)$ and $(\mathrm{C(A}_i)] \subseteq (C(\underset{i \in I}{\cup} A_i)]$.

If now $(C(A_i)] \subseteq (C(A)]$ for every $i \in I$, then for every $\alpha_i \in C(A_i), \alpha_i \in (C(A)]$. Let now $\alpha \in C(\underset{i \in I}{\cup} A_i)$, hence there are subsets $A_i^{'} \subseteq A_i$ such that $\alpha = \underset{i \in I}{\vee} \underset{a_i^{'} \in A_i^{'}}{\vee} a_i^{'}$. It is clear that $\underset{a_i^{'} \in A_i^{'}}{\vee} a_i^{'} \in C(A_i)$ and then from above, $\underset{a_i^{'} \in A_i^{'}}{\vee} a_i^{'} \in C(A)$ and $\alpha \in C(A)$ since $C(A) = C(C(A))$. So if $x \in (C(\underset{i \in I}{\cup} A_i)]$, then $x \leq \alpha$ with $\alpha \in C(\underset{i \in I}{\cup} A_i)$ and as $\alpha \in C(A)$ we would have that $x \in (C(A)]$ proving that $(C(\underset{i \in I}{\cup} A_i)] \subseteq \underset{i \in I}{\vee} (C(A_i)]$ which implies (1).

Again, let $(C(A_i)]$ be a family of elements with $i \in I$. We prove that

$$\underset{i \in I}{\wedge} (C(A_i)] = (C(\underset{i \in I}{\cap} (C(A_i)])]. \quad (2)$$

Indeed, since $\underset{i \in I}{\cap} (C(A_i)] \subseteq (C(A_i)]$ for all $i \in I$, then

$$C(\underset{i \in I}{\cap} (C(A_i)]) \subseteq (C(A_i)] \text{ and } (C(\underset{i \in I}{\cap} (C(A_i)])] \subseteq (C(A_i)],$$

for all $i \in I$. Further, if $(C(A)] \subseteq (C(A_i)]$ for all $i \in I$, then

$$(C(A)] \subseteq \underset{i \in I}{\cap} (C(A_i)] \subseteq C(\underset{i \in I}{\cap} (C(A_i)]) \text{ hence } (C(A)] \subseteq (C(\underset{i \in I}{\cap} (C(A_i)])],$$

which proves (2).

Now let us prove that for every $(C(A)]$ and every family $(C(B_i)]$ for $i \in I$ we have $(C(A)] \circ \left(\underset{i \in I}{\vee} (C(B_i)] \right) = \underset{i \in I}{\vee} (C(A)] \circ (C(B_i)]$

and $\left(\underset{i \in I}{\vee} (C(B_i)] \right) \circ (C(A)] = \underset{i \in I}{\vee} (C(B_i)] \circ (C(A)]$.

We will prove the first equality only since the proof of the second is similar. The left hand side of the equality transforms as follows.

$$\begin{aligned} (C(A)] \circ \left(\underset{i \in I}{\vee} (C(B_i)] \right) &= (C(A)] \circ (C(\underset{i \in I}{\cup} B_i)] && \text{from (1)} \\ &= (C(A \cdot (\underset{i \in I}{\cup} B_i))] && \text{from the definition of } \circ \text{ and lemma 3.1} \\ &= (C(\underset{i \in I}{\cup} A \cdot B_i)] && \text{multiplication is distributive over the set union.} \end{aligned}$$

While the right hand side transforms as.

$$\begin{aligned} \underset{i \in I}{\vee} (C(A)] \circ (C(B_i)] &= \underset{i \in I}{\vee} (C(A \cdot B_i)] && \text{from the definition of } \circ \text{ and lemma 3.1} \\ &= (C(\underset{i \in I}{\cup} C(A \cdot B_i))] && \text{from (1).} \end{aligned}$$

Now since $\underset{i \in I}{\cup} A \cdot B_i \subseteq \underset{i \in I}{\cup} C(A \cdot B_i)$, then $(\underset{i \in I}{\cup} C(A \cdot B_i)] \subseteq (C(\underset{i \in I}{\cup} C(A \cdot B_i))]$.

The reverse inclusion of the latter also holds true. Indeed,

$$\begin{aligned} (C(\underset{i \in I}{\cup} C(A \cdot B_i))] &\subseteq (C(C(\underset{i \in I}{\cup} A \cdot B_i))] \\ &= (C(\underset{i \in I}{\cup} A \cdot B_i)]. \end{aligned}$$

This shows that $(C(\underset{i \in I}{\cup} A \cdot B_i)] = (C(\underset{i \in I}{\cup} C(A \cdot B_i))]$ and as a result that $(C(A)] \circ \left(\underset{i \in I}{\vee} (C(B_i)] \right) = \underset{i \in I}{\vee} (C(A)] \circ (C(B_i)]$.

It is clear that $(P^{\downarrow}(S), \circ, \subseteq)$ is a *le*-semigroup with the greatest element $(S]$. It also has a zero element which is at the same time the lowest element of $P^{\downarrow}(S)$. It is easily verified that this element is $(0]$ where 0 is the zero of S.

Now we embed S into $P^{\downarrow}(S)$ by the map

$$\iota : S \to P^{\downarrow}(S) \text{ such that } x \text{ a } \ (C(x)] = (x].$$

We prove that this is an injective homomorphism which preserves joins that might exist in S. Indeed,

$$\iota(xy) = (xy] = (C(xy)] = (C(x)] \circ (C(y)] = \iota(x) \circ \iota(y),$$

which proves that ι is a homomorphism of semigroups. It is clearly injective since $(x] = (y]$ implies $x = y$. To prove that it preserves joins that exist in S, let $\bigvee_{i\in I} x_i$ be such a join, then

$$\iota(\bigvee_{i\in I} x_i) = (C(\bigvee_{i\in I} x_i)] = (C(\bigcup_{i\in I}\{x_i\})] = \bigvee_{i\in I}(C(x_i)] = \bigvee_{i\in I}\iota(x_i).$$

The map ι preserves finite meets too. Indeed,

$$\iota(x \wedge y) = (C(x \wedge y)] = (x \wedge y],$$

and $\iota(x) \wedge \iota(y) = (x] \wedge (y] = (C((C(x)] \cap (C(y)])] = (x \wedge y]$,

hence $\iota(x \wedge y) = \iota(x) \wedge \iota(y)$.

Theorem 3.1 *Every po-semigroup* $(S, \cdot, \leq)$ *with a zero element embeds into the le-semigroup* $(P^{\downarrow}(S), 0, \subseteq)$ *via the map* $x \mapsto (C(x)]$ *which preserves ordinary joins that might exist in* S *and finite meets as well. The le-semigroup* $(P^{\downarrow}(S), 0, \subseteq)$ *is distributive, complete and has a zero element.*

The question raised in [3] on the similarities of the two theories mentioned above is addressed here for the first time by using categorical arguments.

To this end we consider two categories, the first one is $\vee-\mathbf{sgrp}$ the category whose objects are *po*-semigroups which are $\vee$-complete and with morphisms all homomorphisms that preserve ordinary joins, and the second one is $cd-\mathbf{lesgrp}$ the category whose objects are *le*-semigroups which are $\vee$-complete, $\wedge$-complete and distributive and with morphisms all homomorphisms that preserve ordinary joins. The aim of this section is to prove that $cd-\mathbf{lesgrp}$ is a reflexive subcategory of $\vee-\mathbf{sgrp}$ which amounts to saying that the obvious inclusion functor $K: cd-\mathbf{lesgrp} \to \vee-\mathbf{sgrp}$ has a left adjoint. Also we discus the semigrouptheoric meanings of the universal properties of the unit and the counit of the adjunction at each object.

We mention here briefly that the operator $P^{\downarrow}$ defines a functor $P^{\downarrow}: \vee-\mathbf{sgrp} \to cd-\mathbf{lesgrp}$. Indeed, define $P^{\downarrow}$ by assigning to each object $S \in \vee-\mathbf{sgrp}$ its *le*-semigroup of lowers sets $P^{\downarrow}(S)$ which is proved to be $\vee$ and $\wedge$-complete and distributive hence an object from $cd-\mathbf{lesgrp}$, and to each $\vee$-preserving homomorphism $f: S \to S'$ the map $P^{\downarrow}(f): P^{\downarrow}(S) \to P^{\downarrow}(S')$ defined by $(C(A)] \mapsto (C(f(A))]$.

Theorem 3.2 *The category* $cd-\mathbf{lesgrp}$ *is a reflexive subcategory of* $\vee-\mathbf{sgrp}$.

Proof. We will prove that the inclusion functor $K : cd-\mathbf{lesgrp} \to \vee-\mathbf{sgrp}$ is a right adjoin to $P^{\downarrow}$ and to this end we need to show that for each object $S \in \vee-\mathbf{sgrp}$ and each object $L \in cd-\mathbf{lesgrp}$ there is a bijection of sets

$$\psi : \vee-\mathbf{sgrp}(S, K(L)) \to cd-\mathbf{lesgrp}(P^{\downarrow}(S), L),$$

which is natural in both variables. We define for each order preserving homomorphism $f : S \to K(L)$

$$\psi(f) : P^{\downarrow}(S) \to L \text{ by } (C(A)] \text{ a } \vee_{a \in A} f(a).$$

This is a well defined map. To see this let $A, B \subseteq S$ such that $(C(A)] = (C(B)]$. For each $a \in A$ there is some $\beta_a \in C(B)$ such that $a \le \beta_a$ since $A \subseteq (C(B)]$. It follows that

$$\vee_{a \in A} a \le \vee_{a \in A} \beta_a \le \vee_{b \in B} b.$$

and then applying the $\vee$-preserving map f we get

$$\psi(f)((C(A)]) = \vee_{a \in A} f(a) \le \vee_{b \in B} f(b) = \psi(f)((C(B)]).$$

In a similar fashion one proves the reverse inequality and therefore the equality of $\psi(f)((C(A)]) = \vee_{a \in A} f(a) = \vee_{b \in B} f(b) = \psi(f)((C(B)])$ thereby proving the correctness of $\psi(f)$.

The map $\psi(f)$ is an order preserving homomophism. Let us prove first that $\psi(f)$ is a homomorphism of semigroups. Indeed, let $(C(A)], (C(B)] \in P^{\downarrow}(S)$, then

$\psi(f)((C(A)] \circ (C(B)])$	=	$\psi(f)((C(A \cdot B)])$	from the definition of $\psi(f)$
	=	$\vee_{a \cdot b \in A \cdot B} f(a) \cdot f(b)$	f is a homomorphism
	=	$(\vee_{a \in A} f(a)) \cdot (\vee_{b \in B} f(b))$	S is distributive
	=	$\psi(f)((C(A)]) \cdot \psi(f)((C(B)])$	from the definition of $\psi(f)$.

Further we show that ψ is order preserving. Indeed, let $(C(A)] \subseteq (C(B)]$, then

$$\psi(f)((C(A)]) = \vee_{a \in A} f(a) \le \vee_{b \in B} f(b) = \psi(f)((C(B)]),$$

since for every $a \in A$, there is $\beta_b \in C(B)$ such that $a \le \beta_b$. Also $\psi(f)$ preserves joins. Let $(C(A_i)]$ be any family of elements in $P^{\downarrow}(S)$, then

$$\psi(f)(\vee_{i \in I} (C(A_i)]) = \psi(f)(\cup_{i \in I} (C(A_i)]) = \vee_{i \in I} \vee_{a_i \in A_i} f(a_i) = \vee_{i \in I} \psi(f)((C(A_i)]).$$

Next we show that ψ is a bijection. The map is clearly injective for if $f, g : S \to K(L)$ are two distinct morphisms which differ for instance at some $x \in S$, then

$$\psi(f)((x]) = (f(x)] \neq (g(x)] = \psi(g)((x]),$$

which proves that $\psi(f) \neq \psi(g)$. To prove that ψ is surjective we use the fact that S embeds into $P^{\downarrow}(S)$ via the map $x \mapsto (x]$. Let $g : P^{\downarrow}(S) \to L$ be a morphism in $cd-\mathbf{lesgrp}$ and let f be the restriction of g on S. We will prove that $g = \psi(f)$ which implies the surjectivity of ψ. For any $(C(A)] \in P^{\downarrow}(S)$ the following hold true

$$\begin{aligned} \psi(f)((C(A)]) &= \bigvee_{a \in A} (f(a)] \\ &= \bigvee_{a \in A} (g(a)] \\ &= g\left(\bigvee_{a \in A} (a] \right) \quad \text{since } g \text{ preserves joins} \\ &= g((C(A)]) \end{aligned}$$

proving the equality $g = \psi(f)$. It remains to prove the naturality in the first and the second variable. Let $\sigma : S \to S'$ be a $\vee$-preserving homomorphism and want to prove that the following diagram

$$\begin{array}{ccc} \vee\text{-}\mathbf{sgrp}(S, K(L)) & \xrightarrow{\psi} & cd\text{-}\mathbf{lesgrp}(\mathcal{P}^{\downarrow}(S), L) \\ {\scriptstyle \sigma^*}\uparrow & & \uparrow{\scriptstyle \mathcal{P}^{\downarrow}(\sigma)^*} \\ \vee\text{-}\mathbf{sgrp}(S', K(L)) & \xrightarrow[\psi]{} & cd\text{-}\mathbf{lesgrp}(\mathcal{P}^{\downarrow}(S'), L) \end{array}$$

is commutative. This means that for every $\vee$-preserving homomorphism $f' : S' \to K(L)$ we should have that $\psi(f' \circ \sigma) = \psi(f') \circ P^{\downarrow}(\sigma)$. For every $(C(A)] \in P^{\downarrow}(S)$ on the one side we have that

$$\psi(f' \circ \sigma)((C(A)]) = \bigvee_{x \in A} f'(\sigma(x)),$$

and on the other side

$$\begin{aligned} (\psi(f') \circ P^{\downarrow}(\sigma))((C(A)]) &= \psi(f')((C(\sigma(A))]) \\ &= \psi(f')((C(\bigvee_{x \in A} \sigma(x))]) \\ &= f'(\bigvee_{x \in A} \sigma(x)) \\ &= \bigvee_{x \in A} f'(\sigma(x)), \end{aligned}$$

which proves the equality. Naturality on the second variable amounts to saying that for any join preserving homomorphism $\lambda : L \to L'$ the diagram

$$\begin{array}{ccc} \vee\text{-}\mathbf{sgrp}(S, K(L)) & \xrightarrow{\psi} & cd\text{-}\mathbf{lesgrp}(\mathcal{P}^{\downarrow}(S), L) \\ {\scriptstyle \lambda^*}\downarrow & & \downarrow{\scriptstyle \psi(\lambda)^*} \\ \vee\text{-}\mathbf{sgrp}(S, K(L')) & \xrightarrow[\psi]{} & cd\text{-}\mathbf{lesgrp}(\mathcal{P}^{\downarrow}(S), L') \end{array}$$

is commutative. For this we should prove that for any $f : S \to K(L), \psi(\lambda f) = \lambda\psi(f)$. Indeed, for any $(C(A)] \in P^{\downarrow}(S)$,

$$\begin{aligned} \psi(\lambda f)((C(A)]) &= \bigvee_{x\in A}(\lambda f)(x) \\ &= \lambda\left(\bigvee_{x\in A} f(x)\right) \quad \text{since } \lambda \text{ preserves joins} \\ &= \lambda(\psi((C(A)])) \quad \text{from the definition of } \psi, \end{aligned}$$

proving that $\psi(\lambda f) = \lambda\psi(f)$.■

In the end we prove that in some sense *le*-semigroups are free algebras over *po*-semigroups.

More specifically, if $\left\langle P^{\downarrow}, K, \eta, \varepsilon \right\rangle : \vee - \mathbf{sgrp} \to cd\text{-}\mathbf{lesgrp}$ be the adjunction of theorem 3.2, $\left\langle T, \eta, \mu \right\rangle$ the monad which it defines in $\vee - \mathbf{sgrp}, \vee - \mathbf{sgrp}^T$ the category of T-algebras for this monad and $\left\langle (P^{\downarrow})^T, K^T, \eta^T, \varepsilon^T \right\rangle : \vee - \mathbf{sgrp} \to \vee\text{-}\mathbf{sgrp}^T$ the corresponding adjunction. With this data we have the following.

Theorem 3.3 *The comparison functor* $C : cd - \mathbf{lesgrp} \to \vee\text{-}\mathbf{sgrp}^T$ *is an isomorphism.*

Proof. The proof uses characterization (iii) of Beck's theorem. To this end we have to show that every pair of parallel morphisms

$$L_1 \underset{g}{\overset{f}{\rightrightarrows}} L_2$$

in $cd - \mathbf{lesgrp}$ has a unique coequalizer

$$L_1 \underset{g}{\overset{f}{\rightrightarrows}} L_2 \xrightarrow{e} L$$

provided that the corresponding pair

$$K(L_1) \underset{K(g)}{\overset{K(f)}{\rightrightarrows}} K(L_2)$$

has a split coequalizer

$$K(L_1) \underset{K(g)}{\overset{K(f)}{\rightrightarrows}} K(L_2) \xrightarrow{u} S$$

in $\vee-\mathbf{sgrp}$. Moreover $K(L)=S$ and $K(e)=u$. From our assumption, there are morphisms $t:K(L_2)\to K(L_1)$ and $\sigma:S\to K(L_2)$ with the properties

$$uK(f)=uK(g), u\sigma=1_S, K(f)t=1_{K(L_2)}, K(g)t=\sigma u. \quad (3)$$

We will show that

$$K(L_1)\underset{K(g)}{\overset{K(f)}{\rightrightarrows}}K(L_2)\xrightarrow{\iota u}K(\mathcal{P}^{\downarrow}(S)) \quad (4)$$

is a coequalizer in $\vee-\mathbf{sgrp}$. Let $h:K(L_2)\to S'$ be a morphism in $\vee-\mathbf{sgrp}$ with the property

$$hK(f)=hK(g).$$

From the theorem 3.2, σ induces in $cd-\mathbf{lesgrp}$ a morphism $\psi(\sigma):P^{\downarrow}(S)\to L_2$ and let $K(\psi(\sigma)):K(P^{\downarrow}(S))\to K(L_2)$ be its corresponding morphism in $\vee-\mathbf{sgrp}$. We will show that $hK(\psi(\sigma))$ is the unique morphism with the property $hK(\psi(\sigma))u=h$. Indeed, for every $x\in K(L_2)$ we have

$$\begin{aligned}
(hK(\psi(\sigma))u)(x) &= (hK(\psi(\sigma))((u(x)]) && \text{by the definition of } \iota\\
&= h\sigma(u(x)) && \text{since } \sigma \text{ is the restriction of } K(\psi(\sigma))\\
&= (hK(g))(t(x)) && \text{by conditions (3)}\\
&= (hK(f))(t(x)) && \text{by conditions (5)}\\
&= h(x) && \text{since by (3) } K(f)t=1_{K(L_2)}.
\end{aligned}$$

To prove uniqueness we assume that $\xi:K(P^{\downarrow}(S))\to S'$ is a morphism with the property that $\xi u=h$ and want to show that $hK(\psi(\sigma))=\xi$. For this it is sufficient to prove that they agree on elements of the form $(s]$ with $s\in S$ as this set is a $\vee$-generating set for $K(P^{\downarrow}(S))$ and both morphisms preserves ordinary joins. From the condition $u\sigma=1_S$ we see that u is surjective, hence any $s\in S$ can be written as $s=u(x)$ with $x\in K(L_2)$. we now have

$$\begin{aligned}
hK(\psi(\sigma))((s]) &= hK(\psi(\sigma))((u(x)])\\
&= (hK(\psi(\sigma))u)(x)=h(x)=\xi u(x) && \text{by the property of } hK(\psi(\sigma)) \text{ and } \xi\\
&= \xi((u(x)])=\xi((s]),
\end{aligned}$$

which proves that $hK(\psi(\sigma))=\xi$. So we have that (4) is a coequalizer in $\vee-\mathbf{sgrp}$. Next we show that

$$L_1 \underset{g}{\overset{f}{\rightrightarrows}} L_2 \xrightarrow{\iota u} \mathcal{P}^{\downarrow}(S)$$

is the unique coequalizer in $cd-\mathbf{lesgrp}$ of

$$L_1 \underset{g}{\overset{f}{\rightrightarrows}} L_2$$

and that obviously the functor K maps $P^{\downarrow}(S)$ to $K(P^{\downarrow}(S))$ and ιu identically to itself. If $\mu : L_2 \to L_3$ is a morphism in $cd-\mathbf{lesgrp}$ such that $\mu f = \mu g$, then down in $\vee-\mathbf{sgrp}$ there is a morphism $\omega : K(P^{\downarrow}(S)) \to K(L_3)$ such that $\omega \iota u = K(\mu)$. Now ω can be regarded as a morphism of $cd-\mathbf{lesgrp}: \omega : P^{\downarrow}(S) \to L_3$, and so we have the equality $\omega \iota u = \mu$. The uniqueness of ω in $cd-\mathbf{lesgrp}$ ensures the uniqueness of its copy in $\vee-\mathbf{sgrp}$ with the property $\omega \iota u = \mu$. Finally, the uniqueness of the morphism $\iota u : L_2 \to P^{\downarrow}(S)$ as the coequalizer of

$$L_1 \underset{g}{\overset{f}{\rightrightarrows}} L_2$$

follows from the fact that $P^{\downarrow}(S)$ is the only object that maps to $K(P^{\downarrow}(S))$ under the inclusion functor K .■

6. Conclusion

We bring to the theory of ordered semigroups ideas from category theory with the aim to study *le*-semigroups by means of *po*-semigroups. We hope this will save time to other researchers who need only to work with *po*-semigroups rather than duplicating results from one theory to the other.

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A DISCUSSION ON GROBNER BASIS THEORIES

Fabiana Muharremi (Çullhaj) Phd. Cand.
Mathematic Department,Faculty of Information Technology, UAMD
fabianacullhaj@hotmail.com

Abstract
The theory of Grobner bases has its roots in 60's and has many applications in several branches of mathematics. The aim of this paper is to give first the definition of a Grobner base for a quotient algebra of F = K·∑·where ∑* is the free monoid on ∑ and K is commutative ring with unit 1, and second to explore how this definition works if one replaces ∑* by the set of nonzero elements of a well-ordered reflexive semigroup. This approach is due to Kobayashi and is interesting since it allows to discuss Grobner basis from the viewpoing of String Rewriting Theory. As a testimony for this we present and discuss here the critical pair theorem.

Keywords:*Grobner Bases, free monoid, semigroup, rewriting system, critical pair.*

1. Introduction

The theory of Grobner bases for polynomial ideals in commutative polynomial rings
over fields was introduced by Buchberger[5] in 1965. A Grobner basis G is a generating set of a polynomial ideal such that every polynomial has a unique normal form using the polynomials in G as rules.Buchberger gave a terminating procedure to transform a generating set of polynomials into a Grobner basis of the same ideal. In case we have a finite Grobner basis many algebraic questions concerning polynomial ideals become solvable, e.g. the membership problem or the congruence problem. In the last years, the method of Grobner bases and its applications have been extended from commutative polynomial rings over fields to various types of non-commutative algebras over fields and other rings.

In this paper we give first the definition of a Grobner bases on Algebra based on free monoid and second we explore how this definition works if one replaces free monoids by the set of nonzero elements of a well-ordered reflexive semigroup. This approach is due to Kobayashi and is interesting since it allows to discuss Grobner basis from the viewpoint of String Rewriting Theory. For this we present a critical pair theorem.

2. Related work

The theory of Grobner bases for polynomial ideals in commutative polynomial ringsover a field $K[x_1, x_2, \dots x_n]$ was introduced by Buchberger[5] in 1965. Buchberger present an algorithmto transform a generating set of polynomials

into a Grobner basis of the same ideal. The method of Grobner bases and its applications have been extended from commutative polynomial rings over fields to various types of non-commutative algebras over fields and other rings. Authors as Buchberger, Kandri Rody, Kapur, Lauer, Stifter and Weispfenning extended this theory to other coefficient rings as the integers, Euclidean rings or regular rings. Authors as Mora, Baader, Kandri-Rody and Weispfenning have investigated the situation for special non-commutative polynomial rings K. Madlener and B. Reinert[2], [4] generalize these approaches to monoid rings R[H], where H is an ordered monoid presented by a finite, convergent semi-Thue system ($\sum$,T)

3. The Subject

In this paper we presentRewriting system Theory to discus about Grobner Bases on Algebras based on free monoid and well-ordered semigroup.The aim of this paper is to compare between Grobner bases theories for two different types of algebras. The first one is the free algebra on some nonempty set over a commutative unitary ring K and the second one is the free algebra over K with basis the set B of all nonzero elements of a well ordered semigroup S.

4. Proposed method

4.1 Grobner bases on Algebra based on free monoid

Let $\sum$ be a finite alphabet and $\sum^*$ the free monoid generated by $\sum$. For a commutative ring K with 1, denote $F = K\langle\sum\rangle$be the free (associative) algebra generated by Σ over *K. F is the free K-modulegenerated by*$\sum^*$. An element f of F is uniquely written as

$$f = \sum_{i=1}^{n} k_i x_i$$

with$k_i \in K/\{0\}$and $x_i \in \sum^*$.We fix a compatible well-order $\succ$ on $\sum^*$, that is, >is a (strict) total order on $\sum^*$such that there is no infinite decreasing sequence $x_1 > x_2 > \ldots$ and for any $x, y, z \in \sum^*$, $x>y$ implies $xz>yz$ and $zx>zy$. We can write f above in such a way thatthe terms are in descending order.

In particular k_1x_1 is the biggest term, which we call the*leading term* of f and denote by lt(f). Let rt(f) = f–lt(f).

A (*monic*) *rewriting rule* is a pair $(u, v) \in \sum^* \times F$ such that $u>v$ and will be written as $u \rightarrow v$. A (*monic*) *rewriting system R* is a set of rewriting rules in F. If $f \in F$ has a nonzero term $k \cdot x$ and $x=x_1ux_2$ with $x_1, x_2 \in \sum^*$and we appliedthe rule $u \rightarrow v$ to f than $f$istransformed to $g = f - k \cdot x_1(u - v)x_2$. In this situation we write $f \rightarrow_R g$, and we call $\rightarrow_R$the *one-step reduction* by R.

Let $\overset{*}{\rightarrow}_R$ denote the reflexive transitive closure of the one-step reduction relation $\rightarrow_R$, and let $\overset{*}{\leftrightarrow}_R$ be the reflexive symmetric and transitive closure of $\rightarrow_R$. Let $I(R)$ be the (two-sided) ideal of F generated by $G_R = \{u - v \mid u \rightarrow v \in R\}$.

Proposition 4.1.1. *The relation* $\overset{*}{\leftrightarrow}_R$ *is equal to the congruence on F modulo* $I(R)$*, that is,*

$f \overset{*}{\leftrightarrow}_R g \Leftrightarrow f \equiv g \pmod{I(R)}$

for $f, g \in F$*. In particular,*

$f \overset{*}{\leftrightarrow}_R 0 \Leftrightarrow f \equiv 0 \pmod{I(R)}$

for $f \in F$*, that is,*

$I(R) = \{f \in F \mid f \overset{*}{\leftrightarrow}_R 0\}$.

The quotient algebra $A = F/I(R) = F/\overset{*}{\leftrightarrow}_R$ is said to be *defined by* the rewriting system R. Since *is* well-founded, the relation $\rightarrow_R$ is *noetherian* (*terminating*). If for two elements $f, g \in F$, there is $h \in F$ such that $f \overset{*}{\rightarrow}_R h$ and $f \overset{*}{\rightarrow}_R h$, we say that $f \downarrow_R g$ holds. R is called *confluent* if for any $f, g, h \in F$ such that $h \overset{*}{\rightarrow}_R f$ and $h \overset{*}{\rightarrow}_R g, f \downarrow_R g$ holds.

A noetherian and confluent system is called *complete*.

Lemma 4.1.2. *For* $f, g \in F$, $f - g \overset{*}{\rightarrow}_R 0$ *implies* $f \downarrow_R g$.

An element f in F is *irreducible* (*R-irreducible*) if there is no g such that $f \rightarrow_R g$. $\mathrm{Irr}(R) = \sum^* \setminus \sum^* \cdot \mathrm{Dom}(R) \cdot \sum^*$, where $\mathrm{Dom}(R) = \{u \mid u \rightarrow v \in R\}$, denotes the set of irreducible words. Since R is noetherian and confluent, for any $f \in F$ there is an irreducible $\hat{f} \in F$ such that $f \overset{*}{\rightarrow}_R \hat{f}$, $\hat{f}$ is unique and is called the *normal form* of f.

A set G of F is *monic*, if every $g \in G$ is monic, that is, the leading coefficient of g is 1. Let I be an ideal of F and $G \subset I$ a set of generators.

We say that G is a *Grobner base* of I if it is monic and the system $R_G = \{\mathrm{lt}(g) \rightarrow \mathrm{rt}(g) \mid g \in G\}$ associated with G is a complete rewriting system.

We say that an algebra A over K admits a Grobner base if it is isomorphic to the quotient F/I of some finitely generated free algebra Fover K modulo an ideal I with Grobner base.

Let R be a rewriting system on $F = K \cdot \sum^*$. Let $u_1 \rightarrow v_1$, $u_2 \rightarrow v_2 \in R$. Suppose u_1 overlaps properly with u_2, that is, $u_1 = u'_1 z$, $u_2 = z u'_2$ with u'_1, u'_2, z $(\neq 1) \in \Sigma^*$. We have two reductions p_1: $u_1 u'_2 \rightarrow v_1 u'_2$ and p_2: $u'_1 u_2 \rightarrow u'_1 v_2$ applying the rules to $u_1 u'_2 = u'_1 u_2$ in two different ways. We call $(v_1 u'_2, u'_1 v_2)$ a *critical pair of*

elements of overlapping type and (p_1, p_2) a *critical pair of reductions*. For a critical pair (x_1, x_2) of elements the difference $x_1 - x_2$ is called an *S-polynomial*. A critical pair (x_1, x_2) is *resolvable* if $x_1 \downarrow_R x_2$.

Proposition 4.1.3. *A system R is complete if all the critical pairs for R are resolvable.*

Proposition 4.1.4. *For a rewriting system R the following statements are equivalent.*
(1) *R is complete.*
(2) *Every critical pair is resolvable.*
(3) *Every S-polynomial is reduced to* 0.
(4) *Every element in I*(*R*) *is reduced to* 0.

4.2 Grobner bases on Algebra based on well ordered semigroups

Let S = B ∪ {0} be a semigroup with zero. A semigroup S is well-ordered if B has a well-order >, which is compatible in the following sense: For a, b, c, d ∈ B,

(i) a > b, ca ≠ 0, cb ≠ 0 ⇒ ca > cb,
(ii) a > b, ac ≠ 0, bc ≠0 ⇒ ac > bc,
(iii) a > b, c > d, ac ≠ 0, bd ≠0 ⇒ ac > bd.

A semigroup S is called reflexive if for any a ∈ B there are e; f ∈ B such that *a* = *eaf*. If B is a monoid, S is reflexive.

Proposition4.2.1. For any *a*∈ B, there is a unique pair (*e; f)* of idempotent such that *a*= *ea* = *af*.

Here *e* and *f*respectively are called the *source* and *terminal* of *a* and denoted by σ(*a*) and τ(*a*). Two elements *a, b* are parallel, *a//b,* if σ(a) = σ(b) and τ(a) = τ(b). If *a//b, a* > *b* and *cad* = 0 imply *cbd* = 0 for any *a, b, c, d*∈ B, the semigroup S is called *normally ordered*. If τ(a) = σ(b) implies ab ≠ 0 for *a, b,* ∈ B, S is called *coherent*.

If *a* = *bcd* for *a, b, c, d*∈ B, c is a factor of *a*. If in particular *b* = σ(*c*), that is, *a* = *cd, c* is a left factor, and if *d* = τ(*c*), *c* is a right factor. A factor of an idempotent in B is called idempotential.
An element *b*∈ B is an *associate* of an element *a*∈ B, if *b* = *eaf* for some idempotential elements *e* and *f,* and we write as a ∼ b. A factor of *a*∈ B is *proper* if it is not idempotential or an associate of *a*. An element *x*∈ B is a *prime* if it is not idempotential and has no proper factor.

Elements *a* and *b* in B are *left coprime* (resp. *right coprime*) if they have no nonidempotential common left (resp. right) factor. They are *coprime*, if they are

left and right coprime. Clearly, for any $a, b \in$ B, there are $c, d \in$ B such that $a = ca'd$, $b = cb'd$, and a' and b' are coprime.

A pair $(a; b)$ is nonempty if $axb \neq 0$ for some $x \in$ B. Pairs $(a, b);(a', b')$ are equivalent if $axb = a'xb'$ for any $x \in$ B. The equivalence class of a nonempty pair iscalled a *context* and is denoted by $C(a; b)$.

Let U be a subset of B. If an element $x \in$ B is decomposed as $x = aub$ with $a, b \in$ B and $u \in$ U, the triple (a, u, b) is called an *appearance* of U in x. $A(a, u, b)$denotes the appearance with the context $C(a, b)$.

Let F = K · B be the free K-module generated by B and K is a commutative ring with 1. Then, F has an algebra structure with the product induced from the semigroup operation of S. An element f of F is uniquely written as a finite sum

$$f = \sum_{i=1}^{n} k_i x_i$$

with $k_i \in K/\{0\}$ and $x_i \in$ B. If $x_1 > x_i$ for all $i=2,\ldots n$ is the leading term of f, denoted by $\mathrm{lt}(f)$. We set also $\mathrm{rt}(f) = f - \mathrm{lt}(f)$.The well-order > on B is extended to a partial order $\succ$ on F as follows.

First, define $f \succ 0$ for any nonzero $f \in$ F. Let f, g be nonzero elements of F with $\mathrm{lt}(f) = kx$ and $\mathrm{lt}(g) = k'x'$, where $k, k' \in$ K and $x, x' \in$ B. Then,$f \succ g$ if and only if (i) $x > x'$or (ii) $x = x'$ and $\mathrm{rt}(f) \succ \mathrm{rt}(g)$.

A *rewriting rule* on F is a pair $r = (u, v)$ with $u \in$ B and $v \in$F such that $u \succ v$ and is written as $u \to v$. A rule $r = (u \to v)$ is *normal* if $xuy = 0$ implies $xvy = 0$ for any $x, y \in$ B. If S is normally ordered, any rule is normal.

A *rewriting system* R on F is a (not necessarily finite) set of rewriting rules on F . R is normal if every rule in R is normal.If f has a nonzero term $k \cdot x$ $(k \in K, x \in B)$ and $x = x'ux''$ with $x', x'' \in$ B and $r = (u \to v) \in$ R, then applying the rule r upon this term, f is rewritten to $g = kx'(v - u)x'' + f$. In this situation we write as $f \to_r g$ or $f \to_R g$.We call the relation $\to_R$ the *one-step reduction* by R.

We set $I_0(R) = \left\{ f \in F / f \overset{*}{\leftrightarrow}_R 0 \right\}$, which is a K-submodule of F.
We write $f \downarrow_R g$ for $f, g \in$F, if f and g have a common descendent, that is, there is $h \in$ F such that $f \overset{*}{\to}_R h$ and $g \overset{*}{\to}_R h$. A rewriting system R is *confluent*, if $f \downarrow_R g$ holds for any $f, g, h \in$ F such that $h \overset{*}{\to}_R f$ and $h \overset{*}{\to}_R g$. In general, noetherian confluent system is called *complete*, but in our situation a confluent system is complete. An element $f \in$ F is R-*reducible*, if a rule from R is applicable to f, otherwise, it

is R-irreducible. An R-irreducible element *f'* such that $f \overset{*}{\rightarrow}_R f'$ is a *normal form* of *f*.

Proposition4.2.2. *For a rewriting system R on F, the following statements are equivalent.*

(1) R is complete.

(2) $f \overset{*}{\rightarrow}_R 0$ *for all* $f \in I_0(R)$.

(3) Any nonzero element of $I_0(R)$ *is R-reducible.*

(4) *Every element in F has a unique normal form*.

$I_0(R)$ is a K-submodule of F, but, in general, $I_0(R)$ is not an ideal of F and $\overset{*}{\leftrightarrow}_R$R is not the congruence modulo an ideal. To fill this gap, define

Z(R) = $\{xvy, x, y \in B, u \rightarrow v \in R, xuy = 0\}$

Set

$G_R = \{u - v / u \rightarrow v \in R\}$

and let I(R) be the (two-sided) ideal generated by G_R.

Lemma 4.2.3.*We have* $G_R \subset I_0(R)$, *and* $Z(R) \subset I(R)$.

Lemma 4.2.4. $I_0(R) \subset I(R)$ *and the relation* $\overset{*}{\leftrightarrow}_R$ *is included in the congruence modulo I(R).*

Proposition 4.2.5*Let R be a rewriting system on F. The following statements are equivalent.*

(1) $I_0(R) = I(R)$.

(2) The relation $\overset{*}{\leftrightarrow}_R$ *coincides with the congruence modulo I(R).*

(3) $I_0(R)$ *is an ideal of F.*

(4) $Z(R) \subset I_0(R)$.

Corollary4.2.6.*If* $Z(R) \subset I_0(R)$, *then* $f \overset{*}{\leftrightarrow}_R g$ *implies* $x f y \overset{*}{\leftrightarrow}_R x g y$ *for any* $f, g \in F$ *and* $x, y \in B$.

When R is normal, Z(R) ={0}. Thus, we have

Corollary 4.2.7. *If R is a normal rewriting system on F, then* $I_0(R) = I(R)$, *and* $\overset{*}{\leftrightarrow}_R$ *is equal to the congruence modulo I(R).*

Let G be a set of monic uniform elements of F . We associate a rewriting system R_G on F by $R_G = \{lt(g) \rightarrow -rt(g) / g \in G\}$.

A subset G of F is called *a* ***Grobner basis***, if

(i) every elements of G is monic and uniform,

(ii) the associated system R_G is complete, and

(iii) one of the statements in Proposition 4.2.5 holds.

If G is normal, we can omit the condition (iii). G is normal, if R_G is normal, and G is reduced if R_G is reduced.
If G is a Grobner basis, then by (iii) $I_0(R_G)$ is equal to the ideal I(G) of F generated by G, so G is called a Grobner basis of the ideal I(G). The quotient algebra A = F/I(G) is said to be the algebra defined by a Grobner basis G.

Proposition 4.2.6. *Let I be an ideal of F and let G be a set of monic uniform elements of an ideal I. The following statements are equivalent.*

(1) G is a Grobner basis of I

(2) $f \overset{*}{\rightarrow}_R 0$ *for all* $f \in I$.

(3) Any nonzero element of I is G-reducible

If G is a Grobner basis of an ideal I, then I = I_0(G) = I(G), and $\overset{*}{\leftrightarrow}_R$ is equal to the congruence modulo I.
Let R be a reduced rewriting system on F. R is *locally confluent* if $f \downarrow_R g$ holds for any $f, g, h \in F$ such that $h \rightarrow_R f, h \rightarrow_R g$. Consider two rules $u \rightarrow v$ and $u' \rightarrow v$ in R. Let $w \in B$ and suppose that both the lefthand sides *u* and *u'* of the rules appears in *w*,
$w = xuy = x'u'y'$ for some $x, y, x', y' \in B$.

This situation is called *critical,* if the appearances A = A*(x, u, y)* and $A' = (x'u'y')$ are not disjoint, A is at the immediate right of A' and the contexts C(*x, y*) and $C' = (x', y')$ are coprime.
For the appearances in above of *u* and *u'* we have two reductions $w \rightarrow_R xvy$ and $w \rightarrow_R x'v'y'$. The pair $(xvy, x'v'y')$ is a *critical pair* if the situation is critical. The pair is *resolvable* if $xvy \downarrow_R x'v'y'$ holds.

Theorem4.2.7.*(**Critical pair Theorem**) A normal reduced rewriting system R on F is complete if and only if all the critical pairs are resolvable. A set G of monic uniform normal elements of F is a Grobner basis if all the critical pairs are resolvable.*

5. Results and conclusions

By comparing the above methods we observe that stating up with their definitions, the first one requires the polynomials of the base G to be monic and the respective rewrite system R(G) to be complete, while the definition for the Grobner base for the second type of algebras requires two further conditions, the uniformity of the elements of G and that I_0(G) to be an ideal.

There are also differences regarding the connections the two theories have with the notion of confluence. Theorem 4.2.7 shows that differently from the algebras of the first type, in the case of well ordered semigroups, Grobner bases can be defined in terms of resolvable critical pairs.

There is not much difference between the two ways mentioned above. But we

see that the second
method is better because it is more efficient compared with the first one.

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UNCERTAIN FUZZY HERMITE−HADAMARD TYPE INEQUALITIES FOR GENERALIZED(s, m, φ) −PREINVEX GODUNOVA−LEVIN FUNCTIONS OF THE SECOND KIND

Artion Kashuri, Miftar Ramosaçaj and Rozana Liko
University "Ismail Qemali", Vlora, Albania
Corresponding email: artionkashuri@gmail.com
miftar.ramosaco@gmail.com,rozanaliko86@gmail.com

Abstract
In the present paper, the notion of generalized (s, m, φ) −preinvex Godunova−Levin function of the second kind is introduced and some uncertain fuzzy Hermite−Hadamard type inequalities via classical integrals and Riemann−Liouville fractional integrals are established. At the end, some applications to special means are given.
Keywords: (s, m) −Godunova−Levin function, fuzzy number, fuzzy Hermite−Hadamard inequality,Hölder′s inequality, fuzzy fractional Riemann−Liouville operator.

1. Introduction

Fractional calculus, was introduced at the end of the nineteenth century by Liouville and Riemann, the subject of which has become a rapidly growing area and has found applications in diverse fields ranging from physical sciences and engineering to biological sciences and economics. Due to the wide application of fractional integrals, some authors extended to study fractional Hermite−Hadamard, Grüss, or Ostrowski type inequalities for functions of different classes.The concepts of fuzzy Riemann integrals were introduced by Wu. Fuzzy Riemann integral is a closed interval whose end points are the classical Riemann integrals.Since fuzziness is a natural reality different than randomness and determinism,Anastassiouproved extends fuzzy Ostrowski′s inequalities. These inequalities have been applied for Euler′s Beta mapping and special means such as the arithmetic mean, the geometric mean, the harmonic mean and others.Using new definition, to be referred as generalized (s, m, φ) −preinvex Godunova−Levin function of the second kind some uncertain fuzzy Hermite−Hadamard type inequalities via classical integrals and Riemann−Liouville fractional integrals are established.

2. Related work

In recent years, various generalizations, extensions and variants of such inequalities have been obtained. For other recent results concerning Hermite−Hadamard type inequalities through various classes of convex

functions, (see [1]) and the references cited therein, also (see [2]) and the references cited therein. Since fuzziness is a natural reality different than randomness and determinism, Anastassiou (see [3], [4]) proved extends fuzzy Ostrowski′s inequalities. These inequalities have been applied for Euler′s Beta mapping (see [5]) and special means such as the arithmetic mean, the geometric mean, the harmonic mean and others.The concepts of fuzzy Riemann integrals were introduced by Wu(see [6]). Fuzzy Riemann integral is a closed interval whose end points are the classical Riemann integrals.

3. The subject of your work

Motivated by these results, the notion of (s, m, φ) −preinvex Godunova−Levin function of the second kind is applied to establish uncertain fuzzy Hermite−Hadamard type inequalties for fuzzy Riemann integral. The paper is organized as follows: In Section 2, some uncertain fuzzy Hermite−Hadamard type inequalities for (s, m, φ) −preinvex Godunova−Levin functions of the second kind via classical integrals are given. In Section 3, some uncertain fuzzy Hermite−Hadamard type inequalities for (s, m, φ) −preinvex Godunova−Levin functions of the second kind via fractional integrals are given. At the end of the paper, some conclusions are given.

4. Proposed method

In the first section, in order to prove our main results regarding some uncertain fuzzyHermite−Hadamard type inequalities for generalized(s, m, φ) −preinvex Godunova−Levin functionsof the second kind via classical integrals, we prove an interestingnew Lemma. Our theorems in this section are proved using two well−known inequalities,Hölderinequality and power mean inequality.In the second section, in order to prove our main results regarding some uncertain fuzzyHermite−Hadamard type inequalities for generalized(s, m, φ) −preinvex Godunova−Levin functions of the second kind via fractional integrals,we prove an interesting new Lemma. Our theorems in this section are proved using two well−known inequalities, Hölder inequality and power mean inequality. Finally,by our theorems mentioned in this paper (in this two sections)we can get some special kinds of fuzzy Hermite−Hadamard type inequalities.

5. Results and discussion

In this paper, we investigated uncertain fuzzy Hermite−Hadamard type inequalities for the functions which their derivatives are generalized (s, m, φ) −preinvex Godunova−Levin functions of the second kind via classical integrals and Riemann−Liouville fractional integrals.We established some new interesting uncertain fuzzy Hermite−Hadamard type inequalities for generalized (s, m, φ) −preinvex Godunova−Levin functions of the second kind.

6. Conclusion

These results about uncertain fuzzy Hermite-Hadamard type inequalities for the functions which their derivatives are generalized (s,m,φ) −preinvex Godunova−Levin functions of the second kind can be applied to find new inequalities for special means such as geometric, arithmetic and logarithmic means. We conclude that our methods considered here may be a stimulant for further investigations concerning uncertain fuzzy Hermite−Hadamard type integral inequalities for various kinds of preinvex functions involving classical integrals, Riemann-Liouville fractional integrals, conformable fractional integrals and k −fractional integrals.

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HOMOLOGICAL FINITINESS CONDITIONS FOR MONOIDS

Blerina Boçi [1], Dorina Guxholli [2], Fabiana Muharremi [3], Neime Gjikaj [4]

[1] Mathematic Department, Faculty of Information Technology, UAMD
Durres, Albania
blerinaboci@yahoo.com
[2] Mathematic Department, Faculty of Information Technology, UAMD
Durres, Albania
dorinaguxholli@hotmail.com
[3] Mathematic Department, Faculty of Information Technology, UAMD
Durres, Albania
fabianacullhaj@hotmail.com
[4] Mathematic Department, Faculty of Information Technology, UAMD
Durres, Albania
gjika.memi7@gmail.com

Abstract
This article is a brief summary regarding some important results on monoids, those monoids which are given by a finite complete presentation [10]. We are going to use some advanced concepts of Homological Algebra, as double complexes etc. Starting with the presentation of monoids and the form of general conditions FP_n for the modules, we are going to see how they apply to monoids and groups. To define FDT for a moniod given by a presentation P=[x,r], Squier constructs the so called reduction graph [10]. In 1994 Squier, Otto and Kobayashi proved that this property is an invariant of monoid [11]. Also, we define a new version of finite derivation type based on homological information, together with an extension of this finite derivation type to higher dimensions, and show connections to homological type FP_n for both monoids and groups [1].

Keywords:*Monoid; graph; bi-FP_n; FP_n; FDT; $HFDT_n$.*

1. Introduction

In the mid 80's Squier initiated a program whose main purpose was to find homological and homotopical invariants for rewriting systems and, in particular, to characterize algebraically those monoids which are given by a finite complete presentation. This class of monoids is of interest since they have solvable word problem. In [10] Squier showed that, if a monoid S has a finite terminating Church-Rosser presentation, then S is FP_3. Later Kobayashi [5], extended the result by showing that such a

monoid should necessarily satisfy the conditions left/right-FP_n for all n and in [6] he showed that the monoid is $bi - FP_n$. The same result showed Pasku in [8] in homotopic way. Similar conditions are studied later by Alonso and Hermiller. In this paper we will present a brief overview of only a part of this story.

2. Related work

In 1987, Squeier defined the notion of finite derivation type for finitely presented monoid. Cremanns and Otto showed that finite derivation type implies the homological finiteness condition FP_3 and, Pride have independently shown that finite derivation type (FDT) is equivalent to the property FP_3. Alonso and Hemiller introduced a new definition of homological finite derivation type in all dimensions ($HFDT_n$). Kobayashi, showed that a monoid should necessarily satisfy the conditions left/right-FP_n for all n and later he showed that the monoid is $bi - FP_n$. The same result showed Pasku in homotopic way. Ect.

3. The subject of your work

In this paper we have used the relationship between classes of finite string-rewriting systems, and classes of finitely presented monoids. Also, we have introduced the concept of finite derivation type, which is a graph-theoretical concept that applies to graphs associated to monoid presentation.

4. Proposed method

Using the monoid presentations via reduction systems and, reduction graph associated with a monoid presentation, we define homological conditions FP_n, left/right FP_n, bi-FP_n, the properties FDT and $HFDT_n$. Here we define the notion of $bi - FP_n$ for monoids, using bimodules instead of left or right modules. We use finitely presented monoids and the graph associated toa finite monoid presentation to define FDT and $HFDT_n$.

5. Results and Conclusion

The property of having finite derivation type is an invariant property of finitely presented monoids. A group G has type $HFDT_n$ if and only the group has homological type FP_n. A monoid M has type $HFDT_n$ if and only the monoid is of both left and right homological typeFP_n. Weak FP_n implies FP_n. $bi - FP_n$ implies weak FP_n. For the groups conditions weak FP_n, FP_n and$bi - FP_n$ are equivalent.

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ON INVERSE Γ- RINGS

Orgest BEQIRI[1] and Petraq PETRO[2]
[1]Department of Mathematics, Faculty of Information Technology, University of Durrës 'Aleksandër Moisiu', Albania
[2]Department of Mathematics, Faculty of Natural Sciences, University of Tirana, Albania
Corresponding email: orgestbeqiri@yahoo.com

Abstract
In this paper, we first define the completely regular elements in an arbitrary Γ-ring and using Green's theorem for Γ-semigroups, study them together with (α,β)-completely inverse elements. Further, we give a necessary and sufficient condition for an inverse Γ-ring to be a Γ-division ring. We also give characterizations in the class of inverse Γ-rings, of its subclass of completely inverse Γ-rings. Last we characterize the class of completely inverse Γ-rings in the class of completely regular Γ-rings.

Keywords: *Completely regular element, α-completely regular element, inverse Γ-ring, completely inverse Γ-ring.*

1. Introduction

In this paper, by convention a weakly Γ-ring, which was defined by Petro and Sema [8], will be refered to as a Γ-ring.
The regular, (α,β)-inverse and (α,β)-completely inverse elements in a Γ-ring were defined by Beqiri and Petro [11]. In this paper, we also define the completely regular elements in a Γ-ring. Further, using Green's theorem for Γ-semigroups, we study these elements together with α-completely regular elements as well as with (α,β)-completely inverse and α-completely inverse elements. Among others, we give a characterization of the completely regular element as well as a characterization of the α-completely regular element in an arbitrary Γ-ring $(M,+,(\cdot)_\Gamma)$ by means of quasi-ideals of the Γ-semigroup of the Γ-multiplication $(M,(\cdot)_\Gamma)$ of this Γ-ring.
Inverse rings, which are nothing but 0-rings, were defined and studied by Sain [3]. In [7] it is shown that the class of 0-rings coincides with the class of completely inverse rings and also with the class of completely regular rings. Inverse Γ-rings and completely inverse Γ-rings were defined and studied by Beqiri and Petro [11]. In this paper, we also define completely regular Γ-rings.
Γ-divisionrings were defined by Sema and Petro [10]. Here we give a necessary and sufficient condition for an inverse Γ-ring to be a Γ-division ring.
We also give some characterizations of the class of completely inverse Γ-rings, in the class of inverse Γ-rings, as well as a characterization of the class of completely inverse Γ-rings in the class of completely regular Γ-rings. Completely regular Γ-rings are defined in this paper as Γ-rings, where every element is completely regular.

Also, in the paper we leave two problems open, that deal with the relation of inverse Γ-rings, completely regular Γ-rings and completely inverse Γ-rings.

2. Related work

Here we give some notions and present some auxiliary results that will be used throughout the paper.

Let M and Γ be two nonempty sets. Any map from $M\times\Gamma\times M$ to M is called a Γ-multiplication on M and is denoted by $(\cdot)_\Gamma$.The result of this Γ-multiplication for every $a,b\in M$ and every $\gamma\in\Gamma$, is denoted by $a\gamma b$.

Definition 2.1.[4] AΓ-semigroup is called anyordered pair $(M,(\cdot)_\Gamma)$, where MandΓare two nonempty sets and$(\cdot)_\Gamma$ is a Γ-multiplication on M, which satisfies the following condition:

$$\forall(a,b,c,\alpha,\beta)\in M^3\times\Gamma^2,(a\alpha b)\beta c=a\alpha(b\beta c).$$

Let $(M,(\cdot)_\Gamma)$ be a Γ-semigroup and A,B two nonempty subsets of M.We write:

$$A\Gamma B=\{a\gamma b\colon a\in A,\gamma\in\Gamma,b\in B\}.$$

Definition 2.2.[5] A right [left] ideal of the Γ-semigroup $(M,(\cdot)_\Gamma)$ is a subset R $[L]$ of M such that $R\Gamma M\subseteq M$ $[M\Gamma\mathrm{L}\subseteq M]$.

For each element a of a Γ-semigroup M, the principal right [left] ideal $(a)_r$ $[(a)_l]$ generated by a, is the intersection of all right [left] ideals of M, containing a.

Saha has defined in [5] the Green's relations $\mathcal{R},\mathcal{L},\mathcal{H}$ in a Γ-semigroup M, as follows:

$$\forall(a,b)\in M^2,a\mathcal{R}b\Leftrightarrow(a)_r=(b)_r,$$
$$\forall(a,b)\in M^2,a\mathcal{L}b\Leftrightarrow(a)_l=(b)_l,$$
$$\forall(a,b)\in M^2,a\mathcal{H}b\Leftrightarrow(a)_r=(b)_r\wedge(a)_l=(b)_l.$$

One can prove that $\mathcal{R},\mathcal{L},\mathcal{H}$ are equivalence relations. The respective equivalence classes of $a\in M$ are denoted by R_a,L_a,H_a.

Let $(M,(\cdot)_\Gamma)$ be a Γ-semigroup and keep $\gamma\in\Gamma$ fixed. As in [4] define $a\circ_\gamma b=a\gamma b$. It is obvious that $\circ_\gamma$ is asocciative. Hence, we obtain a plain semigroup$(M,\circ_\gamma)$which is also denoted by (M,γ) or shortly by M_γ.

Theorem 2.3.[9] (Greens Theorem for Γ-semigroups) If the elements $a,b,a\gamma b$ of a Γsemigroup$M$ all belong to the same $\mathcal{H}$-class H_a of M, then $H_a$is a subgroup of the semigroup(M,γ). Moreover, for any two elements $h_1,h_2\in H_a,h_1\gamma h_2$ belongs to H_a.

Definition 2.4.[8] A weakly Γ-ring is called any ordered triple $(M,+,(\cdot)_\Gamma)$,where$M$, Γ are two nonempty sets, $+$ is an addition on M and $(\cdot)_\Gamma$ is a Γ-multiplication on M,such that:

1) $(M,+)$is an abelian group.
2) $(M,(\cdot)_\Gamma)$is a Γ-semigroup.
3) $\forall(a,b,c,\gamma)\in M^3\times\Gamma$,

$$[(a+b)\gamma c = a\gamma c + b\gamma c] \wedge [a\gamma(b+c) = a\gamma b + a\gamma c].$$

We notice that plain rings,Γ-rings of Nobusawa[1] and theΓ-rings of Barnes [2],which in the literature are called Γ-rings, are weakly Γ-rings, but the converse is not true.

Let $(M,+,(\cdot)_\Gamma)$ be a Γ-ring andγa fixed element of Γ.We define the binary operation$\circ_\gamma$on M,by the equality:

$$a \circ_\gamma b = a\gamma b,$$

for every two elementsa, b of$M$. It is evident that $(M,+,\circ_\gamma)$ is a ring.We denote this ring shortly$(M,+,\gamma)$ orwhen no confusionM_γ.

Definition 2.5.[10] Let $(M,+,(\cdot)_\Gamma)$ be a Γ-ring. The element$\gamma \in \Gamma$ is called aΓ-zero if for every two elementsa, b of$M$,we have$a\gamma b = 0$.

If $(M,+,(\cdot)_\Gamma)$ is a Γ-ring, then the set of the elements ofΓ, that are different to Γ-zero is denoted byΓ_0.

Definition 2.6. [10] A Γ-ring $(M,+,(\cdot)_\Gamma)$is called a weakly Γ-division ring if$\Gamma_0 \neq \emptyset$and for every$\gamma \in \Gamma_0$,the ring $(M,+,\gamma)$ is a division ring.

Definition 2.7.[11]An element a of a Γ-ring $(M,+,(\cdot)_\Gamma)$ is called regular, if there exist an element b of M and two elements α, β of Γsuch that:$a = a\alpha b\beta a$.

AΓ-ring$(M,+,(\cdot)_\Gamma)$is called regular if every its element is regular.

Definition 2.8.[11]An element b of the Γ-ring $(M,+,(\cdot)_\Gamma)$ is called an(α,β)-inverse element of the element $a \in M$, if:

$$a = a\alpha b\beta a, \quad b = b\beta a\alpha b.$$

As a special case of the (α,β)-inverse element, we have:

Definition 2.9. An element$b$of aΓ-ring$(M,+,(\cdot)_\Gamma)$is called anα-inverse elementof the element $a \in M$if there exists an element$\alpha \in \Gamma$,such that:

$$a = a\alpha b\alpha a \wedge b = b\alpha a\alpha b.$$

So,the α-inverse elementof an element $a$is an(α,α)-inverse element of a.

Definition 2.10. [11]A Γ-ring $(M,+,(\cdot)_\Gamma)$ is called an inverse Γ-ring if it is regular and when for every element a of $M$and for every two elements α, β of Γ,there exists an (α,β)-inverse element of a, then it is unique.

It is easy to prove the following proposition:

Definition 2.11. [11]An element b of a Γ-ring $(M,+,(\cdot)_\Gamma)$ is called (α,β)-completely inverse element of the element $a \in M$ if the following equalities are true:

$$a = a\alpha b\beta a, \quad b = b\beta a\alpha b, \quad a\alpha b = b\beta a.$$

As a special case of the (α,β)-completely inverse element we have:

Definition2.12. The element$b$of the Γ-ring $(M,+,(\cdot)_\Gamma)$is called α-completely inverse of the element$a$of$M$if there exists an element $\alpha \in \Gamma$,such that:

$$a = a\alpha b\alpha a \wedge b = b\alpha a\alpha b \wedge a\alpha b = b\alpha a.$$

So, the element $b \in M$, which is α-completely inverse element of the element$a \in M$,is just (α,α)-completely inverse of a.

Definition 2.13.[11]A Γ-ring$(M,+,(\cdot)_\Gamma)$is called completely inverseif it is inverse and when for every element$a \in M$and for every two elements α,β ofΓ, if $b$is an(α,β)-inverse element of$a$, then it is (α,β)-completely inverse element of a.

3. The subject of the work

The subject is the development of the properties of completely regular, inverse and completely inverse Γ-rings.

4. Proposed method

Basing on known concepts, propositions and theorems and mixing them, we infer new results on completely regular, inverse and completely inverse Γ-rings.

5. Results and discussion

We first give the definition of the completely regular element in an arbitrary Γ-ring:

Definition 5.1. An element $a$of a Γ-ring$\big(M,+,(\cdot)\big)$is called completely regular if there exist an element $b \in M$and two elements α,β of Γ, such that:

$$a = a\alpha b\beta a \wedge a\alpha b = b\beta a.$$

As a special case of the completely regular element we have:

Definition 5.2. An element$a$of a Γ-ring$\big(M,+,(\cdot)\big)$is called α-completely regular if there exist an element $b \in M$and an elementα of Γ, such that:

$$a = a\alpha b\alpha a \wedge a\alpha b = b\alpha a.$$

AΓ-ring$\big(M,+,(\cdot)\big)$is called completely regular if every its element is completely regular.

One can easily prove the following propositions:

Proposition 5.3. If the element b of the Γ-ring M is regular, then there exist at least two elements α,β of Γ and an element b of M, such that the element b is (α,β)-inverse element of a.

Proposition 5.4. Let$\big(M,+,(\cdot)\big)$be a Γ-ring. If the element $a \in M$is a completely regular element, then there exist at least two elementsα,β of Γand an element b of M, such thatthe element$b$is (α,β)-completely inverse element of$a$.

Theorem5.5. For every element a of theΓ-ring$\big(M,+,(\cdot)\big)$,the following propositions are equivalent:

1) The element$a$is completely regular.
2) The element$a$is α-completely regular.

Proof.1) ⇒ 2).Suppose that the element a of$M$is completely regular.Due to proposition 5.4,there exist an element b of$M$ and the elementsα,β ofΓ, such that:

$$a = a\alpha b\beta a \wedge b = b\beta a\alpha b \wedge a\alpha b = b\beta a.$$

Hence, we have the equalities:

$$a = a\alpha a\alpha b,\ \ b = b\beta b\alpha a,\ \ a = b\alpha a\beta a,\ \ b = a\beta b\alpha b,$$

from which,in theΓ-semigroup$(M,(\cdot)_\Gamma)$follow the equalities:

$$(a)_l = (b)_l,\ \ (b)_r = (a)_r,$$
$$(a)_r = (a\alpha b)_r,\ \ (b)_l = (a\alpha b)_l.$$

So, the elements$a, b, a\alpha b$belong to the same$\mathcal{H}$-class$H_a$ofthe Γ-semigroup$(M,(\cdot)_\Gamma)$. Now, due to Green's theorem for Γ-semigroups, $H_a$is a subgroup of the semigroup(M,α).Denote by $e$the unit of the subgroupH_a.There exists an element$c$ of$M$, such that:

$$a\alpha c = c\alpha a = e.$$

Hence, we find the equalities:

$$a = a\alpha c\alpha a,\ \ a\alpha c = c\alpha a,$$

which show that the element$a$is α-completely regular element.
Implication$2) \Rightarrow 1)$is evident. ■

Theorem5.6. Let$(M,+,(\cdot)_\Gamma)$be a Γ-ring. For every element a of$M$, the following propositions are equivalent:

1) The element$a \in M$has anα-completely inverse element.
2) The element$a \in M$has an (α,β)-completely inverse element.

Proof. Implication$1) \Rightarrow 2)$is evident.
$2) \Rightarrow 1)$. Suppose that the element$b$ of$M$is (α,β)-completely inverse element of a.So, we have:

$$a = a\alpha b\beta a,\ \ b = b\beta a\alpha b,\ \ a\alpha b = b\beta a.$$

Hence, we also have the equalities:

$$a = a\alpha a\beta b,\ \ b = b\beta b\alpha a,\ \ a = b\alpha a\beta a,\ \ b = a\beta b\alpha b,$$

which show that in theΓ-semigroup$(M,(\cdot)_\Gamma)$we have:

$$(a)_l = (b)_l,\ \ (a)_r = (b)_r,$$
$$(a)_r = (a\alpha b)_r,\ \ (b)_l = (a\alpha b)_l.$$

So, the elements$a, b, a\alpha b$belong to the same$\mathcal{H}$-class$H_a$of the Γ-semigroup$(M,(\cdot)_\Gamma)$. Hence, due to Green'stheorem for Γ-semigroups$H_a$is a subgroup of the semigroup(M,α).If we denote by $e$the unit of the subgroup H_a,there exists an element $c$of$M$, such that:

$$a\alpha c = c\alpha a = e.$$

Hence, we have the equalities:

$$a = a\alpha c\alpha a,\ \ c\alpha a\alpha a\alpha c = c,\ \ a\alpha c = c\alpha a,$$

which show that the element$c$is an α-completely inverse element of$a$. ■
From proposition 5.4 and theorem 5.5we immediately get the following corollary:

Corollary 5.7. If the element $a$ofthe Γ-ring$(M,+,(\cdot)_\Gamma)$is completelyregular, then there exists at least an element b of$M$, which is α-completely inverse of$a$. ■
It is evident that by this corollary, we have that an element a ofaΓ-ring$(M,+,(\cdot)_\Gamma)$is completely regular, if and only if it has at leastanα-inverse element.

Proposition 5.8. The element$a$ ofthe Γ-ring$(M,+,(\cdot)_\Gamma)$has an α-completely inverse elementif and only if in theΓ-semigroup$(M,(\cdot)_\Gamma)$it is true the equality:

$$(a)_q=(a\alpha a)_q.$$

Proof. Let $(M,+,(\cdot)_\Gamma)$ be an arbitraryΓ-ring and a any element of M.Suppose that the element$b\in M$,is an α-inverse element of a.Hence the following equalities are true:

$$a=a\alpha b\alpha a,\ \ b=b\alpha a\alpha b,\ \ a\alpha b=b\alpha a.$$

Thus, we have:

$$a=a\alpha a\alpha b,\ \ a=b\alpha a\alpha a,$$

and consequently in the Γ-semigroup $(M,(\cdot)_\Gamma)$it is true the equality:

$$(a)_q=(a\alpha a)_q.$$

Conversely, suppose that for the element$a$ of$M$and for the element$\alpha\in\Gamma$,in the Γ-semigroup$(M,(\cdot)_\Gamma)$it is true the equality:

$$(a)_q=(a\alpha a)_q.$$

If we take$b=a$and apply Green's theorem forΓ-semigroups, we have that$H_a$is a subgroup of the semigroup(M,α).Since $a\in H_a$,then in the subgroup$H_a$there exists the element$c\in M$,such that:

$$a\alpha c=e_\alpha=c\alpha a.$$

Hence, we have:

$$a=a\alpha c\alpha a,\ \ c\alpha a\alpha a\alpha c=c,\ \ a\alpha c=c\alpha a.$$

So, the element$c$is α-completely inverse element of a. ■

Let$(M,+,(\cdot)_\Gamma)$ be aΓ-ring and αany element of Γ. For an element $x\in M$,we denote by$(x)_q^\alpha$the quasi-ideal obtained by the element x in the ring$(M,+,\alpha)$.

Corollary5.9. For every element$a$of a Γ-ring$(M,+,(\cdot)_\Gamma)$and for every element$\alpha\in\Gamma$,the following propositions are equivalent:

1) $(a)_q^\alpha=(a\alpha a)_q^\alpha$.
2) $(a)_q^\alpha=(a\alpha a)_r^\alpha\cdot(a\alpha a)_l^\alpha$.
3) $(a)_q^\alpha\subseteq(a\alpha a)_r^\alpha\cdot(a\alpha a)_l^\alpha$.

Proof.1) ⇒ 2). Suppose thatproposition 1)is true.Due to proposition 5.8,the element$a$ hasanα-inverse element$b\in M$.So, the following equalities are true:

$$b=b\alpha a\alpha b,\ \ a=a\alpha b\alpha a,\ \ a\alpha b=b\alpha a.$$

Hence, we have:

$$a=(a\alpha a)\alpha b,\ \ a=b\alpha(a\alpha a).$$

So, in the ring$(M,+,\alpha)$the following equalities are true:

$$(a)_r^\alpha=(a\alpha a)_r^\alpha,\ \ (a)_l^\alpha=(a\alpha a)_l^\alpha,$$

from which we find:

$$(a)_q^\alpha=(a\alpha a)_q^\alpha.$$

The element$a\alpha a$is a regular element of the ring$(M,+,\alpha)$, since the equalities:

$$a\alpha a=(a\alpha b\alpha a)\alpha(a\alpha b\alpha a)=(a\alpha a)\alpha(b\alpha b)\alpha(a\alpha a),$$

are true. So, due to propositionii)of theorem 9.4 [6]we have $(a)_q^\alpha=(a\alpha a)_r^\alpha\cdot(a\alpha a)_l^\alpha$.

The implication 2) ⇒ 3)is evident.

3) ⇒ 1).Similarly to the above, one can prove that:

$$(a\alpha a)_r^\alpha \cdot (a\alpha a)_l^\alpha = (a\alpha a)_r^\alpha \cap (a\alpha a)_l^\alpha = (a\alpha a)_q^\alpha.$$

So, $(a)_q^\alpha \subseteq (a\alpha a)_q^\alpha$.Since the inclusion$(a\alpha a)_q^\alpha \subseteq (a)_q^\alpha$is evident, we have the equality$(a)_q^\alpha = (a\alpha a)_q^\alpha$. ■

Due to proposition 5.3,for every element $a$of the inverse Γ-ring$(M, +, (\cdot)_\Gamma)$,there exist two elementsα, β ofΓand a unique element b of$M$, which is(α, β)-inverse element of a.

Also, due to proposition 5.4, for every element$a$ of thecompletely inverse Γ-ring$(M, +, (\cdot)_\Gamma)$,there exist two elementsα, β ofΓand a unique element$b$ of$M$, which is (α, β)-completely inverse element of$a$.

It is evident that, if a Γ-ring$(M, +, (\cdot)_\Gamma)$is completely inverse, then it is at the same time inverse and completely regular.

For the plain rings, we also have that when a ring is at the same time inverse and completely regular, then it is completely inverse [7].This motivates us to think about the proof of the respective proposition for Γ-rings, which is just the converse of the clear proposition that we mentioned above. Since we have not been able to prove it or to find any counterexample to decline it, we formulate it as an open problem:

Problem 5.10. If a Γ-ring$(M, +, (\cdot)_\Gamma)$is at the same time inverse and completely regular, then is it completely inverse?

Definition 5.11. Let $(M, +, (\cdot)_\Gamma)$ be a Γ-ring and α an element of Γ. An element e of M is called anα-idempotent if $e\alpha e = e$.

The set of all α-idempotents, for $\alpha \in \Gamma$ is the set of idempotents of M.

The zero element of the addition group$(M, +)$of every Γ-ring$(M, +. (\cdot)_\Gamma)$is an α-idempotent element, for every$\alpha \in \Gamma$.In general, in an inverse Γ-ring different to zero Γ-ring, there are also other idempotent elements.More precisely, it is true the following proposition:

Proposition5.12. If the Γ-ring$(M, +, (\cdot)_\Gamma)$is inverseand has only one idempotent element,then this Γ-ring has no other elements except zero.

Proof. Let $(M, +, (\cdot)_\Gamma)$be an inverse Γ-ring.Suppose that the element$a$ of$M$ is an idempotent element. Since theΓ-ring$(M, +, (\cdot)_\Gamma)$is inverse, there exist the elementsα, β ofΓand the element$b$ of$M$, such that $b$is (α, β)-inverse element of a. Thus, we have:

$$a = a\alpha b\beta a \wedge b = b\beta a\alpha b.$$

The following equalities are true:

$$a\alpha b = a\alpha(b\beta a\alpha b) = (a\alpha b)\beta(a\alpha b),$$

which show that the element$a\alpha b$is a β-idempotent element. So, as$M$has no other idempotent elements except zero, we have$a\alpha b = 0$. Thus,

$a = (a\alpha b)\beta a = 0\beta a = 0$. ■

If an inverse Γ-ring$(M, +. (\cdot)_\Gamma)$is different to zero,i.e it has at least one element different to the zero of its addition group$(M, +)$,then from proposition 5.12,it has at least one γ-idempotent element different to zero. But what happens if this

inverse Γ-ring, for every$\gamma \in \Gamma$,has only oneγ-idempotent different to zero? The reply of this question, for a class of inverse Γ-rings is given by the following theorem:

Theorem5.13. A necessary and sufficient condition for aninverse Γ-ring $(M,+.(\cdot)_\Gamma)$to be a Γ-division ringis that for every$\gamma \in \Gamma_0$,there exists a uniqueγ-idempotent element e_γ different tozero of its addition group$(M,+)$and every $a \in M$,has a γ-inverse element, for every $\gamma \in \Gamma_0$.

Proof. Necessary condition. Suppose that the inverse Γ-ring$(M,+.(\cdot)_\Gamma)$is a Γ-division ring.For every$\gamma \in \Gamma_0$,the ring$(M,+,\circ_\gamma)$is a division ring.Thus, there exists the unit $e_\gamma$of this ring, which is different to zero of its addition group$(M,+)$.If e'_γwould be aγ-idempotent element different to zero of the addition group $(M,+)$,then in the plain division ring$(M,+,\circ_\gamma)$,we would have two idempotentse_γ, e'_γdifferent to zero of addition group of this ring,that would be impossible.For every $a \in M$and for every $\gamma \in \Gamma_0$,the inverse element of a in the ring $(M,+,\circ_\gamma)$is aγ-inverse element of a.

Sufficient condition. Suppose that the inverse Γ-ring$(M,+.(\cdot)_\Gamma)$is such that for every$\gamma \in \Gamma_0$,there exists a unique γ-idempotent element e_γ,different to zero of its addition group$(M,+)$ and every$a \in M$has a γ-inverse element, for every$\gamma \in \Gamma_0$.For this γ ofΓ_0,in the plain ring$(M,+,\circ_\gamma)$we have only two idempotent elements, precisely the zero of its addition group$(M,+)$and the element$e_\gamma$and moreover $(M,+,\circ_\gamma)$is an inverse ring. Let$a$be an element different to zero and let $b$be the inverse element of $a$in the ring$(M,+,\circ_\gamma)$.Then we have the equalities:

$$a\gamma b = b\gamma a = e_\gamma,$$

because the elements $a\gamma b, b\gamma a$are γ-idempotent elements different to zero, since:

$$a = a\gamma b\gamma a, \quad b = b\gamma a\gamma b.$$

So, the element$b$is the inverse element of $a$in theplain ring $(M,+,\circ_\gamma)$,for every$\gamma \in \Gamma_0$and consequently the Γ-ring$(M,+.(\cdot)_\Gamma)$is a Γ-division ring. ■

Let$(M,+.(\cdot)_\Gamma)$be a completely inverse Γ-ring. It is evident that this Γ-ring is completely regularand for every element$a$ of$M$and every two elementsα, β ofΓ, there exists at most one (α,β)-completely inverse element of$a$.

In a natural way, it arises the question: conversely, if a Γ-ring $(M,+.(\cdot)_\Gamma)$is completely regular and for every element a of$M$ and every two elementsα, β ofΓ,there exists at most one (α,β)-completely inverse element of a, then is this Γ-ring completely inverse?We have not been able to give a reply to this question, leaving it as an open problem. We point out that for the case of plain rings, due to theorem 1 of [3], the reply of the respective question is positive, even leaving out the claim that for every element$a$of this ring, there exists at most one completely inverse element of a.

The following theorem is a characterization of the class of completely inverse Γ-rings in the class of inverse Γ-rings.

Theorem5.14. In every inverse Γ-ring $(M, +. (\cdot)_\Gamma)$,the following propositions are equivalent:

1) The inverse Γ-ring $(M, +. (\cdot)_\Gamma)$is a completely inverse Γ-ring.
2) For every element $a \in M$, if b is an (α, β)-inverse element of a, then in the Γ-semigroup $(M, (\cdot)_\Gamma)$ we have $(a)_q = (b)_q$ and the elemenets $a\alpha b, b\beta a$ are α-idempotents.

Proof. 1) ⇒ 2). Suppose that1)is a true proposition.For the elements a, b of$M$, the following equalities hold:

$$a = a\alpha b\beta a, \;\; b = b\beta a\alpha b, \;\; a\alpha b = b\beta a.$$

By these equalities follow the equalities:

$$a = b\beta a\beta a, \;\; a = a\alpha a\alpha b, \;\; b = a\alpha b\alpha b, \;\; b = b\beta b\beta a,$$

which show that in the Γ-semigroup$(M, (\cdot)_\Gamma)$we have:

$$(a)_q = (b)_q.$$

The element$a\alpha b = b\beta a$is anα-idempotent,since the following equalities are true:

$$(b\beta a)\alpha(b\beta a) = (b\beta a\alpha b)\beta a = b\beta a.$$

2) ⇒ 1). Suppose that 2)is a true proposition.For the elements $a$and$b$the following equalities are true:

$$a = a\alpha b\beta a, \;\; b = b\beta a\alpha b,$$

whichshow that in the Γ-semigroup$(M, (\cdot)_\Gamma)$we have:

$$(a)_r \subseteq (a\alpha b)_r, \;\; (b)_l \subseteq (a\alpha b)_l.$$

Since

$$(a\alpha b)_r \subseteq (a)_r, \;\; (a\alpha b)_l \subseteq (b)_l,$$

in$(M, (\cdot)_\Gamma)$we finally have the equalities:

$$(a)_r = (a\alpha b)_r, \;\; (b)_l = (a\alpha b)_l.$$

In$(M, (\cdot)_\Gamma)$it is true the implication:

$$(a)_q = (b)_q \Rightarrow ((a)_l = (b)_l \wedge (a)_r = (b)_r).$$

So, the elements$a, b, a\alpha b$belong to the same $\mathcal{H}$-class$H_a$of the element$a$ ofthe Γ-semigroup$(M, (\cdot)_\Gamma)$. ByGreen's theorem for Γ-semigroups,we have that$H_a$is a subgroup of the semigroup(M, α). In$(M, (\cdot)_\Gamma)$,we also have the inclusions:

$$(b)_r \subseteq (b\beta a)_r, \;\; (b\beta a)_r \subseteq (b)_r,$$
$$(a)_l \subseteq (b\beta a)_l, \;\; (b\beta a)_l \subseteq (a)_l,$$

which show that in $(M, (\cdot)_\Gamma)$the following equalities are true:

$$(a)_r = (b)_r, \;\; (a)_l = (b)_l,$$

since$(a)_q = (b)_q$.Thus, the elements$a, b, b\beta a$belng to the same $\mathcal{H}$-class$H_a$of the element $a$of theΓ-semigroup$(M, (\cdot)_\Gamma)$.By Green's theorem for Γ-semigroups we have that$H_a$is a subgroup of the semigroup(M, β).

The element$b\beta a$ belong toH_a, as a subgroup of the semigroup$(M, \alpha)$and is an idempotent element of this subgroup.So, if we denote by $e_\alpha$the unit of the group$H_a$as a subgroup of the semigroup(M, α),we have$b\beta a = e_\alpha$.The

elements$a, b, a\alpha b$ belong to $H_a$and since $a\alpha b$is an idempotent element, we have the equalities:

$$a\alpha b = e_\alpha = b\beta a,$$

which show that the inverse Γ-ring$(M, +. (\cdot)_\Gamma)$ is completely inverse. ■
Analoguosly, we may also prove this theorem:

Theorem5.15. In every inverse Γ-ring $(M, +. (\cdot)_\Gamma)$,the following propositions are equivalent:

1) The inverse Γ-ring $(M, +. (\cdot)_\Gamma)$is a completely inverse Γ-ring.
2) For every element $a \in M$, if b is an (α, β)-inverse element of a, then in the Γ-semigroup $(M, (\cdot)_\Gamma)$ we have $(a)_q = (b)_q$ and the elemenets$a\alpha b, b\beta a$ are β-idempotents.

From theorems 5.14and 5.15we immediately get this theorem:

Theorem5.16. In every inverse Γ-ring$(M, +. (\cdot)_\Gamma)$, the following propositions are equivalent:

1) $(M, +. (\cdot)_\Gamma)$is a completely inverse Γ-ring.
2) For every element $a \in M$,if $b$is an (α, β)-inverse element of$a$, then in the Γ-semigroup $(M, (\cdot)_\Gamma)$ we have $(a)_q = (b)_q$ and the elements $a\alpha b, b\beta a$ are α-idempotents.
3) For every element $a \in M$, if b is an (α, β)-inverse element of a, then in the Γ-semigroup $(M, (\cdot)_\Gamma)$ we have $(a)_q = (b)_q$and the elements $a\alpha b, b\beta a$ are β-idempotents.

Theorem 5.17. For every Γ-ring $(M, +, (\cdot)_\Gamma)$,the following propositions are equivalent:

1) $(M, +, (\cdot)_\Gamma)$is a completely inverseΓ-ring.
2) $(M, +, (\cdot)_\Gamma)$is a completely regular Γ-ring,such that:

$\forall(a, \alpha, b, \beta) \in M\times\Gamma\times\mathrm{M}\times\Gamma, (a = a\alpha b\beta a \wedge b = b\beta a\alpha b) \Rightarrow (a\alpha b = b\beta a).$

Proof. 1) ⇒ 2). Suppose that proposition1)is true.Then for every element$a \in M$,there exist the elements $\alpha, \beta$of Γand the element b of$M$, such that:

$$a = a\alpha b\beta a, \;\; b = b\beta a\alpha b, \;\; a\alpha b = b\beta a.$$

It follows from these equalities that the Γ-ring$(M, +, (\cdot)_\Gamma)$is regular.
If for the elements$a \in M, b \in M, \alpha \in \Gamma, \beta \in \Gamma$, the following equalities:

$$a = a\alpha b\beta a, \;\; b = b\beta a\alpha b,$$

are true, then the element$b$is (α, β)-inverse of$a$ and since$(M, +, (\cdot)_\Gamma)$is completely inverse, we have $a\alpha b = b\beta a$. Thus, proposition 2)is true.
2) ⇒ 1). Suppose that proposition2)is true.To prove that proposition 1)is true, it suffices to show that theΓ-ring$(M, +, (\cdot)_\Gamma)$is inverse.
Since$(M, +, (\cdot)_\Gamma)$is completely regular, it is regular.For every element$a \in M$and for every two elementsα, β ofΓ,let b, cbe two (α, β)-inverse elementsof a. Thus, the following equalities are true:

$$a = a\alpha b\beta a, \;\; b = b\beta a\alpha b, \;\; a = a\alpha c\beta a, \;\; c = c\beta a\alpha c.$$

It follows from proposition 2)that:

$$a\alpha b = b\beta a, \;\; a\alpha c = c\beta a.$$

By the above equalities, in the Γ-semigroup$(M, (\cdot)_\Gamma)$,we have:

$$(a)_l = (b)_l = (c)_l = (a\alpha b)_l = (b\beta a)_l = (a\alpha c)_l = (c\beta a)_l,$$
$$(a)_r = (b)_r = (c)_r = (a\alpha b)_r = (b\beta a)_r = (a\alpha c)_r = (c\beta a)_r.$$

Hence, the elements

$$a, b, c, a\alpha b, b\beta a, a\alpha c, c\beta a$$

belong to the same$\mathcal{H}$-class$H_a$of the Γ-semigroup$(M, (\cdot)_\Gamma)$.From Green's theorem for Γ-semigroups, $H_a$is a subgroup of the semigroups(M, α) and(M, β).Since

$$a = a\alpha(b\beta a) = a\alpha(c\beta a),$$

in the subgroupH_a ofthe semigroup(M, α)we find:

$$b\beta a = c\beta a.$$

By this equality, in the subgroup$H_a$of the semigroup(M, β)we have$b = c$. ■

6. Conclusions

This paper confirms the efficiency of the use of Green's theorem for Γ-semigroups for Γ-rings. It opens up a new perspective in the study of inverse Γ-rings by analogy to inverse Γ-semigroups.

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COMPARING BETWEEN ORDERED MONOIDS AND ORDERED MONOIDS OF UPPER SETS

Anjeza Pasku[1], Elton Pasku[2]
[1]AleksanderMoisiuUniversity of Durres, Faculty of Technologyand Information, Department of Mathematics
E-mail:anjeza.krakulli@gmail.com
[2] Tirana University, Faculty of Natural Sciences, Department of Mathematics
E-mail: elton.pasku@fshn.edu.al

Abstract
There is a growing interest in the theory of ordered semigroups from those who do research in theoretical computer sciences for several reasons. The two main ones are mentioned below. Finite ordered monoids appear as transition monoids of finite state automata (see [2]), and monoids of upper sets of finite ordered monoids are proved to be useful in studying varieties of finite ordered monoids (see [1]). The aim of our paper is to show that from a categorical view point that ordered monoids and their corresponding ordered monoids of upper sets do not differ that much from each other.
Keywords*:orderedmonoids, upper set monoid, semigroup embedding, adjointfunctor, variety*.

1. Introduction

Given an ordered monoid$(S,\cdot,\leq)$, A. Cano and J.E. Pin in their joint paper [1] define the upper set monoid$\mathcal{P}^{\uparrow}(S)$ whose elements are the upper sets $[X] = \{s \in S: s \geq x \; for \; some \; x \in X\}$ and the multiplication is given by $[X]\circ[Y] = [X \cdot Y)$. $\mathcal{P}^{\uparrow}(S)$becomes an ordered monoid if one defines $[X] \leq [Y)$ if and only if $\forall y \in Y$ there is $x \in X$ such that$x \leq y$. The reason why Cano and Pin study upper set monoids lies in the fact that for any variety of finite ordered monoids**V**, the variety$\boldsymbol{P}^{\uparrow}\boldsymbol{V}$of finite ordered monoids generated bythe upper set monoids of members of **V**satisfies the equality $\boldsymbol{P}^{\uparrow}(\boldsymbol{P}^{\uparrow}\boldsymbol{V}) = \boldsymbol{P}^{\uparrow}\boldsymbol{V}$ which makesthe operator $\boldsymbol{P}^{\uparrow}$an idempotent differently from its counterpart **P** in the unordered case.Although it seems that $\mathcal{P}^{\uparrow}(S)$ is an indispensable gadget in the theory of formal languages,the result of our paper shows that from a categorical viewpoint, one can live without upper set monoids. More specifically, letting **pomon** be the category of ordered monoids andorder preserving homomorphism and **uspomon**the full subcategory of the first generatedby upper set monoids of objects of **pomon**, we show that the inclusion functor$K$ has a leftadjoint$\mathcal{P}^{\uparrow}$ and that each ordered monoid$S$ embeds into $\mathcal{P}^{\uparrow}(S)$. The inclusion $S \hookrightarrow \mathcal{P}^{\uparrow}(S)$is dual to the inclusion established in [3].

2. Related work

A. Cano and J.E. Pin in [1] study monoids of upper sets of ordered monoids. The paper [2] of Pin and Weil is one of the first which mentions and uses ordered monoids to study formal languages recognized from _nite state

automata. The paper [3] makes a connection between two important classes of ordered semigroups, po-semigroups and le-semigroups. The PhD thesis [4] of E. Manes is mainly concerned with the problem of realizing certain algebras as *T*-algebras of simpler ones.

3. The subject of your work

Semigroup theory, theory of automata and categorical algebra.

4. Proposed method

We use categorical algebra to deal with problems of semigrouptheory which are related with automata and formal languages.

5. Results and discussion

We give and alternative embedding to that of [3] which uses upper sets instead of lower sets, and than deal with upper set monoids of [1] by studying the category they form in relation with the category of ordered monoids.

6. Conclusion

There is not a significant difference between the two categories mentioned above. This may lead to a reformulation of known results in terms of ordered monoids instead of upper set monoids.

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A FIXED POINT THEOREM IN QUASI – 2 - BANACH SPACE

Silvana LIFTAJ[1], Luljeta GJONI[2],Mimoza KARAFILI[1]
[1)] *Department of Mathematics, Faculty of IT, University "AleksandërMoisiu", Durrës, Albania*
Email: silvanaliftaj@yahoo.com
[2)]*Department of Mathematics, University "EqeremÇabej", Gjirokastra, Albania*

Abstract

Liftaj, S., Hoxha, E., Dule, K., [7] have given some generalizations of fixed point results of Saha M., et al [8] in 2-normed Banach space, generalizing the condition of contractivity.
In this paper we extend the results of [7] into quasi -2-Banach space.
Keywords:*Fixed Point Theorem, quasi-2-Banach space*, 2-*Banach space*

1. Introduction

The concept of 2-normed space was initially introduced by Gahler [9] as a linear generalization of a normed linear space. There are many authors who have worked with this space. Some of them have proved various fixed Point Theorems in 2-Banach space for a class of contractive mappings having asymptotic regularity property. So Saha M., Garguly A and Debnath [8] in 2012 have proved a fixed Point Theorem in 2-Banach space based on asymptotic regularity related with a certain contractivity condition. As quasi-2-norm function is a generalization of 2-norm function, we have seen with interest the application of fixed point theorem in quasi-2-normed space related to a more generalized contractivity condition.

2. The subject of your work

In this paper we have treated a theorem on quasi-2-Banach spaces, which is a further generalization of a fixed theorem in 2-Banach space based on asymptotic regularityandacontractivity condition, of authors MantuSaha, Debnath, AnamicaGanguly,and Lokenath.This generalization is results of changing both space and contractivity condition.

3. Proposed method

In this paper we have used analogy and generalized methods passing from 2-Banach spaces into quasi-2-Banach spaces, and by made a further generalization of a contractivity condition.The contractivity conditionis a fundamental relation used in Fixed Point Theory of Functional Analysis.

4. Results and discussion

The mainresult of this paper is following theorem:

Theorem. Let$(X, \| \bullet, \bullet \|)$ be a quasi-2-Banach space with coeficient $k \geq 1$ such that for all $x, y, z \in X$holds:

$\|Tx-Ty, z\| \leq h \max\{\|x-Tx, z\|, \|y-Ty, z\|, \|x-Ty, z\|, \|y-Tx, z\|, \|x-y, z\|\}$

where $0 \leq h < \frac{1}{2k}$, $T : X \to X$is an asymptotically regular mapping in a point $a \in X$, then T has a single fixed point in X.

The proof of theorem is based on properties of quasi-2-norme function, which has more generalized properties than 2-norme function.

5. Conclusion

The result of this paper is generalization of Theorem [7] because the quasi 2-normed space is generalization of 2-normed space.

Also our result, is generalization of Theorem [8] because of the contractivity and the space in our theorem are generalization of contractivity and space used in [8].

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USING THE SURROGATE VARIABLES FOR THE MISSCLASSIFICATION VALUES IN DTREG AND WEKA PACKAGE.

Phd.Daniela Halidini (Qendraj)[1],Doc.Neime Gjikaj[2], Phd.Evgjeni Xhafaj[3], Phd.Robert Kosova[4]

[1,2,3,4]Department of Mathematics, Faculty of Information Technology, Durres, Albania.
daniela_qendraj@hotmail.com, gjika.memi7@gmail.com, gena.xhafa@yahoo.com, robertko60@yahoo.com

Abstract

Classification trees are constructed with continuous and discrete variables at the same time and rules generated by them are relatively simple to understand and to interpret.Observations that need to be included are those that lose their current inputs considered in the division.DTREG is a soft for predictive modeling which has a linear or polynomial function to estimate the missclassification values based on variable surrogate. The predictive variables are continuous and categorical with two categories, have surrogate and are surrogate.Data are taken from the total waste in Albania, recycling and the benefits of it in 2014. The surrogate variables of the categorical predictors are very close to real values. From the data and in DTREG we have found out that the missclassification values are calculated 100% in the first prunning fase, while in Weka the missclassification values are 70% for the whole tree classifier.

1. Introduction

Classification trees are an effective classification method especially when variables are categorical.This is because of the simple methodology based in recursive divisions to predictors that share with the best grades of variables responsible for. We actually need more details, such as: choice of the better criterion function for determining the division of the variables, stopping rules, rules of pruning and so on.However the problem of the misclassification values remains to be seen concretely because it is a common problem for predictors.

2. Related work

This work is related to other works as are: "An Approach for Classification using Simple CART Algorithm in Weka" Neeraj Bhargava, Sonia Dayma, "Nonlinear Regression Analysis Program" Phillip H. Sherrod, "An Approach for Classification using Simple CART Algorithm in Weka", T. Santhanam, "Classification and Regression Trees"(1984), U.S.A: Wadsworth, Breiman.

3. The subject of your work

The main study of our work is to evaluate the misclassification values in DTREG and Weka by using the surrogate variables. A sophisticated method is to use surrogate variables to insert values of predictors who are missing. A

surrogate variable is an other predictor variable that is correlated with the variable. DTREG examines each potential surrogate variable for each primary predictor variable and calculates the correlation between them. A surrogate variable in Weka predicts the split of the primary variable. The rate for the misclassification is lower than in Weka.

4. Proposed method

Categorical predictors: A slightly different method is used to calculate the correlation for categorical predictors with two categories $\rho = 200 \cdot |k - 0.5|$.

One of the key differences between surrogate variables as surrogate splitters is in DTREG, because a different set of surrogate splitters is stored for each split.

5. Results and discussion

Applying Weka to the data we have fuond out that there are 9 misclassification values, after being removed the misclassified. The surrogate function is used to compute the replacement value for the variable. As we see the rate for the misclassification is lower than in Weka, from 12.5 % to 20%, in a decision tree constructed from the data.

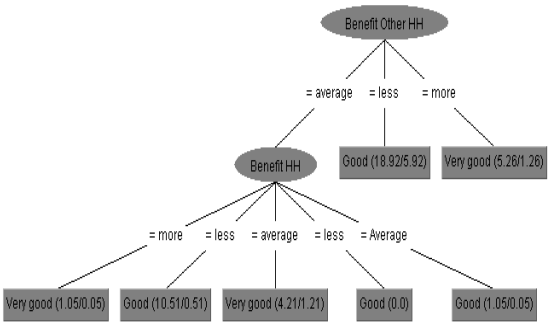

Fig 2. Tree obtained by Weka

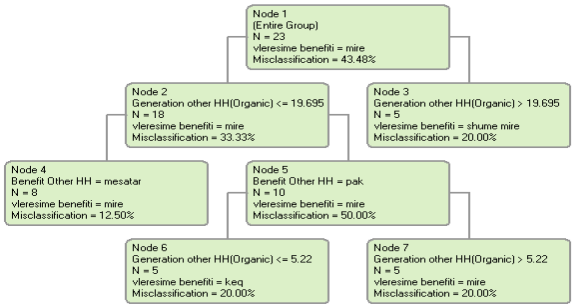

Fig. 3 Tree obtained by DTREG

6. Conclusion

The misclassification values in Weka have to be calculated in two phases, after that we have classified well 70% of the data. In DTREG the misclassification data are being calculated 100% to the first phase, because of the surrogate variables predictors.

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IDENTIFYING AN OPTIMAL FACILITY LOCATION FOR A COLLECTION

Albina Basholli
Polytechnic University of Tirana
Faculty of Mathematical EngineeringandPhysicsEngineering
albinabasholli@yahoo.com

Abstract
This paper concentrates on a study carried out in fruit collection centers in Elbasan district. The study aims to find one or more optimal alternatives for the location of fruit collection centers, which minimizes costs and time of their transportation by the farmers of this district. Gravity Center method and applications such as Arcgis, Google Earth, Excel Solver were used to select the best alternatives for building collection centers that may serve as wholesale market locations or collection / processing centers. Improvement of these areas will make it possible to make more income for the agricultural community all over the supply chain, thus allowing a greater market access towards producers who have limitations as of their location. The need for other additional collection centers is indispensable all over Albania, centers which need to be as close as possible to the administrative areas where these crops have been planted so as to serve as a great help to the farmer to avoid numerous kilometers during their transportation as well as to ensure preservation under favorable conditions. The methodology and conclusions of this paper are of great interest, as optimal planning of agricultural areas in our country and economic evaluation of optimal locations for the collections centers of fruit and vegetables in different farms makes up a basic study for our contemporary agricultural economy.
***Keywords**: Location, Center Of Gravity Method, Optimization.*

1. Introduction

The agricultural sector is one of the most important economic activities in our country for a lot of reasons. The Albanian agricultural reality faces a variety of phenomena, such as: large number of farms, small size, land distribution, limited availability of productive skills, overcrowded families in rural areas, financial difficulties in providing inputs, inadequate market for agricultural products, lack of regionalization, lack of agricultural mechanics, lack of information and infrastructure, productivity and low income, low level of producer-processor integration. One of the main problems domestic production faces nowadays is the lack of collection centers for agricultural products and lack of contracts between farmers and wholesalers, lack of refrigeration conditions to store the products at the respective temperatures. The central agricultural market has a vital role and enables increase of efficiency, reduction of logistical costs for agricultural products, minimizes losses and risks from

collection to product distribution and strengthens the standards of agricultural products. The area we have taken into consideration is the district of Elbasan, as it has a suitable climate to cultivategroves, vineyards, olive groves and citrus fruits.

2. Related work

A study performed by Bosona and Gebresenbet (2011), used GIS and Gravity Center Method to analyze the location in order to find a distribution center. They used Logix and ArcGIS software to analyze the ways of the supply chains from farms to collection centers and from collection centers to small markets. Decision of location is one of the key elements in strategic planning for different firms (Farahani&Hekmatafar, 2009). Alfred Weber in 1909 studied how to find a single center in an optimal location so as to minimize the distance between the center and the distribution centers(producers/consumers).
Using GIS and the Center of Gravity Method enable higher degree of decisions' accuracy (Brown, 2006). Decision-making of locations require an agreement on terms and conditions fordata on transportation, production and the market. Numerous studies of various agro-industrial products have already applied location optimization techniques which are important at a specific period of time (Ramos 2001, Oliveira 2005).

3. The subject

The focus of our study has been agricultural farms in Elbasan district, considering the fact that this is a dynamic agricultural area in our country. At first we took into consideration the situation in which the area of our study is. Then we considered how to target optimal locations and where to build collection centers for fruit in this area, which might enable a generalization for the phenomenon in the future, which as a result will enable its implementation all over the agricultural economies of our country, to organize agricultural production at its best.

4.Proposed method

Techniques of Center of Gravity Method are used to find an optimal geographical location which might serve as a center for processing/collection. This is a quantitative method which is used to decide where to build an object, in our case a collection center, which is supplied with goods by the producers and distributes goods to consumers based on their location distance and quantity of products (Russell and Taylor, 2009).The method aims to find coordinates of the center's location to minimize the overall transportation costs.

5. Results and Conclusion

This study supplies with information and suggestions private companies and administrative areas interested in geographical positionswhere to build a collection center for the agricultural products via the Gravity Center Methods of

the current situation. The need to build additional collection centers is indispensable all over Albania, centers which must necessarily be as near as possible administrative areas where these cultures have been planted. These will serve as basic help for the farmer to avoid numerous kilometers in their transportation and ensure preservation of these products in favorable conditions. Location models might be applied at different levels, such as farm level, area or regional level, or national level as well as in other directions in spite of fruit-vegetables markets, such as forests, fishing etc.

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CLASSIFICATION OF THE FACTORS INFLUENCING HOUSEHOLD EXPENDITURE ACCORDING TO CART METHOD. A CASE STUDY IN THE ALBANIAN HOUSEHOLDS.

Phd.Evgjeni Xhafaj [1], Prof.As.Lindita Mukli [2], Phd.Daniela Halidini (Qendraj)[3], Msc. Dorina Guxholli[4], Msc.Etleva Halidini[5]
[1,2,3,4]Department of Mathematics, Faculty of Information Technology, Durres, Albania.
genaxhafa@yahoo.com, linditamukli@gmail.com, daniela_qendraj@hotmail.com, dorinaguxholli@hotmail.com
[5] High School " Besnik Sykja", Tirana, Albania.
etlevahalidini@hotmail.com

Abstract
The main purpose of this paper is to see the classification of factors influencing Albanian households expenditures, using the Cart method. The data for this paper are obtained from the Living Standards Measurement Study (LSMS) for 2016 .From all of the variables taken into account, the root of the tree, resulted to be the household size variable, which is the most important attribute. The results of this paper may serve in the orientation of social policy in order to increase the standard of living of Albanian households.
Keywords:Cart Method, Classification Method, Regression Tree, LSMS

1. Introduction

The regression trees have become popular in 1960 with the development of AID (Automatic Interaction Detection) by Morgan and Sonquist (1963). Cart method is presented by Breiman (1984). CART can statistically demonstrate which factors are particularly important in a model or relationship in terms of explanatory power and variance. This process is mathematically identical to certain familiar regression techniques, but presents the data in a way that is easily interpreted by those not well versed in statistical analysis.Statisticians can use CART to present preliminary data to householders or other based in their size, gender, and zone. In this paper we have constructed the regression tree for these factors.

2. Related work

This work is related to other works as are: Classification and Regression Tree (CART) analysis to predict influenza in primary care patients, Richard K. Zimmerman, Classification and regression tree (CART) model to predict pulmonary tuberculosis in hospitalized patients, Fabio S Aguiar, "An Approach for Classification using Simple CART Algorithm in Weka", 2016 T. Santhanam, ``Classification and Regression Trees`` (1984), U.S.A: Wadsworth, Breiman.

3. The subject of your work

The main study of our work is to classify the factors influencing household

expenditure according Cart method. The factors are household size, gender and zone, while the expenditure is a continuous independent variable depending on these factors. All the values generated by the Cart method are the expenditure values related to the factors below.

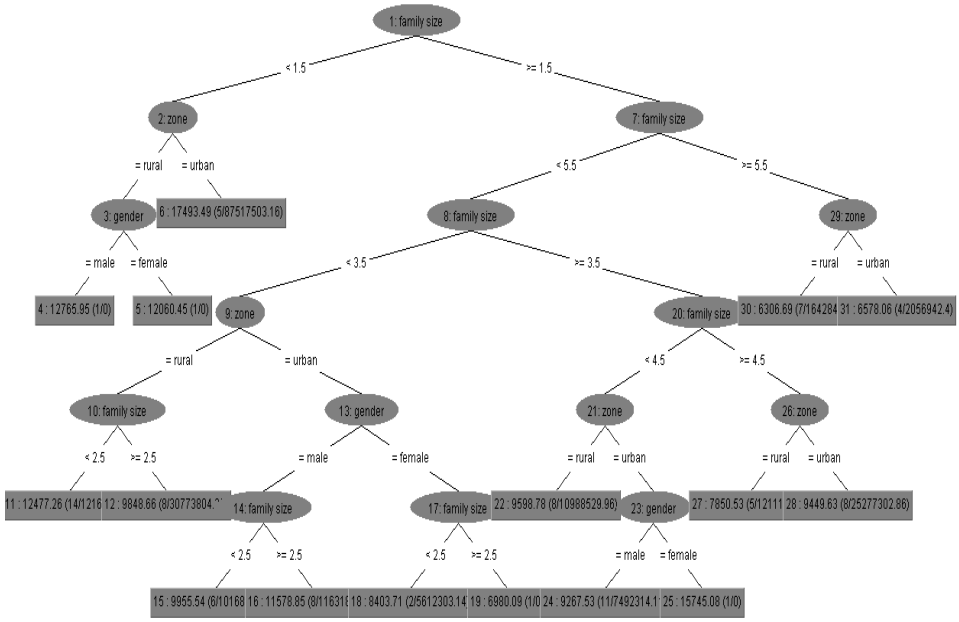
4. Proposed method

The data for this paper are collected from the Living Standards Measurement Survey for 2016. LSMS includes in total about 6671 households that include the observation unit and are representative for 4 regions, central, mountain, northern and coastal. From this database are selected randomly 100 households

$$SS(t) = \sum_{i=1}^{N_t} (y_{i(t)} - \bar{y}_{(t)})^2 \quad \Phi(s,t) = SS(t) - SS(t_r) - SS(t_l)$$

5. Results and discussion

By growing the household size, the expenditure factor decreases,as it is from 17493 in urban zone to 9267.5 , and from 12060 in rural zone to 9598.



6. Conclusion

The results of this paper may serve in the orientation of social policy in order to increase the standard of living of Albanian households.

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SAX ALGORITHM FOR CONSUMER PRICE INDEX. THE BEST ALGORITHM FOR THE SEQUENCE

Anxhela Gjecka[1] *Alsa Kaziu*[2]
Edjola Naka[3] *Krisel Tola*[4]
[1,3,4]*Department of Computer Science, Faculty of Information Technology, University "Alexander Moisiu" Durres*
[2]*Department of Information Technology, Faculty of Information Technology,*
e-mail: a.gjecka@gmail.com

Abstract
Symbolic time series analysis is a methodology that usually includes all data structures measured in time. Initially the data is reduced and the symbols are repeated based on the set conditions. This study includes Symbolic Aggregate Approximation (SAX) which is based on Piecewise Aggregate Approximation (PAA). The database used to apply the aforementioned method for this study is the Consumer Price Index. Simple examples will be used to interpret several theoretical parts. This study presents an algorithm that uses the symbolic time series technique in the programming R language and at the same time in program Python. The purpose of building both programs is to determine the best applicable program. Three key points where this work is based on are: 1) Execution speed, 2) Complexity, and 3) Standard error. The reliability of the algorithm will be determined by using symbolic sequences derived from techniques of PAA and SAX.

Keywords: *time series, SAX, Projection of the price index, R, Python*

1. Introduction

Symbolic time series analysis is a methodology that usually includes all data structures measured in time. Recently the problem of searching similarities in large time series has caught the attention of researchers. This is a problem not simply because of the vast nature of the data size. Appropriate representation of data is key to effective solutions. The most promising solutions to these problems include reduction of data and then indexing the reduced data in a spatial approach (spatial access method).Several techniques have been proposed for reducing the size of data, some of which are: the Singular Value Decomposition (SVD), and Discrete Wavelet Transform (DWT). Generally the effort of searching similarities between time series lies in finding identical structures (motifs, themes). If there is little time series data then all the work fails because no satisfactory outcome is achieved. As for long sequences, satisfactory results can be obtained based on the finding structures with high similarity.

2. The subject of mywork

In this study we present a new technique to reduce the size of the time series called PAA (Piecewise Aggregate Approximation) which is a part of the SAX method (Symbolic Aggregate Approximation). PAA makes it possible to reduce the size of the time series by dividing it into subsequences of equal length and then uses the arithmetic average for each subsequence, which makes it faster and easier in comparison to other methods. PAA is further exploited by SAX techniques (Symbolic Aggregate Approximation). SAX uses symbols (letters of the alphabet) to present a series of time and creates the possibility of comparing two time series using a distance function.

3. Proposed method

This study uses the Consumer Price Index (CPI) data obtained from Instat.The data are collected on a monthly basefor the 1990-2016period, for a total of 312 observations. This time series will be converted to 8 segments with 39 symbols, with alphabet size 3.Most of the algorithms used for detection of similar sequences use Euclidean distance. This work presents an algorithm of a technique to symbolize time series in the R and Python programming languages. The effectiveness of the algorithm will be observed through the use of symbolic sequences derived from PAA and SAX techniques. The execution time of the algorithm in each programming language will be observed. Additionally, we will identify the program with the lowest error for:

1-C *time series* $C=c_1,c_2,c_3,.....,c_n$

2-$\bar{C}$ $PAA\ of\ time\ series\ \bar{C} = \overline{c}_1, \overline{c}_2, \ldots, \overline{c}_n$ (In this technique, each sequence of the time series data is separated in k segments of equal length and the average value of each segment is used as a coordinate of a k-dimensional vector that represents the PAA technique)

3-A *Symbolic representation of one time series* $A=(a_1,a_2,....,a_n)$

4-w *Number of parts from PAA that represent time series C*

5-a *Size of the alphabet (example: alphabet={a,b,c})*

This is a mathematical algorithm that shows us the steps you need to follow when programming in R and Python.

4. Results and discussion

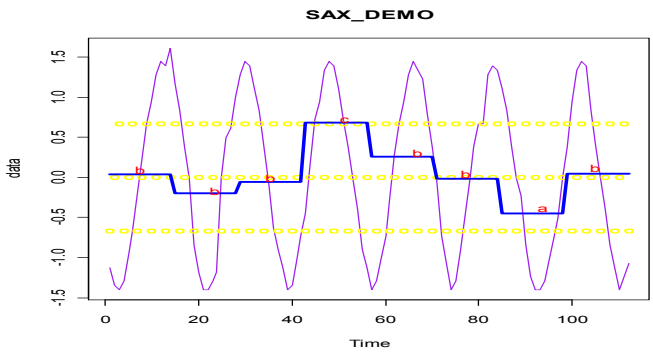
The following results were obtained from the technique executed in R and Python:

	Series 1 (CPI)	Series 2 (EEG)	Series 3 (Simulated seriesN(0,1))	Series 4 (Simulated seriesN(10,20))
DIAGONAL MATRIX	1	2	2	2
SAX andMINDIST in R	43.87349	44.84498	42.03416	50.99048
SAX andMINDIST in Python	44.6788	44.98877	42.99893	51.0099

R took more execution time after making the graphical representation which in Python with pandas (editor) is not realized as the series derived from SAX is symbolic (with letters). Also, we notice that R values are almost equal to the values derived from Python but we will take in consideration the lowest values since the most effective time series is theone with the lowest Euclidean distance; in this case the values obtained from R.

data_len=312
nseg=8
win_size=39
ans="b" "b" "b" "c" "b" "b" "a" "b"

Symbolic representation of the series in Python



Symbolic representation of the series in R

5. Conclusion

As seen from the results above, unlike Python where the results are expressed only as a symbolic series, R provides a graphical representation in addition to the symbolic series. Additionally, the distance values between the series in R have relatively small values in comparison to those obtained from Python. Furthermore, all functions are performed within the R environment, unlike Python where the graphical representation is executed in other editors.R has a smaller execution time in comparison to Python; R is at a disadvantage when graphical demand is added to the code which takes more time to execute in comparison to Python. R is much easier to use and thus it is recommended to be used for comparison and analysis of time series.

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FORECAST IN BUSINESS USING NUMERIC METHOD

Bora MYRTO[1], Alsa KAZIU[2], Edjola NAKA[3]
bora_imi@yahoo.com kaziualsa@yahoo.com edjolanaka@gmail.com
[1,2,3]Faculty of Information Technology, "Aleksandër Moisiu" University of Durrës, Albania

Abstract
In recent years, forecast has been one of the main tools for setting up a new business or succeeding in an existing one. Considerable attention has been directed towards numerical methods which will not only describe real economic problems, but also contribute to explain and understand crucial concepts of today's economy.The objective of this study is to help the business to analyze their human resources data to improve the choice of new employees. Based on real data from an albanian company, we will study the stability, bifurcation, chaos, Lyapunov exponents and employment indicators like positive Turn Over, negative Turn Over and Complex Turn Over.In recent years, forecast has been one of the main tools for the business. Considerable attention has been directed towards the application theory of difference equations, possion distribution, bifurcacion and caos, Cobeweb model and Lyapunov exponent, as means of building dynamic models which will not only describe real economic problems, but also contribute too the explaining and understanding crucial concepts of today's economThe objective of this stady is to help the business to forecast the investment in advertising their companis for good vacancies, and to analyse their human resorces menager for good choise of new employes. Real data will be taken from a company in Albania about how many employes the company hiers and how many employes quits the working place. Using those data we will stady the stability, bifurcation, caos, Lyapunov exponents and employment indicators like positive Turn Over, negativTurn Over and Complex Turn Over.

***Keywords**: Lyapunov exponents, Bifurcation, Chaos, TurnOver, Poisson distribution*

1. Introduction

Forecasting is of utmost importance in setting up a new business. It is not an easy task to start a new business as it is full of uncertainties and risks. With the help of forecasting, the promoter can find out whether he can succeed in the new business or whether he can face the existing competition. To get the needed information the managers can analyze the company's data or the data of a specific department.

2. Forecasting the employee TurnOver

The specific impact of replacing an employee varies based on many factors, including the difficulty of filling the position, the amount of training required for a new employee and specific costs, such as recruiter fees or advertisements.

In this paper we will focus on forecasting the employee indicators like Turn Over.

3. Proposed method

In this paper we will forecast the Turn Over, as an indicator for the employment. The study is based on the data of a company with 560 employees. Monthly positive Turn Over will be the report of new employees on the total numbers of employees and negative Turn Over will be the report of people the company has lost.To forecast the Employees Turn Over we will use the Cobweb Model, logistic equation and Lyapunov exponents. To prove the stability of the data, Lyapunov exponent λ will be studied before forecasting: If $\lambda>0$ neighboring trajectories diverge from each other at large n, which corresponds to chaos, if $\lambda<0$ trajectories converge to a fixed point or limit cycle they will get closer together.

A continuous version of the logistic model is the differential equation:$\frac{dP}{dt} = rP(1-\frac{P}{M})$ where r – is the Malthusian coefficient (rate of population growth) and M – is maximal capacity.Dividing both sides with M and denoting $X = P/M$ we obtain the differential equation: $\frac{dX}{dt} = rX(1-X)$

The discrete version of the logistic model is: $X_{n+1} = rX_n(1-X_n)$

We shall calculate the turnover and check if we are in the boundaries of convergence. Following the analysis given by [Gonze, 2013] it is justified that if $|r| < 1$, the stage is stable (the perturbations x_n goes to zeros n grows), and if $|r| > 1$, the state is unstable (the perturbations grow as n is increased).

4. Results and discussion

After Using the Cobweb Model for forecasting the employees Positive and Negative TurnOver we have achieved the results on table 1 while the Lyapunov exponent gives us negative values (fig 1) for an interval [a b] which means that the continuous logistic equation will give us stability.For the forecast we studied 24 different equations and the last four gave the min error ensuring the possibility to use this method. The forecasting error is reflected on the below error table. As we are dealing with real life values we have decided to use a nonlinear difference equation, because they represent reality better. The evaluation of the growth rate and the capacity building is made using different time interval (T=20, 21, 22, 23, 24) and from the error analysis it has come out that approximations made for T=24 are more accurate to do the forecast.

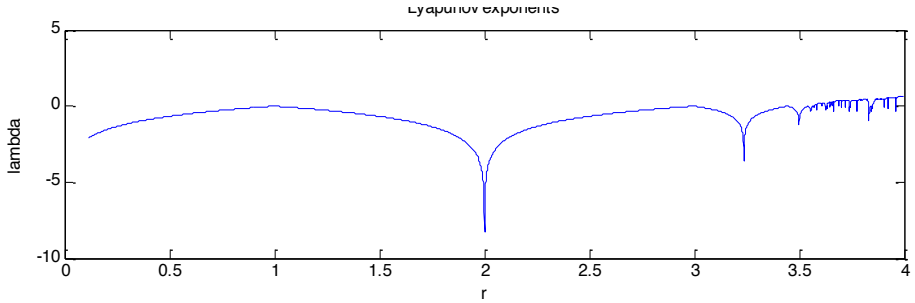

Fig1: Graphic of Lyapunov exponents

Table 1: Error table

	t=20	**t=21**	**t=22**	**t=23**	**t=24**
	r=0.113	*r*=0.0908	*r*=0.1232	*r*=0.009	*r*=0.0508
	M=0.0666	M=0.0441	M=0.0918	M=-0.1108	M=0.0408
Errors(MSE) (Positive TurnOver)	0.065443881	0.060178676	0.075092879	0.075093015	0.065276114
Errors(MSE) (Negative TurnOver)	0.064443881	0.066178376	0.085012879	0.056509301	0.063278114

The results of the forecasting methods has shown that the positive TurnOver will be 0.0432 and the negative TurnOver will be 0.066, which means that the complex TurnOver is -0.0228.

5. Conclusion

We have bolded the smallest error and it corresponds to the approximation made using the nonlinear difference equation with time interval equal to 24.The results has shown that there are problems in the Human resources department. The results predict that around 7% of employees will quit their job monthly, which is a clear indicator that the company should improve this situation to avoidthe amount of training required for new employees and specific costs, such as recruiter fees or advertisements.

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APPLICATION OF POISSON PROCESSES IN DECISION MAKING, FORECASTING AND COST MANAGING FOR COMPANIES OPERATING WITH REAL-TIME DATA

Emiliano Mankolli[1], Anxhela Gjeçka[2,] Alsa Kaziu[3], Aida Bitri[4]
[1,2,3,4]Lecturer at Faculty of Information Technology
emiliano_fshn@hotmail.com, a.gjecka@gmail.com, kaziualsa@gmail.com, aida_bitri@yahoo.com

Abstract
Optimization, forecasting and correct decision making, make the difference in a business nowadays. The model of online business becomes difficult because of the competition, variety of choices or limited time to make the right decision. In this paper we will use modified methods of Poisson Processes where we consider the probability for our success to be more than a limit put by the user and we will take traffic volume as a parameter and not time. The paper includes mathematical transformations on data in order to have detailed presentation over possibilities of failure or success, and suggestions of making the optimal choice.
Keywords*:Poisson Processes, Clicks, Cost, Probability.*

1. Introduction

The way we do business today has completely changed from the old traditional way. It is totally based on a constantly dynamic environment that is changing all the time. Online markets, being the most exposed to those changes, face the highest number of difficulties. Taking the right decision at the right time is the only way for these markets to succeed.

In order to achieve this, an immediate calculation of the market variables with a high probability of success is required. The aim of this paper is to show how Applied Mathematics and Poisson Processes in particular can play a crucial role in the decision making to online ads marketing. Nowadays, online ads marketing is a new business model and it is of its nature to require a real time data management with the highest probability of success.

2. Determination of CPC

Affiliate marketing is based on marketing of the products of a third party. To advertise the products the affiliate has to purchase clicks from different traffic sources. Based on the number of sales, affiliate benefits the pre-defined commission.For a better affiliate and traffic source, the business has to compete with many others on the market based on the cost per click where finding the optimal ratio appears to be one of the biggest challenges amongst all competitors and those that get closer to this intersection point become the best in business.
To estimate this parameter we are based on Poisson transformations processes

and the fact that: an advertising campaign is called profitable when Payout (commission) is greater than the cost between two consecutive sales. The target is to have a probability of success of a CPC (cost per click) value by which we must compete in the purchase of traffic to have a profitable campaign.

3. Proposed method

First of all we will mark with λ- the intensity of sales (Conversion/Click) and with τ- clicks between successive sales. Based on Poisson Processes $\tau \sim \varepsilon(\lambda)$ where α – is the probability that the marketing campaign is beneficial.

$$P(\tau < Clicks) = \int_0^{Clicks} \lambda e^{-\lambda\tau} d(\tau) = \alpha \qquad Clicks = \frac{Payout}{CPC}$$

The worst scenario will have a 0 income when the cost and the benefit are equal as shown below:

$$Clicks * CPC = Payout \implies$$

$$P\left(\tau < \frac{Payout}{CPC}\right) = \int_0^{\frac{Payout}{CPC}} \lambda * e^{-\lambda*\tau}\, d(\tau)$$

$$= -e^{-\lambda*\tau}\Big|_0^{\frac{Payout}{CPC}} = 1 - e^{-\lambda*\frac{Payout}{CPC}} = \alpha$$

$$1 - \alpha = e^{-\lambda*\frac{Payout}{CPC}}$$

$$\implies \ln(1-\alpha) = -\lambda * \frac{Payout}{CPC} \implies \boxed{\boldsymbol{CPC = \frac{-\lambda * Payout}{\ln(1-\alpha)}}}$$

The last equation tells us the exact amount to be spent per clicks in order that with a security coefficient α, the marketing campaign will result beneficial.

4. Results and discussion

Below is shown an applied scenario of this method by using a function written in R:

cpc(0.003,5)

[1] "With success probability 80% CPC optimal is ” cpc = 0.009320024

This is a real example of a code run in R which calculate CPC optimal, in this case 9$/1000 clicks.

5. Conclusion

Transformation of Poisson processes resolves quite efficiently the optimal CPC value which is probably one of the greatest difficulties when working with affiliate. This method is part of a project that aims the full automation of this process and we suggest to be used by all affiliate because it is an effective and tested method.

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MEASURING RESILIENCE: CASE STUDY ON COMMUNALITIES INVOLVED IN FLOODING ITALIAN OMBRONE RIVER. A MULTI- CRITERIA APPROACH.

Antonino Scarelli,
University of Tuscia, Department of Environmental and Biological Science,
Viale Università, 01100Viterbo, Italy
E-mail: scarelli@unitus.it

Abstract
As resilience, on its human, socio-economic and environmental features, is a hyper-complex system, firstly we ask if its management can be realized by mathematical models that can include a set of criteria, most of times conflicting each other and on which stakeholders are waiting for patchy expectations. Then a multi-criteria decision aid process is developed in interaction with decision makers (DM) and stakeholders and oriented to facilitate the intelligence phase of a decision process, by means of a preliminary study that includes modelling and application of multi- criteria (MC) methods, in order to clarify the situation and to propose a consistent approach for the later phases of the decision process. The visualization of both a structured model and the results of an MC method application, and the identification of weakness and strength points facilitate and improve the modeling phase. In such situation a mathematical model is provided in order to analyse an evaluation of weak or strong resilience, that is to maintain or increase a constant value of the sum accumulated resilience plus disaster risk reduction, compared with some expectations too. The sensitivity analysis of the results, by the inverse classification problem,with the involvement of the all stakeholders, can point out a post-optimal and robust inference on the mitigation of the systemsvulnerability. A case study, related to the disaster resilience of the municipalities near the Italian Ombroneriver had been dealt with the proposal of a new modeling and visualization logics.
Keywords: *mathematical model, multi- criteria, resilience, Ombrone river.*

Introduction

The net of connections created by the concept of resilience is the one specific feature of the hyper-complex systems; in fact in its structure are inserted vary factors; from the social ones, as the sensibility level created by the local communities end stakeholders, to the political ones, as the involvement of the territorial administrative organizations; from the economic ones, as the costs of all the interventions on the infrastructures, to the specific environmental ones, inclusive of the biological, ecological, demographic and landscape elements of the considered area. Taking in consideration all the potential multi factorial phenomena which are threatening the complex dynamic equilibrium of the studied eco system, the present paper proposes specific aims. It is possible to evaluate the resilience of some territorial units, up to quantify it by some technical and scientific indicators? Is it possible to say that a territory is more resilient of another one and to give the suitable explanations?

Related work

We spoke of resilience in engineering, as the capacity of some material to withstand to impulsive forces, in informatics as the capacity of a system to adapt itself to the flexibility of the users; in psychology, as capacity to react and to face the adversities of the life; in medicine, recently, as the patients' reaction to some treatment of therapy and in law, as community's capacity to react and to integrate the new rules and proceedings of local authorities. In ecology is defined as the capacity of an ecosystem to come back to the equilibrium point preceding the disruption either of anthropic reason (pollution) or natural reason (climatic, earthquake, landslide, etc.). A good level of social resilience is also the result on an education activity addressed to the prevention and minimization of the disaster's effects: "Resilience is something which we can grow in ourselves in our family, in our communities".

Proposed method

In the real situation we have to face and solve problems with a set of diversified parameters and point of views. Multi-criteria analysis let us to consider the several expectations from the solutions of the proposed problem. First of all we have to define key concepts as action, criterion and the required problematic. The set A of actions is the collection of objects of our decision within we want to search the best possible option. The concept of criterion has an important role too. A criterion is a tool which let us to compare the actions on the base of a specific point of view. In the mathematical meaning is a real function, representing the preference of the decision maker, defined on the set A and allow us the comparison among various actions.

Results and discussion

It is clear that those communalities more responsive to the factors closer to the resilience are in the top of the ranking; on the contrary, the ones with some vulnerability are in the bottom. In fact the communalities Murlo, Buonconvento e Gaiole in Chianti, which are in the top, have nice performances in criteria as CO2 emissions, rate on differentiated waste and demographic density. The communality of Siena has the worst performances for two ones of the quoted criteria.

Conclusion

The results have offered the incentives for interesting discussions, either on the situation and evolution of the vulnerability, or on the richness of multi-criterial methodologies. We have ascertained as the Multi-criteria Decision Analysis, able to combine the compliance and coherence between the decisional process evolution and the original aims, could properly be inserted on the set of mathematical models that allow a concrete evaluation of the resilience. Such kind of framework instigates the involvement of the stakeholders in the decision.

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SESSION 2: ICT AND BUSINESS APPLICATIONS

A NEW 1-TO-N SMART WIRELESS DISPLAY

Y. Lazzez and H. Hamam
EMAT lab, Université de Moncton, NB, E1A3E9, Canada
Corresponding email: eyl3538@umoncton.ca

Abstract

Purpose: Displaysystems are frequently used in supermarkets, airports, shops, etc. These systems often need a significant effort of installation and manipulation. To overcome this drawback, a new technique is proposed. Method:Based on RSSI calculation, the method consists in identifying the nearest screen (terminal) that will receive the data. Wireless network sensor technologywas implementeddue to its simplicity and reliability. It is a cheaper efficient technology that simplifies data exchangebetween devices. Using the RSSI (Received Signal Strength Indicator) methodology we can measure the distance between our new proposed device and installed displays. This helps us identify which display to be used.Results: On light of illustrative experiments, our solution demonstrated its efficiency and high performance. Data are transmitted fluently between the device and the displays. It shows also a remarkable accuracy and faster real-time communication. Conclusion:The concept for sending data between a device and other displays is based on the RSSI. We attained the objective of minimizing time management and the user effort of updating several surrounding displays. Our perspective for future works is to extend the coverage of the system to scan a larger area.

1. Introduction

The successful exchange of data is an important step forward in the world wide communication. The complexities of installation, handling and setting ofaddresses areconstraining tasks. Besides, it requires knowledge about the equipment, and an expert is needed to set up the network.This is mainly one of many reasons that tends the technology to deploy wireless devices to guaranty the accuracy and data transfer.

In this workwe present a new concept for wireless data exchange in a smart way based on RSSI (Received Signal Strength Indicator) power. The aim of this work is to implementa device that estimates how far awayit is from the different screens (terminals), which represent the receivers. Then this devicesendsdata to the closest receiver. In practice, the user comes closer to the desired receiver and sends data to it, by for example dragging on a smart phone.

The system is based on several techniques. First, we recognize the available equipment and choose the most reliable, secure and economical technology. Next, it is necessary to design and implementa device that can detect the power value of eachdisplay and can send data to corresponding screen (receiver). Then, the RSSI power should be accurately assessed in order toidentify the closest screen. Finally, a complete solution will be implemented.

2. Related work

Sending data has tremendouslyevolved to tackle applications in several fields such as medicine, educationand social science ... There are several methods of sending data.S. Pathak etal. [1] proposed a method that is tested with several routing protocols.After some experiments,they suggested that the LAR1 (Location Aided Routing scheme1) routing protocol may offer better results by sending telemedicine data with higher throughput and lower error. S. Omer etal.[2] developed a multi-channel Ad hoc On-Demand Distance (AODV) routing.Theycompared the operation of the protocol with a mobile node and the other static nodes against all static nodes using dual channels and only one Channel. The results showed that high DCH RSSI performance in terms of packet delivery.

The current methods of the calculation of the RSSI power provide only an estimation of the distance.As a consequence there are different methods and algorithms to better assess the position of the nodes. A.Cherietetal. proposed the decision tree method which is to select the three best neighbors reference nodes involved in the estimation of the position of the target sensor node. Then, the process is applied the approach of the Cramerdecision tree.Accuracy of the position is abouttwo meters for a real location [3]. Other methods, like RANSAC (Random sample consensus) investigated by J.Janicka,confirmed the possibility of obtaining a quiteaccuratevalue of the distance when usingZigBee modules. Howeverthe main drawback is the computational cost of the algorithm [4]. MoreoverJ.Svečkoused an adaptive filer based method to assessthe RSSI values. This filter and the Sequential Importance Resampling (SIR) algorithm [5] allow RSSI measurements for antennas placed in circular wayreach very accurate location values.Z.Yu appliedthe Kalman filter onthe RSSI value and used centroid based algorithm [6].He obtained a localization error rate of the algorithm about 10%.

3. The Subject

In our work a solution is advanced for the transmission data between multiple devices based on RSSI. Auser friendly human interface atthe sender side is also

implemented to facilitate the configuration of the device such as Port setting, Baud rate, data bits, partial bits, Stop bits and flow control as shown in Figure 1 so it can handle Xbee connections.

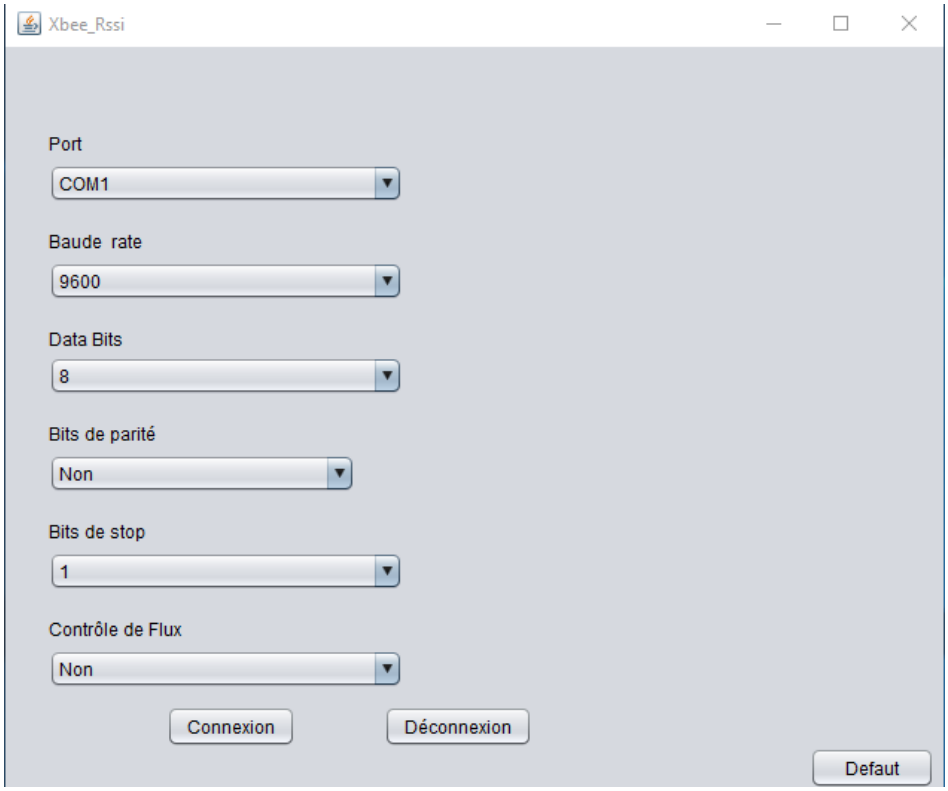

Figure 1. Interface for the configuration of the device

It was set on broadcasting address so that a node can communicate with the rest of the nodes. The receiver RSSI values (depends on the distance between the device and the screen) is measured, the distances between nodes are accurately assessed, and the nearest node is identified.

Proposed method

The concept consists incollecting all RSSI values from the screens (destinations) and then comparingthem between them to identify the nearest one with respect tothe sending device.

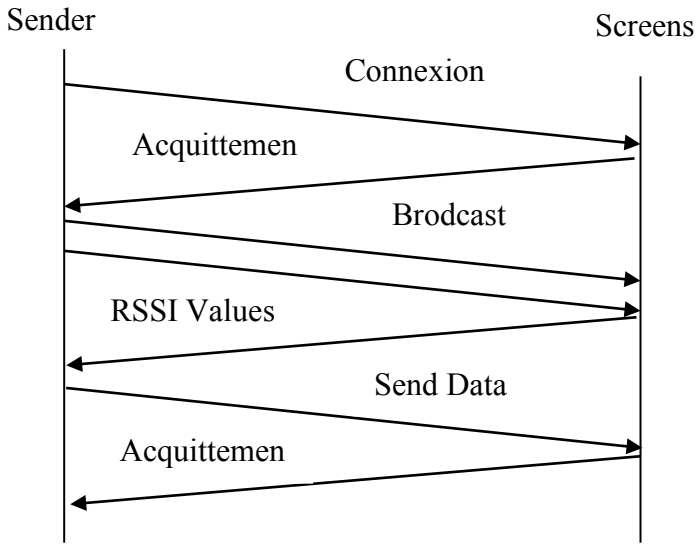

Figure 2.Exchange Diagram of data

Figure 2 shows the steps between the transmitter and the screens.After the connection procedure, all the screens are put into listening mode.The sender will send a broadcast message for all detected screens. Upon receptionof this message each screen will respond by the RSSI value. Then, the transmitter will compareall received values.Thendata is sent to the nearest device.

Results and discussion

The purpose of the project is to send and transmit data between devices depending on RSSI values.

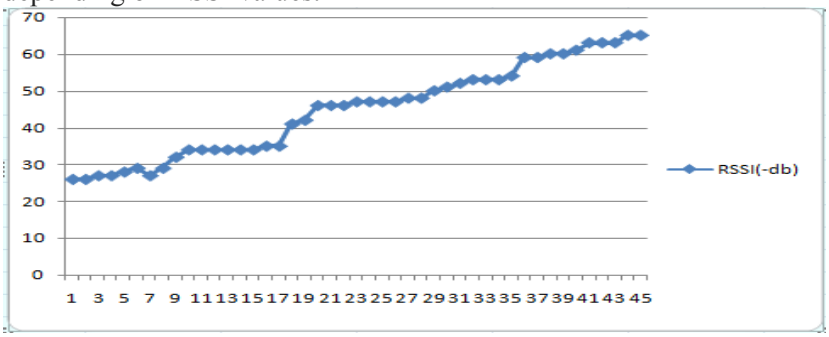

Figure 3.Vaiaration of RSSI with respect to the distance between the sender and the receiver.

Figure 3 shows dependence between the distance and RSSI. The power variation turned out to be quite proportional to the distance.

During the sending process, when screens received the broadcasting message each one will calculate its own RSSI value with respect to the sender position. Afterwards,the receivers send back the measured RSSI values.

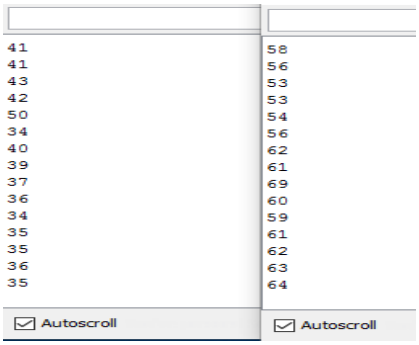

Figure 4.RSSI measurement

The duration of the RSSI calculation is so fast that the idea may be implemented in real-time. As the receivermoves away from the sender the RSSI values change instantaneously.

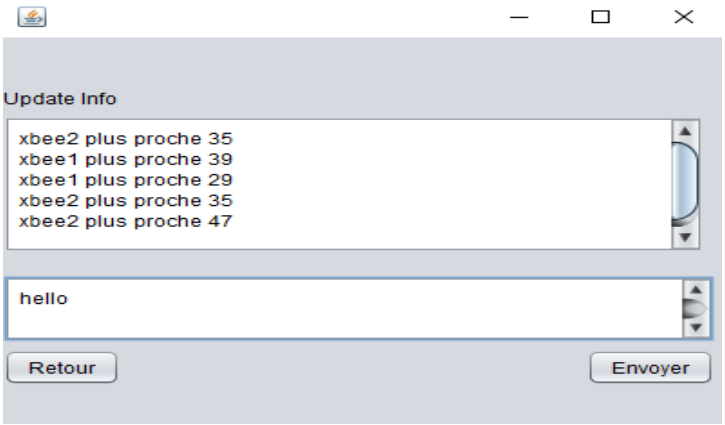

Figure 5.Screen Comparison

After receiving all the RSSI values, the device compares them to identify the nearest one.

The smaller value is then picked out. A communication process is started to establish a channel between the sender and the closest terminal.

Conclusion

The proposed method in this article consists incommunicating data to the nearest receiver based on RSSI. It allows the user to reduce installation time, effort and cost. The system was implemented and tested successfully.

For future work, the system will be extended to cover larger distanceswhile maintaining a goodaccuracy.

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INTERACTIVE SYSTEM BASED ON A CAMERA-PROJECTOR AND INFRARED POINTER MOTION DETECTION

Amal Kilani, Habib Hamam
EMAT lab, Université de Moncton, NB, E1A3E9, Canada
Corresponding email: eak2022@umoncton.ca

Abstract
Interactive projection is one of the new interesting technologies. It provides a new experience for users to interact and communicate with computers in an efficient and clever way. The proposed system is based on the interactive projection technology. Thanks to a system projector-camera and an interactive pointer, it transforms any field of projection (a surface table, a wall etc.), into an interactive space. This pointer contains an infrared source. By a simple click, the user points on a position on the projected screen. The camera detects the infrared signal coming from the pointer. Finally, the system points on the exact chosen position which makes the pointer a virtual cursor. We successfully implemented the proposed system to accurately interact with the projected screen. Its simplicity and minor cost proved it effective in applications like education. In perspectives, an interactive system based on the fingertip detection will be studied.

Keywords*: Interactive projection, infrared pointer, camera-projector system, calibration.*

1. Introduction

The interactive system proposed in this research is based on a projector-camera system and an infrared pointer. Unlike other interactive systems, this product is simple to install and has a lower cost. These advantages widen its fields of application.

2. Related work

The most recent interactive projection systems use algorithms to recognize human action by means of a camera and a projection device. In [1], Cheng et al., propose an interactive system based on the finger's tip motion. While this system provides live interaction, it does not support multi-touch detection. In [2], Argwal and Al., propose a new algorithm for multi-touch detection on surfaces by using a camera. Its main drawback is its sensitivity to lighting conditions. T. Amano [3] proposes an interactive projection system where the projector and the camera are positioned in the same optical position. However, inaccuracy is an issue for this system. In [4], a new interactive projection system is proposed by J. Hu et al. It allows bare finger tactile interaction on regular flat surfaces. Their system has a detection rate less than 100%. It needs an additional detection technique to ensure full detection.

3. Proposed method

The interactive system proposed is based on a projector-camera system and follows the flow diagram of Figure 1. A button is implemented on an infrared pointer to enable a click. The infrared pointer is moved over the surface of the projected screen, which becomes equivalent to a touchscreen. By clicking on the button of pointer infrared signal is sent and detected by the camera (Fig. 2). The latter may be an ordinary camera with an infrared filter. The projection field is a natural environment i.e. it can be a board, a wall or any plane surface. The application of the system performs the analysis and processing of the images perceived by the camera. It is modeled in a way to ensure the real-time interaction between the pointer and the computer.

The first step of image processing consists in the suppression of noise. Then filtering of the image seen by the camera is performed. In a third step, the conversion of this image into the HSV (Hue Saturation Value) color system is performed. HSV is a model representation close to human perception [5]. For our application, the processed image is a black and white image. The fourth step consists in applying the morphological operations, detailed in [6] - [9], a set of image analysis methods developed to process binary images. In our case, they help enhance the image. To determine the exact position of the signal, the moment of the resulting image [10] is computed. At this stage, the position of the click on the projected elements is perceived. An important step in the algorithm is the calibration of the camera. It matches the field of camera to the projection field.

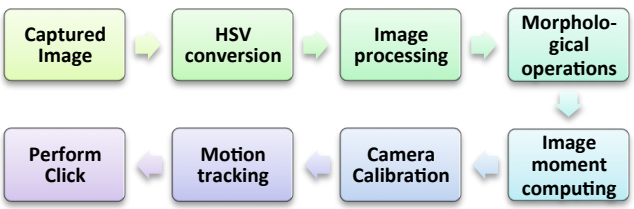

Figure 1. Algorithm used for interaction

4. Results and discussions

The proposed system was successfully designed. The camera and projector are placed along the same optical longitudinal axis to assure the highest accuracy of the algorithm and of the system (Fig. 2). The system offers a reliable real-time interaction between the projected field and the computer.

Figure 2. The designed proposed system

5. Conclusion

The interactive system proposed in this research is cost-effective and uses a projector and a camera. It is easy to install, to calibrate and to use. Comparing to other systems it is non-expensive and a natural environment without need of physical modifications. In future works, another interactive system based on the fingertip detection will be proposed to further reduce the cost.

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ACCURATE SECURE PASSIVE RFID BASED FUELINGSYSTEM

R. Zayoud and H. Hamam
EMAT lab, Université de Moncton, NB, E1A3E, Canada
Corresponding email: erz1944@umoncton.ca

Abstract
Purpose:The Fueling of vehicles is a daily operation that needs to be managed and secured. Some difficulties are faced and need an effort of intelligent design. These difficulties includelong waiting queues, non-continuous availability, and fraud. In this work we propose a solution to avoid the fraud. Method: We developed an intelligent system based on RFID (Radio Frequency IDentification) technology to solve the issue of possibility of fraud especially with the complicity of the employees in the fuel station. Since the place of fueling includes inflammable material, we must avoid the risk of causing a spark. We opted for the passive RFID technology, since semi-passive or active tags include batteries which present a safety risk. Our work consists in designing the required system byoptimizing the topology of antennas and tags. The first major challenge is that the environment includes human beings and therefore the presence of water. This presents a serious difficulty when reading UHF tags. The second major challenge is the presence of metals on the pump hose.Results: Despite the presence of water, our topology of antennas and tags enabled each antenna to detect its corresponding RFID tag. Our solutionconsists in using the fact that metals block RFID waves. We could read the tags correctly and determine whether the pump hose is aligned with the fuel tank, and then decide whether we authorize fueling or not.Conclusion:Although metals present a serious difficulty for reading UHF tags, we transformed this difficulty into an advantage by designing an RFID system using the blocking behavior of metals.

Keywords: RFID, identification, location, fraud, service station.

1. Introduction

Today, we observe a significant increase of the demand for fuel due to both industrial and population growth. Fuel supply has become a more frequent action, which causes certain problems in service stations, including waiting in long lines, the temporary fuel out stock at service stations, and the possibility of fraud. The issue of fraud is becoming

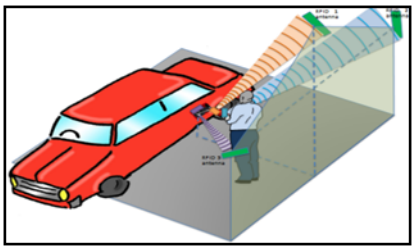

Fig. 1. The basic solution

increasingly common. The question is how to manage the payment of fuel so that we are certain that fuel went in the right vehicle. In this article we design an intelligent management system to prevent possible fraud in the fuel supply.

2. Related work

An RFID system is an automatic system that works in the RF band. It consists of at least two components: the reader and the tag. The communication with the reader and the tag is performed according to defined protocols. P. Yang et al. attempted to improve the accuracy of a passive RFID location system by using sparselydistributed RFID tags. Based on the experimental results, an RFID tag sparse distribution approach is proposed. The results show that, compared with conventional distribution of RFID tag, RFID passive localization system with a sparse distribution RFID tag can provide superior localization precision to the required accuracy [1]. In 2014, Y. Zhao et al. introduced a system which is capable of detecting the 3D position and the movement of a free battery integrated RFID tag with an ultrasonic sensor and an accelerometer. Location accuracy is the median of 7.6 cm - (3.1, 5, 1.9) cm for each (x, y, z) axis - with maximum update rate of 15 samples / s using a single RFID reader antenna [2]. W. Zhu et al. investigate the localization problem for an RFID reader when RFID faults occur frequently. They proposed a method named ATI can tolerate regional permanent fault and provide a quality index to measure the accuracy of the positioning results in both 2D and 3D environment. The ATI error is less than 15 cm when the loss angle is less than 120 degrees [3]. T.H. Dao et al. present a cheap indoor localization system using passive UHF RFID tags. Data calibrating method and improved KNN algorithm are applied to locate target positions with an average localization error of 32.3cm [4].

3. Methodology

Passive UHF RFID technology was chosen since it allows identification over a range of 4 to 6 m, avoiding therefore the risk of causing spark. The basic solution consists of using three passive UHF RFID tags and three UHF linearly polarized passive UHF antennas. The labels are placed as follows: one above the tank of the vehicle to be identified and two on the fuelnozzle. The three linearly polarized passive RFID antennas have been chosen so that each antenna detects only one tag. The tags and antennas were placed in three different directions: diagonal, vertical and horizontal (see Fig. 1). The passive UHF RFID tags used are 15.875 mm wide and 98.40 mm long.The three labels are fixed on metal mounts. A

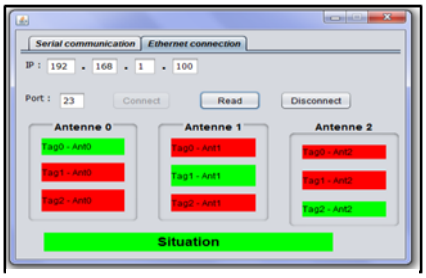

Fig. 2. Non-fraud situation [5]

cardboard insulation is interposed between eachtag and itsmount. In a normal situation (non-fraud situation) each tag is detected by only its corresponding antenna, whereas the waves produced by the two other antennas are blocked by metal. A human-machine interface (see Fig. 2) is developed in Java to ensure communication (serial or Ethernet) with the RFID system.This application reports fraud situations if any.

4. Results

Clicking on the "Read" button (see Fig. 2) simulates the gun relieving for refueling. On the middleware window, each antenna shows a green cell when the tagis detectedotherwise this cell will red(see Fig. 2). If each antenna detects only the corresponding RFID tag, then it deals with a non-fraud situation. A fraud situation occurs when an antenna detects one tag (or more) that this antenna is not supposed to detect.

5. Discussion

Water and metals represent challengesfor the RFID technology since they prevent wave back scattering. During the fueling process, the driver's bodymay prevent the reading wave to reach the three tags. Howeverthe antennas may be placed so that each tag is red by one antenna, no more. The fuel nozzle is made of metal.The mounts where thetags are attached are also metallic. While generally metalpresents a challenge for RFID systems, it is used as a filter for us to enable each antenna to detect the corresponding tag. That said, a certain tolerance is necessary. Our system tolerates an angular aperture of less than 11.30 ° from the tank axis (axis that is perpendicular to the vehicle). When the driverstopshis/her motorized vehicles in a service station for fueling, the distance between the vehicle and the pump is arbitrary within a certain limit. The tank openingisnot in a fixed position x, y. Our system tolerates a variation of 1m longitudinally (x) and 60cm laterally (y). The tank opening is generally at almost the same height.

6. Conclusion

This work deals with the accurate alignment of objectsfor the sake of avoiding frauds in a very harsh environment (risk of flame). This system is based on passive UHF RFID technology. It ensures identification and also relative localization. The chosen solution transforms one weak point of the RFID technology, namely sensitivity to metals, into a strong point for the given application.This presents the main element of originality of the solution. The system demonstrates high robustness against fraud at service stations.

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LOW-COST PORTABLE VIDEO TRANSMISSION SYSTEM BASED ON VISIBLE LIGHT COMMUNICATION

A. Jebali and H. Hamam
EMAT lab, Université de Moncton, NB, E1A3E9, Canada
Corresponding email: eaj2628@umoncton.ca

Abstract
Purpose:Visible light communication is a promising substitution to radio frequency communication due to the wide frequency spectrum and to the security since the light can't pass through walls. In this paper, we present a low-cost energy efficient system based on visible light communication for video transmission. Method:We propose a system that could be easily implemented without doing a major modification to the existing infrastructure. This systemis compatible with the commonly used devices without the need of installing drivers. The main research challenges are the following: 1) Remove the noise which is the ambient light and recover data, 2) Reach transmission debit that allows high-quality video runningfluidly, 3) The distance between the transmitter and the receiver should be long enough to be implemented in real life. Results: We implemented a visible light communication prototype operating at 4 Mb/s with a distance more than 2 meters. The transmitter is based on a regular white LED. Due to its nanosecond response and the high sensitivity to the light, the photodiode PD is the main component of the receiver. The system is based on On-Off keying modulation and demodulation technique. A cyclic redundancy check (CRC) is implemented within the developed software to reduce the error bit rate (BER).Conclusion: This green communication technology can be implemented where the radio frequency communication cannot, for an example in hospitals. In perspective, we intend to progress at the software level to enable real-time video transmission.

1. Introduction

Wireless communication occupies a very important place in our daily life. In the 90s, the number of phones sold in Canada did not exceed 1 million, while currently it exceeds 20 million devices. Doubtlessly, Wireless communication using radio wave is the most used. However, the radio communication has a limitation due to the saturation of the radio frequency spectrum [1].

The visible light spectrum is 10,000 times larger than the radio frequency spectrum, which present the main interest for visible light communication (VLC) [1]. The VLC has three additional advantages: 1) intrinsic security: light waves cannot come across wallsand therefore unauthorized people have no access to the network, 2)high-speed communication: the high speed of the light and 3) low power consumption: the system use the light sources to illuminate and transmit data so no power loss is expected.

Since VLC is a new communication method,it requires an interface that is compatible to conventional methods to be easily implemented. A license free

protocol (Universal asynchronous receiver/transmitter: UART) has been chosen in this research. We implemented a video transmission system using LEDs that is compatibleto a large range of devices such as Smart phones, Tablets, Desktops and Laptops. Unlike other systems, this product doesn't require any software or any complicated method of pairing. These advantages open its application to larger fields.

2. Related work:

Among others, VLC has been used in intelligent Transport Systems (ITS) to control traffic problems by using LED based traffic lights for data transmission and Cameras for data reception [2]. S.Sudhaproposea model that helps monitor patients in the hospital.The interest ofVLC in this applicationis avoidingthe interference of radio frequencies with human bodies [3]. The LED is the main component for VLC.Various LED technologies have been,so far, used to transmit data and various camerashave been used to receive data [4]. Several systems useOrthogonal frequency-division multiplexing (OFDM) and reached 2.1 Gbs/s for the Downlink [5]. All these systems share three principal weaknesses, namely low speed data rate, high implementation complexity and the need of changing the existing infrastructure.

3. Proposed method

An overview of the proposed VLC system is shown in Fig. 1. One computer acts as the transmitter and the other acts as the receiver. Both the transmitter and the receiver can be any device that supports UART for example Smartphone, Raspberry pi, ...

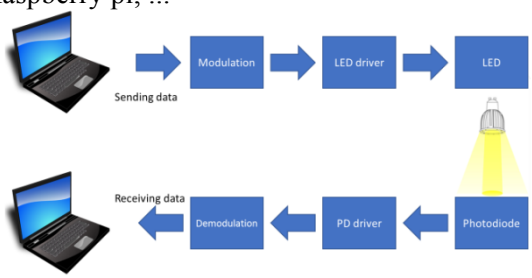

Figure 1. An overview of the proposed VLC system

The computer modulates data and sendthem to the LED driver which controls the LED and turns it ON and OFF very fast. The blinking of the LED is not detectable by human eye. The Photodiode senses the blinking of the LED and delivers a signal that is conditioned by the photodiode driver.Thus, it can be demodulated and red by the computer. The transmitter has two main components: a white LED and the LED driver. For the light source, a commercial phosphorescent white LED module (OSTAR LEW E2A) has been used. The LED driver is composed of two transistors and a Mosfet to improve the rise time [7]. As described in Fig. 2,tThe receiver has two main components:

a photo diode, and the photodiode driver which is composed of two amplifier stages, transimpedance amplifier and gain and filtering.

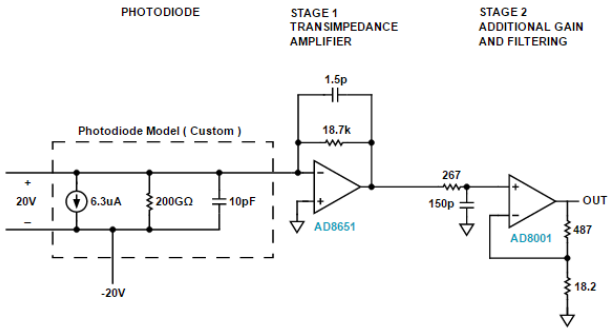

Figure 2. Photodiode driver for visible light communication system

A cyclic redundancy check (CRC) is implemented within the developed software to reduce the error bit rate (BER).

4. Results and discussions

The LED driver and the Photodiode driver are designed and printed. A 2 Mhz square signal is generated by the transmitter and is successfully detected by the Receiver. The proposed system is tested on a distance larger than two meters. A video has been transmitted by the developed system on a distance larger than 1 meter with 4 Mbs/s. The error bit rate is less than 1%. The result is shown in the Figure 3.

Figure 3. Original and received image

5. Conclusion

Low-cost Portable Video Transmission System Based on Visible Light Communication is proposed in this article. The system is developed and is successfully tested. In the future works, a bidirectional system will be investigated and developed.

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BROADBAND SIGNAL FROM THE POINT OF VIEW OF USERS IN TIRANA, ALBANIA

Dr. Eng. Nikollaq TEREZI[1], Dr. Eda TEREZI[2]
[1]Faculty of Technology of Information, University "AleksandërMoisiu", Durrës, Albania.
tereziniko8@gmail.com
[2]Sur-Place Albania StipendiumWorld University Service, WUSTirana, Albania.
terezi@wusgermany.de

Extended Abstract
The population under study comprises broadband users living in Tirana urban area and its outskirts, aged 20-64, who use tele-communication services. The level of confidence for sampling is 95%, ($p < 0.05$). A descriptive research is used to provide needed statistical data on broadband signal evaluation from users' point of view. The main methodology used isthe face to face interview supported from a properly designed questionnaire. The evaluation methods to approve the hypothesis are linear regression and, Pearson Correlation and central tendency(Mean measurements). Variables to be considered are broadband speed, signal coverage, signal interruptionandbroadband signal quality during pick hours. According to the findingsthe broadband signal speed is the technical attribute offered the broadband users consider at most. A significant importance has signal coverage for both, fix (IPTV users) and mobile broadband users. Broadbandsignal quality during pick hours appears to have smaller but significant influence to the mobile service users too.

Keywords:Broadband signal speed, signal coverage, signal interruption, broadband signal availability during pick hours, off-net and on-net calls.

1. Introduction

3G and 4G services in Albania have been introduced in Albania in the beginning of the year 2011 and 2015 respectively. In the current conditions the telecommunication users in Albania can test the technical quality of broadband servicesoffered from the operators and then select either remain in the current operator or switch to another one, using portability feature. On the other hand operators are continuously improving signaltechnical features being at the same time very attentive to the offers of their competitors. As per above in this articlewe are focused on clarifying how the telecommunication users consider the main attributes of broadband services like speed, signal coverage, signal interruption and speed of fix broadband signal during pick hours.

2. Related work

Karahmetovic N, Izetbegovica A.A., Tuzla Bosnia and Herzegovina; Influenca of demografic features on the customer satisfaction with complex telecommunication services on the market of Bosnia and Herz. Journal of Trends in the Development of Machinery and Associated Technology Vol. 17, pp. 92.

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Malhotra Arvind, Claudia Kubowicz Malhotra, (2013) "Exploring switching behavior of US mobile service customers", Journal of Services Marketing, Vol. 27 Iss: 1, pp.13 – 24
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MatejŠvigelj, NevenkaHrovatin, "Network effects and choice of mobile operator in Slovenia", ed. 3/2011, pp 96.
Richard Lee, Larry Neale, "Interactions and consequences of inertia and switchingcosts", Journal of Services Marketing, 2012. Vol. 26 Iss: 5, pp.365 – 374
Chia-Chi Chang, Chia-Yi Chen , (2013) "Alleviating the negative impact of delayed recovery: process- versus outcome-focused explanations", Journal of Services Marketing, Vol. 27 Ist: 7, pp.564 – 571.

3. The subject of your work

Telecommunication operators in Albania are especially focused on brand promotion and competitors offers. After they launch a new application or service they pay more attention on rate of return of its related cost and they are not properly focused on the technical quality of the newly offered service. Although they have introduced a clear and escalated procedure of failure remedy or complain follow-up they does not seem to pay the right attention on this issue. With the help of this study we would like to make clear that subscribers follow continuously the quality of service and application they use and act accordingly in case of problem switching to a new operator with help of number portability facility.

4. Proposed Method

This study presents mainly a descriptive research. Relying on the data fromMunicipality of Tirana the number of inhabitants as per census 2011 was 654.168 and 102.144 respectively. According to the penetration rate of mobile and fix telephony[i]the sample size calculated[ii]resulted in 397 participants for mobile service users and in 283 participants for fix broadband users.

5. Results and discussion

H0 3G-4G signal speed is not the most important feature that user consider for the evaluation of mobile services.
H1 3G-4G signal speed is the most important feature that user consider for the evaluation of mobile services.
Multiple Linear Regression is conducted to test this hypothesis; Model reliability was tested to comply with the standards forAlpha Cronbach=0.762.

Multiple R=0.613[a]R square = 0.953; Adjusted R square= 0.908. Standard Error of the estimate = 0.683. Since F cal (639.048) > F tab (2.13) at 0.01 level of significance we cantherefore reject H0 and accept the alternative hypothesis H1 that 3G-4G signal speed is the most important feature that user consider for the evaluation of mobile services.

In the Coefficients table the Beta value for 3G-4G speed resulted in very high value(B=0.893), and others coefficients values of independent variables like operators' web page, promotion, roaming price are very low. This is in compliance with results of other researchers who state that it turned out that service quality factor directly influences continuous use intention of LTE service is device and speed[iii].

To test users opinion on signal coverage worse when moving from urban toward suburban areas we usedLikert scale 1-5(where 1 most stable and 5worsens signal). Findings result in value of MEAN=3.07-3.74 which confirms that from users' point of view 3G-4G signal coverage worse when moving from urban toward suburban areas.

H0 Speed and interruption of broadband Internet provided from fix network during pick hours does not influence users'opinion for the evaluation of broadband fix services.

H1 Speed and interruption of broadband Internet provided from fix network during pick hours are always taken into consideration from users for the evaluation of broadband fix services.

Multiple Linear Regression is conducted to test this hypothesis; Model reliability was tested to comply with the standards for Alpha Cronbach=0.746.

Multiple R=0.613[a]R square = 0.376; Adjusted R square= 0.362 Standard Error of the estimate = 0.994.Since F cal (27.691) > F tab (2.13) at 0.05 level of significance, therefore we reject H0 and accept our alternative hypothesis H1 that Speed and interruption of broadband Internet provided from fix network during pick hours are always taken into consideration from users for the evaluation of broadband fix services.

In the Coefficients table the value of Beta follows: Beta=219 for the speed of fix broadband Internet (Significance level 001) and Beta=0.136 for the interruption of fix broadband Internet during pick hours (Significance level 009). This result means that users follow attentively the reduction of speed or interruption of Internet during pick hours that's why the operator must pay proper attention to this issue. This result is incompliance with the findings of other researcher ho state that:

Thequality for the transmission of data is not adapted to the expectations and demands of the users and need to be revised[iv]. Speaking to the features users take into consideration toward switching in a certain operator the researchers found thatthe second most common reason was better coverage of the network[v]. In the US both operators and customers alike benefit from the rate of LTE coverage and LTE-A network. In South Korea in 2013, it is also making significant progress in expanding the coverage of the territory with its network LTE-A[vi].

Thetrend of mobile users to switch a certain operator in Albania tested with the help of Pearson correlation which resulted for VODAFONE operator to be $r = -0.142$ and for AMC $r = -0.148$. The trend differs very little althoughthe user base differs too much;according to AKEP, Vodafone encounters 1.933 thousand users and ex-AMC 1.289 thousand.This means that in Albania the reason of users for switch is not proportionally related to the number of users an operator has. This result complies tofindings of researcher who using a regression model with panel data, found that in the Taiwanese mobile market operators with a large subscriber base recruit a dis-proportionately greater share of new users *ceteris paribus* than operators with a low-penetration rate[vii]. The explanation for Albanian market can be found from AKEP data which show that the portion of outgoing calls within the network (on-net) is decreasing reaching a level around 58% of the total outgoing calls compared to last year 2015 andthe calls outside the network (Off-net) have increased by 12% for the same period.

6. Conclusions

The findings of this study accept the models and hypothesis we decided to deal with. They confirmed the fact that 3G-4G signal speed is the most important feature the users consider for the evaluation of mobile services. Fix broadband internet speed, especially during pick hours, have a significant importance on users evaluation toward fix broadband as well. There is no advantage on the side of bigger operators as far as acquiring new users is concerned. As per above the telecommunication operators in Albania should pay better attention toward providing broadband signal with the requested speed and quality countrywide and during pick hours especially.

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DOCKER INTEGRATION IN THE DEVELOPMENT WORKFLOW

Albi Abdyli
Student-Faculty of Information Technology-UAMD
albi.abdyli@gmail.com

Abstract
This project explains the possibilities that containers have given to the developer to use the same environment in development, staging and production of an application.Many big companies, including Google, Amazon, Microsoft, Red Hat, IBM, VMware and Oracle have built entire platforms for this technology, for creating, managing, deploying and securing containers. These big names have foreseen the evolution of this technology and have invested time and resources on the further development of containers. Using the same technology stack on all the phases of the deployment of an application allows the developer to focus on its app and not the configuration of environment where the app will reside. Containers are gaining much momentum from the advantages that they have form the Virtual Machines, they consume less memory, boot faster and remain the same on all environments. This project will introduce you to Docker, one of the major players in the development of this technology, the advantages of using containers in your workflow and resolving the biggest problem of the IT community "This works on my machine!".

Keywords:*containers, Docker, DevOps, microservices, container orchestration*

1. Introduction

Docker is an application for creating, managing and deploying Software Containers. A container is an isolated environment hosting the code and everything needed to run the code of your application hosted directly on operating system level and sharing the kernel with the operating system they are running on [1]. Containers got the name from the Shipping containers which provided a standardization for the shipping industry providing common standard for transporting merchandise across the globe. In operating systems, Linux vendors and application versions in different environments has really been a struggle for everyone. Containers brought a new way of shipping software to production but building and configuring them the right way was a hard job until Docker came. Docker provided a new way of creating, managing and deploying software. It provides a simple interface for everyone to interact with containers.

2.Containers and VM

Many people that are using VM for they applications to develop, test and run they applications ask, what is the difference between a container and a VM? Both consist in isolation of concerns but deal in different ways the problem.
A VM is a virtualized hardware which requires an operating system hardware allocation on the host machine and many software to make it work. It takes

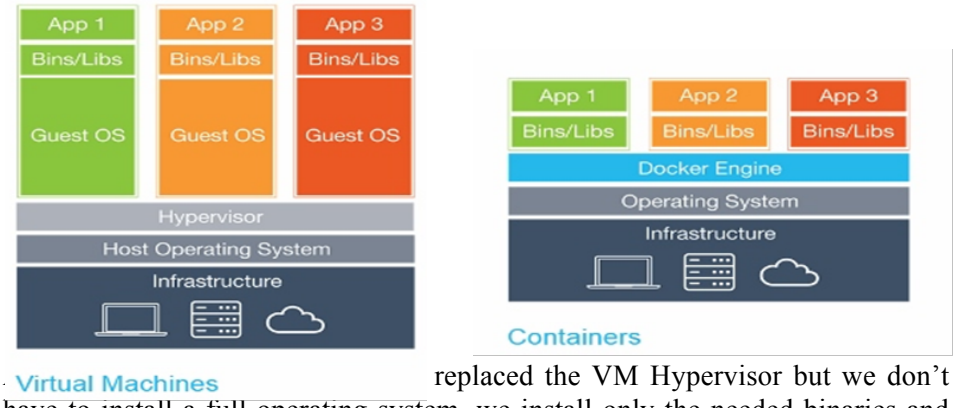
from minutes to hours to configure it the right way and take minutes to boot up. On the other hand, Containers run directly on top of the host operating system on user space. It shares the kernel with the operating system and does not duplicate what the host OS already has. Not needing to start an entire system like a VM a container is fast.

```
~ › time docker run -p 8080:80 -d nginx
6b8f646cd194a02c4b0e7c6a0923f76ecf68cbc02abcc72fca88d40adf92f815
docker run -p 8080:80 -d nginx  0.02s user 0.01s system 3% cpu 0.976 total
```

It needs less a second to start anginx container and ready to serve users.
Even downloading the full container from the Docker Registry is fast.

```
~ › time docker run -p 8080:80 -d nginx
Unable to find image 'nginx:latest' locally
latest: Pulling from library/nginx
6d827a3ef358: Pull complete
f8f2e0556751: Pull complete
5c9972dca3fd: Pull complete
451b9524cb06: Pull complete
Digest: sha256:e6693c20186f837fc393390135d8a598a96a833917917789d63766cab6c59582
Status: Downloaded newer image for nginx:latest
af91d4ec9231d327e8eca5c4dbb22a4de41b06c07e196206a97afba3e1584f03
docker run -p 8080:80 -d nginx  0.09s user 0.07s system 0% cpu 1:48.83 total
```

Just downloading an ISO for a VM takes much more time than that.
Benefitting from the layered structure that containers have, docker does not need to always download all the layers showed in the below picture so it takes less time building that container given that many containers share the same layers.



replaced the VM Hypervisor but we don't have to install a full operating system, we install only the needed binaries and libraries with the downloaded container.

3. Dockers and their usage

The tools that make Docker so suitable for the developers: docker-machine, docker-compose, Docker Hub, volume, networking, Kitematic, etc. Docker pull

is used for pulling images from Docker Hub [2]. We will show how "docker-compose" are used in the creation of an environment for developing an app. Understanding docker volume and docker networking. Also give examples of the possible ways of making a docker development environment. The approach is to show the separation between the application and the stack it runs on, explaining why this approach gives more flexibility in testing of the application. Explaining what is a Docker Image and Container, will give benefits of getting it up and running in the development environment. To give a better view of the Docker ecosystem firstly need to know the necessary tools and how to use them

4.Docker and DevOps

Docker has pushed further the DevOps approach to application development. In this part will explain what has made Docker the de facto DevOps container management service.The integration of this tool on DevOps workflow.Introduction of apps that are being made by companies to support the container initiative. Presenting Kubernetes, a container management and orchestration tool integrated in Google Cloud Platform [3], CoreOS and RancherOS, Operating Systems built from the ground up for with container in mind.

5. Conclusions

Docker provides a great tool for creating development environments on the fly, testing the application in different environments or runtimes. Provides a unified way of managing the deployment of an application, using the same configuration in development, staging, testing and production of an application. This short paper gives the general information about Docker and container thus every reader can be able to identify where they can or can't use Docker in their development environment.

6. References

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3. Google Container Enginhttps://cloud.google.com/container-engine/
4. https://www.youtube.com/watch?v=pGYAg7TMmp0
5. https://www.youtube.com/watch?v=Soh2k8lCXCA.

A REAL-TİME SYSTEM FOR NUMBER RECOGNİTİON USİNG KİNECT DEVİCE

Eriglen Gani[1], Klajdi Harizi[2]
[1]Department of Informatics, Faculty of Natural Sciences, University of Tirana
eriglen.gani@fshn.edu.al
[2]Academic Network of Albania
klajdi.harizi@fshnstudent.info

Abstract
Hand gestures recognition is an important research topic in human computer interaction (HCI) field. One of its benefits is enabling the communication between hearing impaired persons and the hearing ones. Numbers play an important role in this kind of communication. Number gestures recognition, mostly are based on finger identification and finger counting. The purpose of this paper is to build a real-time system that is able to capture hand gestures, identify the fingers and then translate them into textual numbers, by using Microsoft Kinect. The followed methodology consists of four main phases. By using the depth sensor of Kinect, the hand segmentation is performed. K-means algorithm is applied to distinguish signer's hands. A circle, which intersects each of the signer's fingers, is then drawn. Based on circle intersection points, the finger counting process is calculated. This technique does not need a database to store hand gestures. Because the Kinect device is an infrared camera, lighting conditions and hand color do not affect the appearance and transformation of the images. The proposed system achieves an accuracy of 83% and is able to process approximately 48 frames per second.

Keywords:*HCI; Microsoft Kinect; Number recognition; Circle-method; K-means;*

1. Introduction

Communication is an important aspect for every person therefore today all kinds of communication have gained a huge importance. Communication is often difficult to achieve among people who have trouble hearing or speaking, since their natural way of communication is understandable only by limited number of persons who have knowledge about them.

Hearing impaired persons use sign language as their natural way of communication. Sign language gestures are often obtained as a combination of hand shapes, hand's trajectory, arms and body movement. It is the only way of communication within a category of society who suffers from hearing problems. Communication between hearing impaired persons and the hearing ones is realized with the help of interpreters, which is not an effective method since it requires time and resources. Over the years, development of technology has played an important role in facilitating communication for this category of society. Many researchers have focused on building system for recognition of sign language. Recognition of hand gestures is not an easy process since it is

affected by many external factors including lighting, the angle of observation, the speed of movement and signer's distance.

The main purpose of this paper is to introduce a system that will provide a viable solution for the recognition of number hand gestures and translating them into textual form in real time. Our work will address the methods used for identification, transformation and translation of numbers from fingerprints, based on segmentation techniques, depth statistics calculation and circle method. The developed system consists of a combination of many algorithms which at the end provides a vision-based solution for recognition of number gestures. Used algorithms provide a system which is rotation, translation and scale invariant. Moreover this technique does not require a database to store hand gestures. The system is based on Microsoft Kinect. It offers a depth camera which facilitates the process, especially the hand segmentation process. It can be integrated in many real environments with a low cost.

The rest of the paper is organized as follows: Section I and II gives a brief introduction and related work. Section III presents an overview of methodology and a brief description of each methodology processes. Section IV describes the experimental environment. Section V presents the experimental results. The paper is concluded in Section VI by presenting the conclusions and future work.

2. Related work

Many works have been done to integrate some existing technologies in order to capture and translate signer's gestures. There are several suggested methods for recognizing hand gestures which differ in the way of addressing the problem. Efforts have begun in 1990 when authors at [1] have done some work for capturing and processing static and dynamic images. The methods they used were related to the detection and movement of the hand, the hand tracking location based on the motion and classification of signs using simple trajectory shape and adaptive clustering of stop positions. Another approach was proposed in article [2] which uses data gloves for capturing input data for hand gestures. Although it may result effective, it had problems in terms of cost. The special sensors of data gloves have a high cost, and this can be seen as an obstacle for implementation in real scenarios. Also the usage of data gloves was not very suitable for some applications, since it uses cables which restrict signer's movements. Another approach was used in the article [3] which uses color of the skin for hand segmentation purpose. This approach finds some difficulties dealing with images that contain complex background colors. Authors at [4] used markers for finger detection in order to identify hand gestures. The algorithm used in this method detects the presence of markers for identification of fingers, active in the gesture. This approach does not provide a natural way for communication. The latest methods use the most advanced techniques and do not require manual work like markers. The method presented at article [5] uses cameras to recognize gestures from Indian sign language. Another method for identifying fingerprints was used in article [6]. Kinect device was used to

identify user's hands. Then Fourier Descriptors were used for classification purpose. Article at [7] is based on an approach of analysis hand gestures using the 3D model of the hand. To determine this approach more than one camera is necessary for data retrieval. This method has some drawbacks since it is not very natural, requires a high cost for data processing and also can face some problems related to complex background environment.

3. Methodology

The methodology followed consists of several main phases: detection, segmentation, identification of hands and finger counting. The followed methodology does not use a database to store gestures but performs all the actions immediately after the frame is fully generated. The following subsections describe shortly each phase.

A. Detection

Microsoft Kinect is used to obtain input data. It is composed of a RGB camera, an IR sensor and depth sensor [8]. Kinect device is not affected by light and other external factors. It can be used in vision-based systems and simplifies the segmentation phase [6]. Microsoft SDK is used as a library for processing input data.

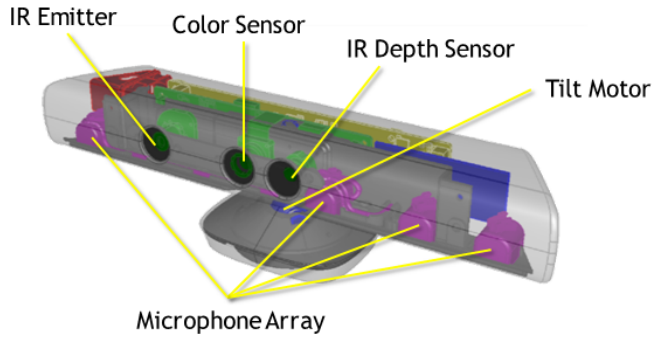

Fig 1: Microsoft Kinect device sensors

B. Segmentation

Microsoft Kinect is able to generate depth for each pixel located in image frames [9]. The first approach for hand segmentation is based on depth statistics. Firstly a histogram is built which contains number of pixels located in each layer. Then a threshold is applied which results only in layers which are nearest to Kinect device. They correspond to signer's hand. The problem of using only the depth statistics is when a third object is placed between signers and Kinect device. In this scenario the external object will be recognize as signer's hand. To overcome this problem and to increase the accuracy of the results we were focused only on pixels which belongs to the user's skeleton [6]. Kinect device provides this kind of information.

C. Hand detection

Segmentation was the first step of image processing in order to identify gestures. Our approached is able to identify numbers from both hands. The second step was to apply a K-means algorithm to cluster the pixels corresponding to each signer's hands. K-means algorithm [10] assigns a group of pixels for K given points. The main idea is to define a center for each group. These centers are placed randomly, but the best choice to set the centers is, as far away from each other. The grouping is done by minimizing the amount of square distance (Euclidean Distance) between values (pixels) and the respective centers. The algorithm continues until the pixels on each cluster do not change groups. We apply a novel solution that has an effect on system performance since our aim is to built a real-time system. The signer's hands mostly are placed in a horizontal line like Fig.2. If the first center corresponds to the most middle left location and the other center corresponds to the most middle right point, all the pixels can be clustered within one cycle.

D. Circle Construction

Circle construction is based on a work published at [11]. This step involves construction of a circle for each identified hand based on palm centers. The radius of the circle should be enough to intersect all fingers part of the hand. It can be accomplished by calculating the furthest point from the hand centers and multiply it by a certain coefficient. Euclidean distance can be used to calculate the largest distance.
The following formula is applied to calculate circle radius:

$$r = k * \left(\sqrt{(xc - xt)^2 + (yc - yt)^2}\right)$$

Where **r** is obtained radius; **k** is the threshold coefficient which takes values in a range of 0.65 to 0.75; **xc** and **yc** are palm center coordinates and **xt**, **yt** are coordinates of the largest point from palm center. Fig 2 presents the results after construction of circles.

Fig 2. Circle construction

E. Finger counting

Finger counting process consists of finding the points where the circle intersects the fingers. During the segmentation phases each pixel located in the image is marked as white or black. A white pixel means that it is part of the hand and a

black pixel means it is not part of the hand. Starting from 1° to 360° we have to find the points where the circle intersects the hand. To do so we have to use trigonometric functions. The figure below summarizes the followed approach.

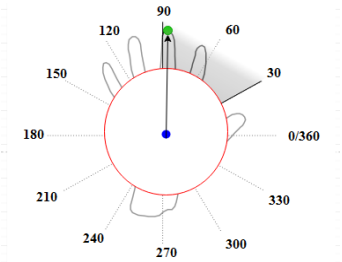

Fig 3. Finding hand pixels intersected by the circle

Above calculation will result in a binary string where 1 means that the pixel is part of the hand and 0 means the opposite. The below string is an example:

1 11111 0 00000000 1 11111 0 00000 1 11111 0 00000000 1 111 0 000

From this result we have to eliminate same consecutive values and then summarize them. From the final result we have to subtract 1 because it consists of signer's forearm. The below figure illustrates an example of number three.

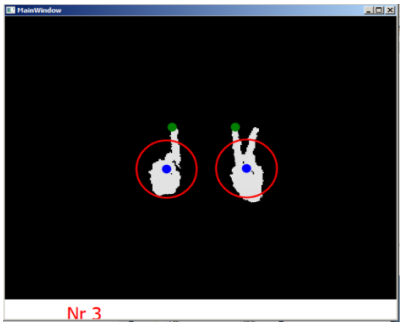

Fig 4. Recognition of number three

4. Experiment environment

Experiments are focused in two directions: Firstly on system accuracy (how correctly does the system identify numbers observed by one or two hands). Second direction is related to the performance of the entire system. Performance is an important factor since we are interested in developing a real-time system. Experiments have been realized on the premises of Faculty of Natural Sciences, with the participation of four volunteer students. Each volunteer student has completed four tests for each number gesture. Total combinations of numbers from 0 to 10 that were taken in our experiment were 21. Each volunteer has completed four tests for each combination. The total number of tests carried out was 336. Microsoft Kinect device supports a distance of 8 meters. Experiments were performed on a computer with an Intel® Core ™ i3 3.3 GHz processor and 4 GB of memory. The following table presents the possible combinations of

numbers tested in the experiment.

Number	First combination	Second combination (left hand-right hand)	Third combination (left hand-right hand)	Fourth combination (left hand-right hand)	The number of tests carried out by a volunteer for each combination	The total number of tests carried out by four volunteers
0	1	-	-	-	4	16
1	1	-	-	-	4	16
2	2	1-1	-	-	8	32
3	3	2-1	-	-	8	32
4	4	2-2	3-1	-	12	48
5	5	3-2	4-1	-	12	48
6	-	3-3	4-2	5-1	12	48
7	-	5-2	4-3	-	8	32
8	-	4-4	5-3	-	8	32
9	-	5-4	-	-	4	16
10	-	5-5	-	-	4	16

Table 1. Numbers combinations

5. Experimental results

A. Experiment 1: Measuring the performance of the system

This experiment focuses on measuring the performance of each system processes, including the process of segmentation, the process of hands identification, the process of circle construction and the process of finger counting. To measure the performance, execution time is stored in an external file for each of the above processes.

For 336 tests that are stored in the file the average latency time for-each process is then calculated. Processes for which time is measured consist of: segmentation, hands identification (it includes the creation of the first center, the creation of the second center, recalculation of the cluster), circle construction process and the process of finger counting.

Results of experiment 1 are summarized in following table:

Process	Average time (in milliseconds)
Segmentation	13.01
Identification of first center	1.17
Identification of second center	1.23
Recalculation of cluster	3.16
Circle construction	1.15
Finger counting	1.77
Total time	**20.92**

Table 2. Measurements of system performance

Results of the experiment show that the total average time is not high which allows the system to be implemented in real-time. Segmentation process takes more time to be completed, approximately 13 milliseconds. The reason why this process takes a longer time to be completed is because it includes the capture of image, identification of layers nearest the Kinect device by using depth statistics and determination of image contours. Referring to the results of above table, other processes occupy less time. The process that apply K-means algorithm for hand identification is consider to be fast because of the followed approach which consists to a modification of algorithm which execute only in one loop starting at a same time from left to right and vice-versa. The average time for the whole processes is approximately 0.02 seconds or 20.92 milliseconds. Starting from this result we can say that the approach followed has a good performance. It should also be noted that computer performance on which experiments were performed affect the total efficiency of the system.

B. Experiment 2: Accuracy of the system

The other experiment deals with the system accuracy. In the experiment 336 tests have been performed. The results of accuracy in percentage are listed in the table below:

Number	**Accuracy (percentage)**
0	100
1	81
2	84
3	82
4	83
5	85
6	83
7	78
8	84
9	75
10	81

Table 3. Accuracy of number recognition

From the experiment it was concluded that finger identification was affected by the radius of the circle since it is obtained as a static threshold. In some cases the circle does not include all the hand resulting in a wrong identification number. Testing results shows that numbers zero and number 5 have the highest identification accuracy. According to the results, number 9 has the lowest identification accuracy. Average accuracy of recognition for all numbers is 83%.

C. Experiment 3: The confusion matrix

From the results of the experiment it was observed that out of 336 testing performed, the system classify correctly 277 (83%) and incorrectly 59 (18%).

The confusion matrix gives details of how number gestures have been classified.

	0	1	2	3	4	5	6	7	8	9	10
0	16										
1		13	3								
2		2	27	3							
3			2	26	4						
4			1	2	40	4	1				
5					4	41	2				
6						2	40	4	2		
7							3	25	4		
8								1	27	4	
9									2	12	2
10									1	2	13

Table 4. Confusion matrix

6. Conclusion and future work

The purpose of this article is to propose a real-time system that is able to recognize numbers obtained from both signers' hand. Usage of Microsoft Kinect depth sensor simplifies the process of segmentation. It is not affected by external factors which makes its practical implementation real. The proposed methodology uses K-Means algorithm for hands identification. It demonstrated a high effectiveness during experiments development. Our approach does not use a database to store gestures which simplifies the whole process. It does not need an environment to store data persistently and make some comparison between gestures in order to recognize them. Experiments showed that the followed approach is efficient in gestures recognition and can be applied in real time. The accuracy of the system is 83%. System is not affected by the rotation of hands and does not require a static position of them. It has some limitations including: both hands must have a specific distance from each other in order for K-Means algorithm to identify them correctly (in our case it is 100 units). The circle method has a primary role for finger counting and supports an efficient way for real-time number recognition.

Future work includes addressing the problem of hand identification by K-means algorithm when the distance of two hands may be smaller than a static threshold. The other step includes the improvement of recognition accuracy. Future work also can be extended to handle gesture recognition composing of two-digit numbers.

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THE ACCURACY OF DATA TRANSMITTED IN WSN-S FOR HEALTHCARE APPLICATIONS.

Sonila Halili[1], Edmira Xhaferra[2], Aida Bitri.[3]
1,2,3 "AleksanderMoisiu" University, Technology of Information Department, Durres, Albania, sonila.halili90@gmail.com, edmiraxhaferra@gmail.com, aida_bitri@yahoo.com

Abstract
The use of wireless sensor networks is applied in healthcare applications in a new field known as wireless body area networks (WBAN) and its importance is growing every day. Sensor devices can be used to monitor human activities and illness in real time. A wireless sensor system is designed to constantly access and transferthe patients datacalled bio-signals like temperature, breathing, heart rate, blood pressure, pH monitor, glucose sensor etc. to the doctor's interface. If something goes wrong with patients, an alert will be transmitted to the doctors, and they will make a decision based on that data.Data accuracy is one of the most important features of this application, because if the data are incorrect, than the doctor may follow a wrong procedure. We propose fuzzy logic controller in order to assure the accuracy of the transmitted data. The proposed scenario can involve a large number of bio-signals. It is able to recognize and accept only correct values from the collected data, thus reducing the load of processing multiply data at the doctor's side.

Keywords: WSN, Healthcare, Data Accuracy, Fuzzy logic Controller.

1.Introduction

The focus of this paper is to explain how data the will be transmitted without failure, and how accuracyproblems will effect on the behavior of the network.The information provided from the system will help the doctors to supervise the condition of the patients at time, 24 hours a day. In case of emergency alert, an alarm will be transmitted to the doctors. If the system fails, it will send wrong information to the doctors, and maybe misinforming them about the true conditions of the patients. Here are some accuracy problems according to our study:

- Interference:Patients may have mobile phones or other devices, which use Wi-Fi, and the signals could interfere with the accuracy reading of the sensor.
- The sensors can break free, disengage or malfunction as a result of patient movements.
- Sensor's lifetime: There is a chance that sensors could become faulty, and give a wrong description of what is happening to the patients.
- Data accuracy could be effected by the environment that is surrounding thepatient like temperature.If the patient is in his home, the temperature of the room could affect the patient's temperature, but in hospitals the situation is more controlled.

2. Fuzzy logic based solution

Fuzzy logicis form of logic that handles multiple values. It is driven by an algorithm that is based on the status of the object that is being monitored. Fuzzy Logic variables may have a level of truth value that runs between 0 and 1.It is a continuous value rather than the defined discrete values (0 and 1) used in the traditional true-false system. It plays an important role in medical field, and we use it in our proposal, because of the large number of parameters that can be included and the possibility to lead to different diagnoses.There is possible that in some cases the output will lead to unknown results, especially when all the signs of the patient are in normal condition but some sensor values notify for critical conditions.This could be the result of faulty sensors. For example, blood glucose sensor information from the sensor was used to get the rate of insulin infusion.If the value of the sensor/s falls outside the normal condition window of fuzzy logic an alarm signal will be sent to the doctors.The alarm indicates that something unexpected is happening, if it doesn't reflect the real situation than we may face with faulty equipment condition. In this case if the other parameters such as blood temperature and breath rhythm are producing normal conditions, but an alarm is transmitted, then it should be an alarm for the sensor condition, the fuzzy logic algorithm, but not an alarm for the patient condition. In this case the fuzzy logic combines this information with that of other vital signs and makes the decision to trigger an appropriate alarm accordingly.Anomaly detection is the task of fuzzy logic controller,to identify unusual events, which do not match the predetermined values.

3. Conclusions

The research in the development of real time monitoring applications will enable the doctors to monitor the patients, wherever they are. This system will enable the patients to receive medical care as they should, regardless of the time and location. Data accuracy is really important, because if the data transmitted are incorrectthan the doctor may follow a wrong procedure. The platform is implemented by using a system for detecting sensors abnormalities based on Fuzzy Logic techniques. It includes vital sign monitoring and alarming services, and controls the accuracy of data gathered from sensors. This algorithm is enabled to remove unnecessary data from the doctor’s side, therefore reducing energy consumption and increasing the network lifetime.

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RFID-BASED SMART SYSTEM MONITORING PARKING AREAS

F. Kallel and H. Hamam
EMAT lab, Université de Moncton, NB, E1A3E9, Canada
Corresponding email: efk2460@umoncton.ca

Abstract
The monitoring and control of moving objects in an open space requires deploying significant human time and effort, as for example the monitoring of cars in the parking areas. To overcome this problem, we propose an automated RFID technology system to monitor the parking.

Keywords: *Radio Frequency Identification (RFID),RFID tag performance, Received signal strength indicator (RSSI).*

1. Introduction

The monitoring of vehiclesbecame a serious issue for the municipality. While the vehicle facilitates the life of the citizen in some aspects it complicates his/her life in other aspects. Traffic congestion is one of the negative aspects. The search of parking spaces is an additional complication [1].Without any need of infrastructural changes, a wireless and portable system is proposed in this work for the monitoring of parking lots.The proposed system is in the form of a web application accessible by all drivers whoare looking for a free parking place and it is used by security agents for monitoring by scanning cars in the park spaces.

2. Related work

RFID technology has been used to satisfy several different needs such as the identification of aircrafts in the Second World War [2]. Several systems have been implemented to solve the parking management problem, as the solutions proposed in references [3, 4] whichare based on wireless sensor networks. The systems have been implemented by using image processing techniques [5, 6]. RFID technology combined with infrared sensors were applied on automatic barriers like the system proposed by Pala [7].
All of these systems have some weaknesses, such as the need for a change in the parking area infrastructure and not allowing mobile use.

3. Proposed method

Figure 1 illustrates the proposed system. It consists of an RFID reader, four antennas (2 antennas on each side) and two passive RFID tags placed on the front and rear windshields of each authorized car. The use of four antennas and two tags allows increasingthe detection performance. It also allows detecting cars having parked backwards.The RFID tags used in our system are passive tags, each composed of a microchip and an elementary antenna. Thisreceivesa

radio wave, reading wave, produced by a primary antenna to a reader.The reading wavepowers the circuit of the passive tagwhich use this energy to send information back [8]. A tag may react to several primary antennas.

In addition to the each identifier of a tag we append some data that are specific to the object we want to track.

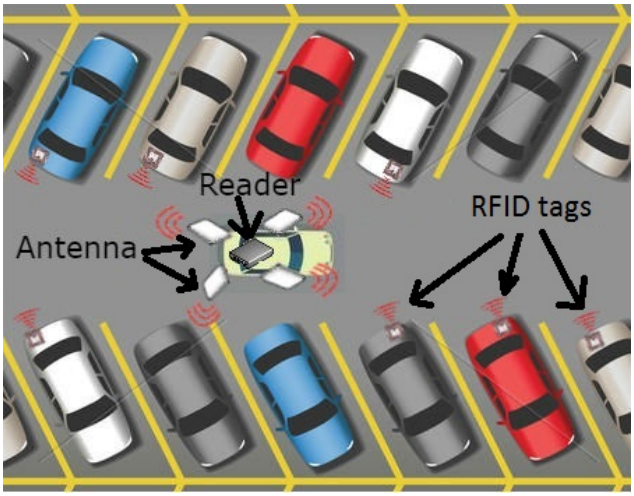

Figure 1. The proposed system

These are saved in our database as shown in the following tables:

TABLE I. List of registered tag

ID	Tag number	Car registration	Payment date
01	E2002064900902052010 42E5	PNY EXPS	15/10/2016
02	E2002064900902042010 42E1	ZOOMN65	15/12/2016

TABLE II. List of registered car

D	License plate	Mark	Picture	Customer ID
01	PNY EXPS	mustang	E733A783D22	8871985
02	ZOOMN65	Mazda	0xFFD8FFE0	7849652

As shown in Tables 1 and 2, each tag ID is associated to one car. For each tag we can record any data we want. In our case, we recorded the date of payment of the parking fees.

4. Results and discussion

The processing speed and real-time detectionare main requirements of our system. For this reason, fast and repetitive measurements should be done over a short period of time.

TABLE III. Performance measurement of our system

	Experiment 1		Experiment 2		Experiment 3	
	Antenna 1	Antenna 2	Antenna 1	Antenna 2	Antenna 1	Antenna 2
Possibledetections	135	135	135	135	135	135
dist.	2 m	2 m	3 m	3 m	4 m	4 m
# ofdetections	119	110	105	110	91	92
# of missed	16	25	30	25	44	43

As shown in the table, the performance of our system was tested using only two antennas attempting to detect 9 tags. We made 3 measurements,where we changed in each time the distance between the tags and the antennas (2, 3 and 4m).The3 measurementsare repeated 15 times.For the distances of 2 and 3m, we found almost the same results. For a distance of 2m, among135 possible detections (9 * 15),the antenna 1detectedthe tags119 times, Antenna 2made 110detections. For 4 m, slightly less detections are madebutthe detection rate remains high.This makes the systemreliable and the reader could read all the tags without skipping one, especially when using two antennas for reading.Our system functionality is not limited to reading the tags, but it also deduces the number of the empty places and the number of not registered cars. To ensure these functionalities we must extract the exact distances between the antenna and the tags through the values of the RSSI.

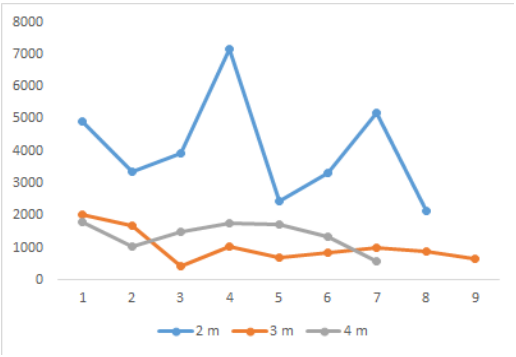

Figure 2. Results of RSSI values received by nine tags located in different distance from one antenna.

As pointed out in Figure 2, we can distinguish between 3 ranges of RSSI values, the blue line presentsthe results of the RSSI values measuredat 2 m. The points in orange show the values found at 3 m, whereas the gray line stands for the values observed at 4 m.For each distance an interval of RSSI values should be determined. When a measured RSSI value falls in one interval we then know to which distance it corresponds. These intervals can be used to deduce the number of spaces occupied by unregistered cars.

5. Conclusion

A new mobile system for monitoring and parking management based on RFID technology is proposed. The synchronization ofthe detection and the processing of our system have been successfully tested at the Université de Moncton. In the future, we will extend our technique to other applications.

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TECHNOLOGY TREND IN THE FIELD OF ELECTRICAL DRIVES

Loreta Nakuçi, Aida Spahiu, Enxhi Jaupi
Instituti Hurry Fultz, Tirana Albania
loreta.nakuci@gmail.com
Department of Automation, Polytechnic University of Albania, Tirana, Albania
aida.spahiu@fie.upt.al
Instituti Hurry Fultz, Tirana Albania
enxhi_jaupi@hotmail.com

Abstract
The paper presents the technology trend of using BrushLess Direct Current (BLDC) motor instead of induction motor in variable speed electrical drives. The induction motor is by far the most widely used choice for development application in industry and in the tertiary sector. Being both rugged and reliable, it is also the preferred choice for the variable speed drive applications. Meantime BLDC motor is the result of the research, not only in the field of the motor design, but also in other areas like the power electronics, integrated circuits and finding of materials with very good magnetic properties. BLDC motor is called a miracle of technology, not only for its advantages but also for its flexibility and adaptation, through using of the intelligent control which decreases the costs and improves its working and energy performance. The paper aims to compare permanent magnet based, three-phase brushless DC machine to induction motor technologies in terms of efficiency. The analysis is specifically related to low power fan applications. The findings presents in the paper provide information that BLDC motors provide better efficiency compared to single-phase induction motors.

Keywords*--induction motor; BrushLess Direct Current motor; efficiency; losses;*

1. Introduction

Electric drives have a great development activity in today than at any time in the past. Two important reasons for increasing technical variety of electrical drives are: (1) Increasing use of computers and electronics to control mechanical motion. The trend towards automation demands new drives with a wide variety of physical and control characteristics. (2) New 'enabling technology' in power semiconductors and integrated circuits, leading to the development of non classical motors such as brushless direct current motors (BLDC) and steppers [1]. These motors are used in variable speed drive. There are three reasons why variable speed drives are preferred more than fixed speed drive: 1) energy savings, 2) speed and position control, 3) reduction of electrical and mechanical stress during transient processes.

Energy saving is a very sensitive issue nowdays. From the statistics about electricity consumption about (43-46) % of total energy is consumed by

electrical drives, 19% by illuminations and 34% for different aims [9]. It is clear that the electrical drives are the most important consumers of electrical energy. So, it is very important to increase the efficiency of electrical drives in order to have energy savings [2]. In the paper we proposed as effective way to reduce energy consumption the replacement of induction motor with BLDC motor in fan application. BLDC motors are replacing other motors in numerous applications as they offer significant energy efficiency improvements, lower acoustic noise and better reliability to name a few advantages. On the other hand, the request for long life, no maintenance leads us to use the BLDC motors instead of DC motors. This is made clear by the comparison of the mechanical characteristics of induction motor, direct current and BLDC motors [3] [4] [5] [6]. The paper aims to show through experimental method that the use of BLDC motor in fan application instead of induction motor can bring the energy savings 25% up to 43%.

3. The subject of your work

The subject of the paper is to show through experimental work that the BLDC motors are the technology trend in replacing the induction motors especially in fan and pump applications ensuring potential energy savings. We can find the reason about that in the properties that BLDC motors posse compared with induction motor and DC motors such as mechanical characteristic, starting torque, speed range, the possibility to control the speed and the position, inertia, dynamic respond, thermal performance, losses, efficiency, environmental pollution, design, size, weight, maintenance, long life, where the BLDC motor is winner [3], [8], [5]. However the disadvantages of BLDC motor which are the cost and the complexity of the control are used in many applications in the fields of automobile, industry, household appliances, office equipment, tools, toys, medicine, aerospace, [3] [4] [5] [6].

4. Proposed method

Our aim is to highlight the advantages of BLDC motors, compared with induction motors used in variable speed drives especially in terms of efficiency. The study is done through experimental way comparing the efficiencies of two electric drives that drive a fan. The same fan, is driven at first by induction motor and after by BLDC motor. The experiment place is shown in figure 1 as below. Through two experiments we have measured the power consumed and losses for two drives with different motors. We have compared the results and have calculated the energy savings, for five working hours in day for full year.

Figure 1. Experiment work

5. Results and discussion

It is seen from experimental results that the usage of BLDC motor instead of AC motor in fan application brings potential energy savings.

6. Conclusion

It is been recommended from literature that the usage of BLDC motor instead of AC motor brings energy savings. This is made clear even in our measurements, but replacing of induction motor with BLDC one has even more advantages in fan application such as no noise, no maintenance, low volume and weight, etc. This replacement is important in the applications that need speed and position control. In the future, we think to continue our work with comparison of the induction motor with BLDC drive in the other applications with more complex tasks.

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ESTIMATING TRAVEL DYNAMICS TO REDUCE VEHICLE USAGE FOR SHORT–DISTANCE ROUTES IN URBAN AREAS

Alban Rakipi[1], Joana Jorgji[2]
[1,2] Department of Electronics and Telecommunications, Faculty of Information Technology, PUT
arakipi@fti.edu.al, joana.jorgji@fti.edu.al

Abstract
Increased vehicular traffic in dense urban areas is an issue of major concern. The inherent results are higher pollution levels and car accidents, shrinking of parking areas and severe traffic congestion. Switching to public transport and walking suggests an improvement.
In this work, we present a method to estimate the rate of daily vehicle usage in Tirana. With the use of SUMO (Simulator of Urban Mobility) microtraffic simulator we simulate the city traffic and evaluate the average traveling distances. Given a time threshold, destinations within less-than-threshold range are considered of ease of reach. The existence of a direct bus line is considered. Statistic results demonstrate the effectiveness of the proposed method.
Keywords:*GPS, threshold, distance estimation, vehicle tracking.*

1. Introduction

Because of the recent growth in the surface area and population of Tirana, due to administrative changes, the city road planning has become a major issue. The contributing historical reasons mainly concerned to the unsupervised development of the city, give rise to complex problems like narrow roads, lack of parking areas, lack of cycle and bus lanes and the non-existence of other public transport means like metros, trains and trams. To identify the critical problems of the city's road network, the urban traffic is generated by microscopic simulation using SUMO Simulator. The use of a simulator provides a good method of road planning to serve as a testbed for future realistic traffic measurements using field collected data.

2. Related work

There are several methods to estimate and measure vehicular traffic in urban areas [4-7], yet no one of them has been deployed in Albania. The existing traffic data is almost non-existent and non-accurate and the methods require either high implementation cost of road sensors or extended research in the field. The simulation type that is the most adequate for this project is the microscopic traffic simulation that represents the process of creating a model of a certain network, to predict the effectiveness of the proposed modifications. Our work differs from [4-7] in the fact that it is innovative in Albania and it combines various approaches such as the use of the GNSS system, traffic simulators and a method of transferring to slower modes of transportation to reduce the dominance of cars in urban areas.

3. The subject of your work

The aim of this work is to determine the possible reduction extent of car usage in the urban area of Tirana. Using a simulation model that assigns «car tours» to alternative transport modes,it is intended to define the potential changes in the choice of mode with regard to the time performance of the different transport modes. Two different scenarios are used: the usual traffic and heavy traffic conditions. A map of the central urban area of Tirana is considered to estimate the average time travel in the arterial roads starting from Scanderbeg's Square to the most frequented work and leisure places, using all three basic means of transportation (driving, walking, public transport).

4. Proposed method

For the vehicular traffic tests, it is firstly needed to obtain a map of the city, compatible with SUMO. The OpenStreetMap (OSM) XML file is edited in Java OpenStreetMap Editor (JOSM) to remove all the road edges which cannot be used by vehicles such as railway, roadways, and pedestrian. Random routes of vehicles in the network are generated using the DUAROUTER. The number of cars to be reduced can be easily calculated, based on the threshold for each of the above scenarios. While the results are only theoretical in this context, the proposed method gives a good approach to estimate at which extent car tours can be reduced daily in urban areas.

5. Results and discussion

In the first scenario, 12 in 100 cars (12%) travelling in the city of Tirana during the usual traffic could be reduced. The decrease in the CO2 emission is estimated around 624 mg. For the heavy traffic conditions (scenario 2), 47 in 100 cars could be eliminated from the network (47% of the urban traffic). The amount of CO2 emissions decreases by 8.688 gr.

6. Conclusion

The results indicate that SUMO was capable of simulating the Tirana urban traffic in the context. Two different scenarios were considered, the usual traffic and heavy traffic conditions. The results are given above. Although it lacks real traffic data gathered from the field tests in the city, the method potentially solves the problem, giving a theoretical approach to decreasing urban traffic by transferring to other potential modes of transportation such as walking or public transport when possible.

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OPTİMİZED ENERGY RECOVERY FROM USED BATTERİES BEFORE RECYCLİNG

J. Chakroun and H. Hamam
EMAT lab, Université de Moncton, NB, E1A3E9, Canada
Corresponding email: ejc1919@umoncton.ca

Abstract
The optimization of energy consumption and the protection of the environment against pollution have been noticeably the first issue for many countries. In this paper, we propose a special design for energy recovery from used batteries into a renewable power source.The workconsists in advancing an intelligent flexible control structure able to extract the residual energy according to the dynamic behavior of the chemical batteries. For this issue, a Proportional-Integral (PI) and Fuzzy-Logic (FL) based algorithm wassuggested and designed to adapt the dynamic aspect of the batteries' charge and discharge. To obtain the optimum residual energy, both methods are compared using MATLAB- SIMULINK software. In our case, the Fuzzy-Logic controller method has improved the performance and the speed of the system. A hardware implementation was also provided to validate the theoretical concept and the proposed models. ***Keywords****— PI Controller, Battery, Fuzzy Logic Controller, Buck converter, Residual Power, Simulink.*

1. Introduction

The energy recovery concept in this research hangs on a step-down chopper converter controlled by using two techniques based on the conventional fuzzy logic and Proportional-Integral (PI) controller. This development should ensure a maximum power recovery from used batteries by the use of highly efficient converters. Moreover, it takes into consideration the low voltage condition of chemical batteries.In this work, we intend to design a specific control for a low voltage DC-DC synchronous converter to obtain the maximum residual energy from used batteries charging another rechargeable battery.

2. Related work

In the most recent power recovery systems, renewable energy extraction strategies are frequently used. For that reason, the DC-DC buck converter presents one of the most prominent converters used in the industry and power systems. It converts a specific DC voltage into a lower level voltage [1]. In [2], M. S. Krishna and S. S. Narayanapropose that initiating an integral control with a constant gain state feedback as a PI controller can help the system behavein a linear way with respect tothe reference inputs. As a consequent, its stability and small signal dynamic functioning can be evaluated by using the small signal model of the converter.In [3], L. Guo and al. demonstrate that Fuzzy Logic controllers can adapt the nonlinear characteristics of buck converters with varying operating conditions. The Fuzzy algorithm is built upon multiple outputs selected specifically for every type of application. The output variable is

the duty ratio used to command the DC-DC converter. Besides, there are often severalinputs, chosen particularly from the characteristics of the battery model developed by A. Rameshkumar and S. Arumugam in [4].According to P. Vyroubal et al. in [5], the used model enables an adequate presentation of a battery's real behavior. It turned out that the simulated dynamic and static aspectsare close to the experimental onesby.

3. Proposed method

In this research, we intend tocreate a power source by using chemical batteries providing a range of voltage capable to charge another of secondary type. For this purpose, DC-DC Buck converter is required to supply a regulated voltage at a constant rate of current. In order to efficiently use the remaining capacity of the battery, a control strategy should be implemented to ensure the speed of the power transfer, the high efficiency and the charging process of the rechargeable battery. In Fig. 1, a block diagram presents the tenet of the proposed developed structure.

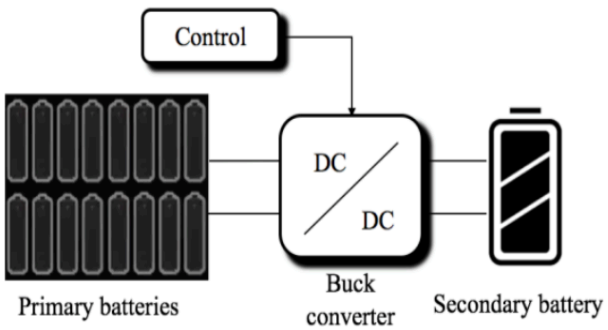

Figure 6. Block diagram of proposed work

Both Fuzzy Logic and PI controllers were designed for buck converters during the energy recovery operation. The conventional PI controller gains (K_p and K_I) are tuned at rated conditions based on Ziegler–Nichols tuning rules and have fixed values during the different operationpoints. In this case, Fuzzy Logic controller (FLC) is proposed to control the output of buck DC-DC converter using four main units [13].

4. Results and discussions

The proposed system was successfully designed. The SoC progression proved that the designed FL controller, with the adequate choice of membership functions, gives a more efficient and rapid behavior than the PI controller in our case as shown in Figure 2.

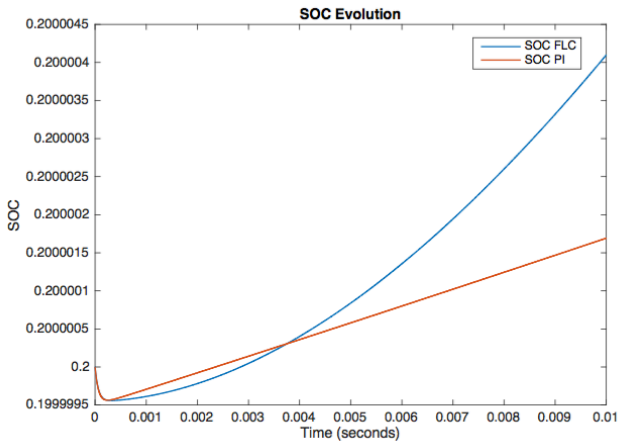

Figure 7. The evolution of SoC with FLC and PI controller

For the hardware implementation, the optimal set point of the energy recovery structure provided 1.3 W as power derived from the used primary batteries for 85% of converter efficiency.

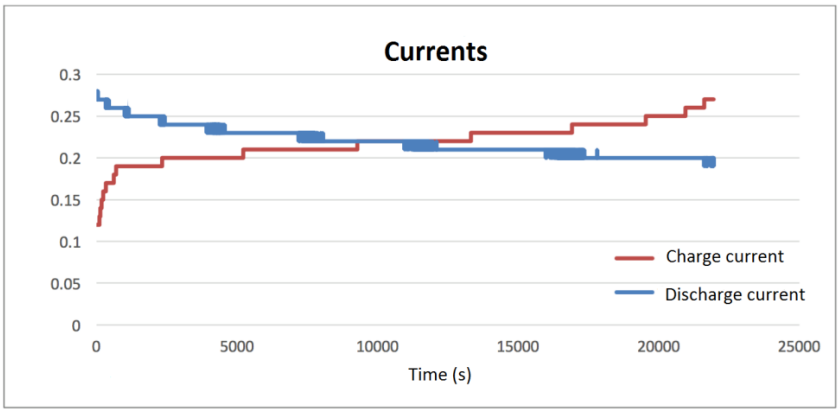

Figure 8. Discharge and charge current

These results represent 55% of the maximum power of the used batteries which can be supplied under these conditions.

5. Conclusion

This paper discusses the possibility of providing a new energy source with the ability to receive residual power from used batteries. The proposed system is designed to control the charge and discharge of this type of cells with a low voltage buck converter, wherein two types of controls were designed to manipulate the current and voltage transfer.

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MANAGEMENT OF RENEWABLE SOURCES OF ENERGY FOR A SUSTAINABLE ECONOMIC DEVELOPMENT

Luçiana Toti[1], Klesta Toti[2]
"Aleksander Moisiu" University, Durres, Albania
luciana.toti.kini@gmail.com
University of Tirana, Tirana, Albania
klestatoti@gmail.com

Abstract
In the framework of the directives given by European Unity, all countries must work to promote the use of Renewable Energy Sources and to reduce the national consumption of energy, until 2020.
In these conditions, a detailed analysis of the overall situation in the energy sector in Albania, takes a special importance.
The paper is focused at the latest issues, such as losses in transmission and distribution of electricity, expansion, though slow steps, of the capacity generated, etc. Also, in this paper are identified the duties set to be faced by the Albanian society about the difficulties encountered in the energy sector, as well as the recommendations regarding the solutions of these tasks.
One of the effective ways to overcome the difficulties is the *management of Renewable Energy Sources*, which should lead the country towards a sustainable economy and should improve the social and ecological aspects of citizens' life. Of course the made steps in this direction should be guided and supported strongly by the responsible institutions in the country.
***Keywords**: objectives, energy, renewable sources, photovoltaic systems*

1. Introduction

Let's look the situation of Renewable Energy Sources all over in Albania*[4].
The energy needs in our country mostly are covered from the import. On the one hand the Albanian society is facing grown demand for electricity (an average annual rate of 4.8% in the last decade), on the other hand, the generating capacity' growth has slowed down (an annual rate of about 0.6%). Also, we should not forget the losses during the transmission and the distribution of energy (which is been decreased from 44% in 2012 to less than 29% in 2015). As a result of these processes, Albania is turned from " exporter of energy" to "importer of energy" country. For this reason the expansion of generating capacity is one of the main priorities of the energy policy sector in Albania. *[2]
The Albanian Government has set duties and has planned the promotion of Renewable Energy Sources through the preparation and adoption of the National Action Plan on Renewable Energy, from which emerge tasks about their usage and the ways to achieve them.
Albanian intellectuals should raise the awareness of the public opinion, especially to the younger generation, for such energy sources, which above all directly affect the life and health of the population. The specialists must design

and implement such systems, following the same direction as the world's development in the energy field.
Some of the national objectives for the expansion of generating capacity through RES in Albania are:

- Using renewable energy at the rate of 38% till 2020
- Increase renewable energy to 10% of total fuel consumption in the transport sector

The realization of the objectives should be achieved through:

1. Improvements on legitimacy:
   - Market Liberalization
   - Increase competition
   - Promoting renewable resource development*[1]
   - Attracting foreign investment in the energy sector
   - Ensuring a sustainable reform in the energy field

2. Improvements to the licensing process:
   - Heating / cooling
   - Electricity
   - Transport

Renewable Energy Sources contribution toward the production of electricity:

Technologies	2015		2016		2017		2018		2019		2020	
	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh
Hydro												
<1MW	48	185	50	195	55	213	60	232	61	236	67	259
1MW–10 MW	248	941	272	1,035	315	1,197	360	1,368	369	1,402	423	1,607
>10MW	1,506	4,453	1,571	4,713	1,571	4,713	1,571	4,713	1,834	5,680	1,834	5,680
Solar												
Photovoltaic	-	-	-	-	50	120	-	-	-	-		
Solar energy NEUD	-	-	-	-	-	-	-	-	-	-	-	-
Wind												
In the sea	-	-	-	-	-	-	-	-	-	-	-	-
Ground	-	-	-	-	4	8	10	20	20	40	30	60
Biomass												
Solid	-	-	1	4	2	8	3	12	4	16	5	20
Bio-gas	-	-	-	-	-	-	-	-	-	-	-	-
Bio-liquids	-	-	-	-	-	-	-	-	-	-	-	-
Total	1,803	8,095	1,995	8,396	2,052	8,697	2,114	8,998	2,405	9,299	2,483	9,600

Conclusion:
In conclusion the application of Renewable Energy Sources develops the economic and social life all over the world. Their management guarantees:

- Macroeconomic and political security by reducing the country's budget deficit.
- Interest of investors from European Union

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A NEURAL NETWORK APPLICATIONFOR CONTROL PERFORMANCE IMPROVEMENT IN TIME DELAY SYSTEMS

İlır Juniku[1]
[1]*Department of Automatic Control*
Faculty of Electrical Engineering, Polytechnic University of Tirana
Sqr. Mother Tereza, Tirana, Albania
ijuniku@hotmail.com

Abstract
Time delay systems are widespread in industry. The study of "time delay" effect in control systems has been in the focus of intensive research, taking into account the problems associated with the control of such systems, such as system performance deterioration and destabilizing effects. In this paper, it is proposed the application of neural networks as an intelligent controller to improve the control performance of a time delay process identified in a laboratory oven. The performance of the proposed control design is analyzed through the step response characteristics, which are treated as performance indexes. Comparison between classical control with PID controller and new approach with neural networks is also provided. From the obtained results, it is concluded that the application of neural network controller achieves better control performance in time delay systems, comparing to the application of classical methods.

Keywords:*Time delay systems, neural networks, PID control, performance indexes*

1. Introduction

Delays are frequently faced in control systems as computing or processing delays or as delays imposed by information transmission [1]. Time delays are common in industrial processes which are characterized by energy and materials transport, such as chemical, biological, information, measuring, computing processes, etc. Time delays introduce problems in process control due to decrease of robustness and performance deterioration, which brings the systems close to instability [2]. To achieve the control of such processes, PID controllers have found wide application [3]. Their popularity is related to the fact that they are simple to understand and to operate by operators, and are effective and robust in control [4]. Given that approximately 95% of the control schemes in practice are built on PID controllers, finding the right parameters that improve the control performance, poses a challenge in itself [3].

There exist many methods for the calculation of the PID optimal parameters, in order to obtain a specific characteristic of process time response [5]. To check the effectiveness of various design methods for PID controllers, the comparison is made by analyzing the transient characteristics of the system. The

characteristics obtained by adjusting the PID parameters, often do not meet the control performance criteria defined by the designer. For this reason, methods based on intelligent nonlinear control algorithms, are introduced which result veryefficient in improving the overall control performance of time delay systems.

Therefore, the application of a neural network controller in the control of a time delay process to improve the performance of the closed loop system is the main focus of this work. Transient response performance criteria such as rising time, settling time, overshoot, peak value, peak time are used to perform the performance comparison between classical PID control and proposed neural network control of the temperature control process.

The structure of the article is as follows. Section 2 presents the classical PID control for the temperature control process, modeled as a first order time delay process and also the transient response performance criteria that will be used as the basis for comparison between the two control approaches. Section 3 presents the proposed control approach with neural network controller. All performed simulations and achieved results with classical method (PID controller) and intelligent method (neural network) are presented in section 4. Conclusions obtained from simulations are presented in section 5. Algorithms and computational simulations are performed in Matlab R2015b environment.

2. Problem formulation

The application of classical PID controller in parallel form in a closed loop is illustrated in Fig.1.

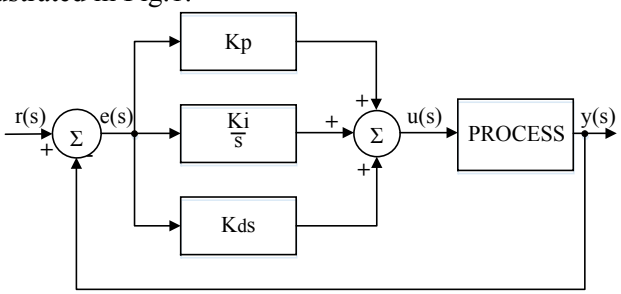

Fig. 1. Structure of closed loop with PID controller

Signals presented in the control scheme are:

r(s)-reference signal. In our case, a step function is taken as reference.

y(s)-output signal of the system

u(s)-control signal

e(s)-error signal, derived from *E(s)=R(s)-Y(s)*

Proposed PID controller is in its parallel form, and is provided by the algorithm:

$$u(s) = K_p e(s) + K_i \frac{1}{s} e(s) + K_d s e(s) \quad (1)$$

where:
u(s)-control signal in Laplace domain
K_p-proportional gain, a tuning parameter
K_i- integral gain, a tuning parameter
K_d- derivative gain, a tuning parameter
e(s)-error signal in Laplace domain
Some very popular classical methods for design of PID controllers are used to have a first view of the difficulties faced with the control of time delay systems. The Ziegler-Nichols (ZN) tuning formula [6] is obtained when the plant model is given by a first order plus dead time model (2).

$$G(s) = \frac{k}{Ts+1} e^{-Ls} \quad (2)$$

Where *k, T, L* are respectively amplification gain, time constant and time delay of the process. Based on process step response, PID controller gains with Ziegler-Nichols design method are defined as in (3):

$$a = kL/T, \quad K_p = 1.2/a, \quad T_i = 2L, \quad T_d = L/2 \quad (3)$$

where T_i is the integral time and T_d is the derivative time.

Chien-Hrones-Reswick (CHR) design method [7] is also based on first order plus dead time model of the process.The CHR method uses the time constant *T* of the process explicitly as is illustrated in the tuning formulas (4) and (5). For setpoint regulation, CHR proposed two tuning methods, with 0% overshoot and 20% overshoot.
For 0% overshoot:

$$a = kL/T, \quad K_p = 0.6/a, \quad T_i = T, \quad T_d = 0.5L \quad (4)$$

For 20% overshoot:

$$a = kL/T, \quad K_p = 0.95/a, \quad T_i = 1.4T, \quad T_d = 0.47L \quad (5)$$

Cohen-Coon (CC) design method [8] is based on first order plus dead time model of the process. The tuning formulas for the PID gains are listed in relations (6).

$$a = kL/T, \quad \tau = L/(L+T), \quad K_p = \frac{1.35}{a}\left(1 + \frac{0.18\tau}{1-\tau}\right), \quad T_i = \frac{2.5-2\tau}{1-0.39\tau} L,$$

$$T_d = \frac{0.37-0.37\tau}{1-0.81\tau} L \quad (6)$$

Wang, Juang, and Chan (WJC) design method [9] is based on ITAE performance criterion. The tuning formulas for the PID gains are listed in relations (7).

$$K_p = \frac{(0.7303 + 0.5307T/L)(T + 0.5L)}{K(T+L)}, T_i = T + 0.5L, \qquad T_d = \frac{0.5LT}{T + 0.5L} \tag{7}$$

The process that is studied is a single input-single output first order system with time delay, which represents many processes in industry. The first order plus time delay model is retrieved from the process identification procedure of the temperature control process of a laboratory oven model G34/EV. The experiment set is shown in Fig.2. Based on the surface method applied in this case for the open loop step response, the identified transfer function of the temperature control process is:

$$G(s) = \frac{1.33}{1400s + 1} e^{-30s} \tag{8}$$

This is a self-regulating process with rising time $t_r = 1281$ seconds and settling time $t_S = 2307$ seconds.

Analysis for the process transient response in time domain is performed through performance criteria [10] like:

-Rising time t_r: time required for the output of the system to reach 90% of its final value $h(\infty)$.

-Settling time t_s: time after which the output remains within ±2% of the final value $h(\infty)$

-Overshoot $M_r(\%)$: shows the peak overshoot value above the step value, expressed in percentage, which should preferably be 1.2 (20%) or less.

-Peak value h_{max} : peak value of the transient response $h(t)$ of the process

-Peak time t_{peak}: time required for the transient response $h(t)$ to reach the peak value h_{max}

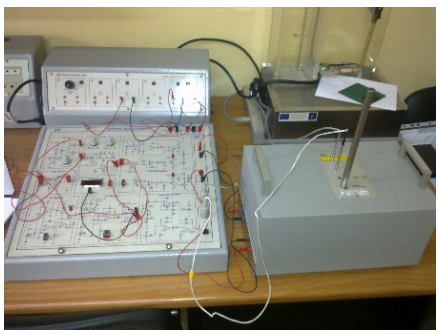

Fig.2 Experiment set for temperature control of laboratory oven

Rising and stabilizing time are measures of response speed of the system while overshoot, peak value, and settling time are measures related to the quality of response.

3. Proposed method

The proposed method for the control of this time delay system is a neural network controller. An artificial neural network is an electrical analog of the biological human neural network [11]. Neural networks are inspired by biology, they are parallel processing systems with distributed information. They are characterized by computing power, error tolerance, learning through experimental data, and they are low level algorithms that achieve good performance in processing of numerical data. They are able to represent nearly all nonlinear functions constructed on input-output identification data, with a predefined accuracy. Since most of practical systems that we know in industry are of nonlinear nature, neural networks are one of the most accepted and used intelligent control method.

An indirect neural control design is applied in this case. Indirect neural control is based on the neural network model of the process to be controlled. The proposed control system is composed of two feed-forward neural networks with multiple layers that are used to represent both, the neural network model that mimics the transfer function of the time delay process under study, and the neural network controller that handles the nonlinearities and system input changes. The neural network model of the process is built based on the process identification procedure. The input-output data of theprocess is taken into consideration for a particular signal. As a second step, the neural network controller is designed based on the identified neural network model of the time delay process. Multilayer networks were chosen since they can be used for every kind of nonlinear model.

In the feed-forward neural networks with multiple layers, the neurons from one layer have weighted connections with neurons in the next layer. Every layer has a weighting matrix *W*, a bias vector *b*, and an output vector *a*. The input layer accepts the input data or training data and forwards these data to the hidden layers. Most of the data is processed in the hidden layers. The last layer is the output layer, where we receive the output data from the network. The output data from a*n*-layers neural network is achieved using relation (9):

$$a^n = f^n\left(W^n f^{n-1}\left(W^{n-1} f^{n-2}\left(W^{n-2} p + b^{n-2}\right).....+ b^{n-1}\right) + b^n\right) \tag{9}$$

Where *a* is the network output, *f* is the transfer function used in each layer, *W* the weight value, *b* the bias value. The superscripts on each parameter in (9) represent the number of the layer.

Logarithmic sigmoid activation functions (10) were used in the hidden layers and linear activation functions (11) were used in the output layer.

$$\log sig(n) = \frac{1}{1+e^{-n}} \tag{10}$$

$$f(n) = K \cdot n \tag{11}$$

Usually, to design a neural network, a multi-step process should be followed. It consists of the following activities: process input-output data gathering, neural network type selection, initialization of network weights and biases, training of the network, validation/testing of the network, and finally the implementation of the designed neural network in the control scheme. As mentioned above, the neural networks need to be trained from input and output data of the process in order to achieve a control law based on the performance criteria. Flowchart for the training process is illustrated in Fig. 3.

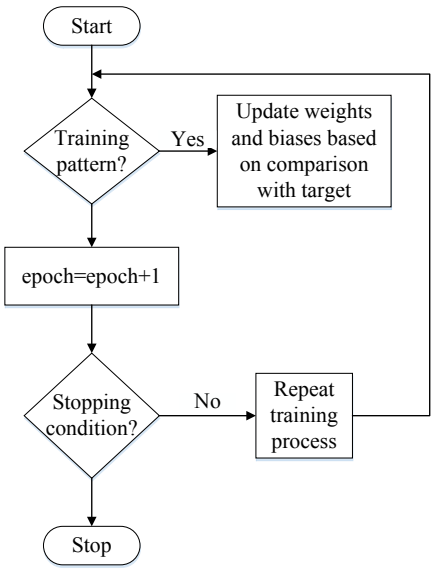

Fig.3. Flowchart for training process

Levenberg-Marquardt (LM) training method was used in this paper, as one of the most popular methods for training feed-forward neural networks. When receiving the data, the input neurons receive the input training data, and the output neurons generate the output data. From the input-output data the network computes the error, and the LM training method works to reduce this error to a predefined value. The trainingof the network starts with random weights W and bias b values, then these values are adjusted until we get the best performance of the network, that is the point where the network has reduced the error to the predefined value. After successful training, the network is able to deal with any new input data, to find the correct output data.

4. Simulation results

Following the control design methods explained in sections 2 and 3, simulations were run in Matlab-Simulink software for the time delay process of temperature

control. In the first part of simulations, the PID controllers based on the classical design methods were obtained. Closed loop step responses for the five classical PID designed methods were compared. The Simulink diagram constructed to perform the simulations is illustrated in Fig. 4. Comparison of transient behaviors of the time delay temperature process for these 5 control methods is illustrated in Fig. 5.

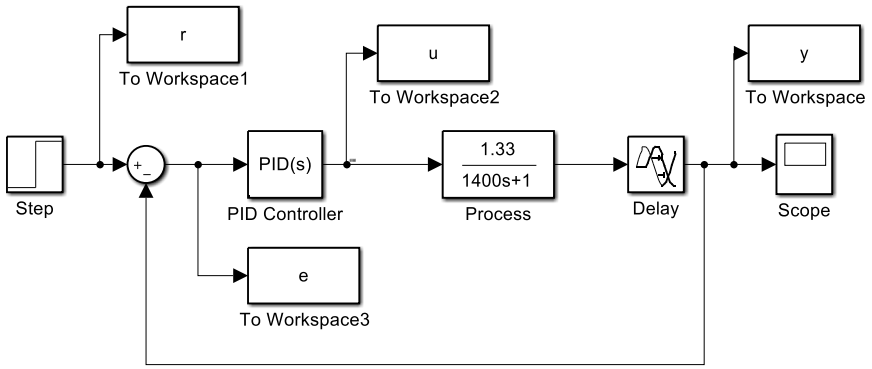

Fig. 4 Simulink diagram for the conventional PID control

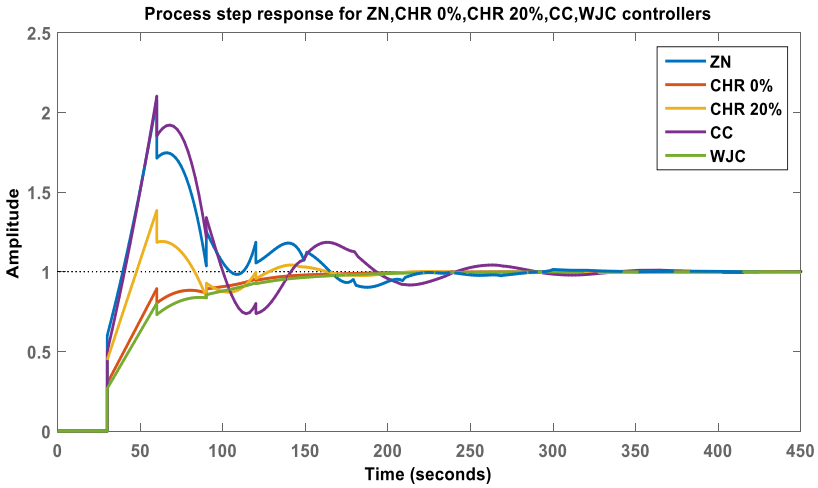

Fig. 5 Step responses of the temperature control process for the classical PID design methods

PID controller gains as well as performance criteria obtained from the simulations are included in Table 1.

TABLE 1. OBTAINED PID CONTROLLER GAINS AND PERFORMANCE CRITERIA WITH CLASSICAL CONTROL DESIGN METHODS

PID	Kp	Ti	Td	t_r	t_s	$M_r(\%)$	h_{max}	t_{peak}

design Method								
ZN	42.11	60	15	7.16	270.16	107.24	2.07	59.99
CHR 0%	21.05	1400	15	65.50	150.73	0	0.99	267.01
CHR 20%	33.33	1960	14.1	14.49	191.9	38.41	1.38	59.99
CC	47.55	74.35	11.06	8.47	278.8	110.10	2.10	59.99
WJC	18.97	1415	14.84	79.06	175.62	0	0.99	402.63

From the results, the best performance is achieved with CHR (0% overshoot) and WJC methods.

The second part of simulations included the design and simulation of the proposed intelligent neural network controller. As a first step, the input data from a pseudorandom signal, and the output data from the temperature process model output were obtained and recorded. These data were used to train the neural network that will represent the temperature process. The structure of the achieved temperature process neural network model consisted of 10 neurons in the hidden layer. The selection of the number of the neurons in the hidden layer and the transfer function came from the simulations results for the network with different number of neurons and different transfer functions. Obtained high level structure of the neural network, for the process model, is shown in Fig. 6 and internal structure of the neural network is shown in Fig.7.

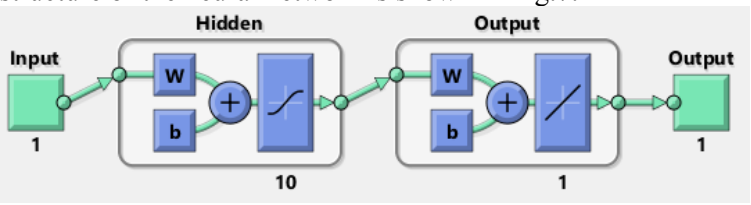

Fig. 6 Neural network structure for the process model

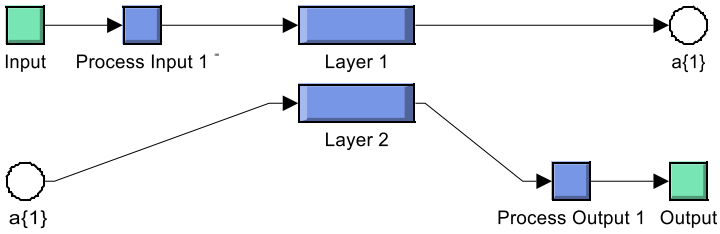

Fig. 7 Internal structure of the neural network

As illustrated in Fig. 8 and Fig. 9, logarithmic sigmoid activation functions were used in the hidden layer and linear activation function was used in the output layer.

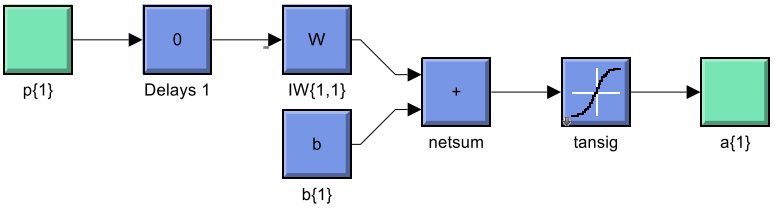

Fig. 8 Hidden layer activation functions

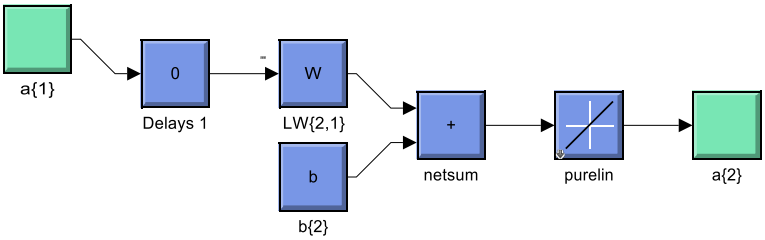

Fig. 9 Output layer activation functions

The performance of the neural network was very good, the network took 14 epochs to reach the predefined error of 0.000015 as is shown Fig.10. This very small error between the actual network output and the desired output confirms the high efficiency of the network and that it was able to mimic the time delay first order temperature process model.

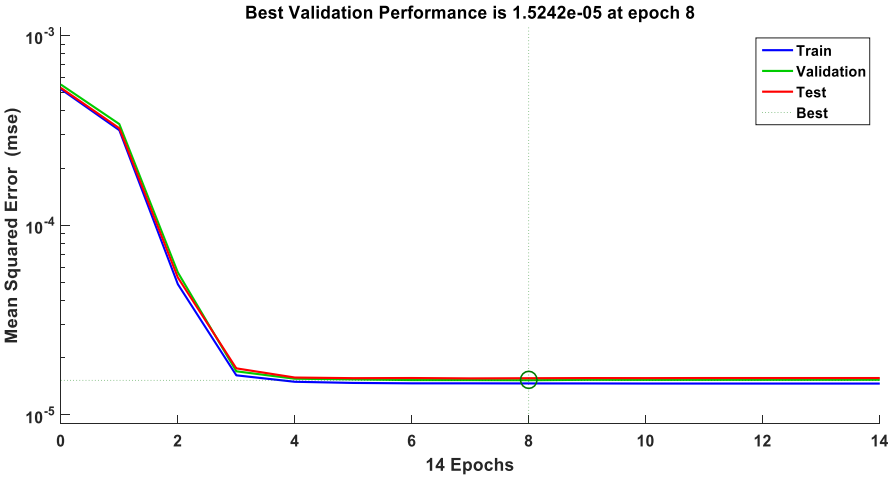

Fig. 10 Achieved error for the neural network model of the temperature process

The trained neural network generated in Simulink for the temperature process is shown in Fig. 11.

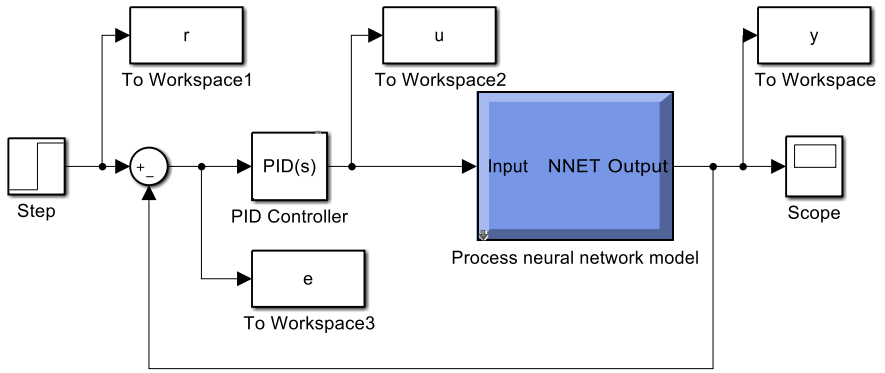

Fig. 11 Simulink diagram for the neural network temperature process model

The training data for the neural network controller was obtained from the PID control scheme used in the first part of the simulations. Both the input and output signals of the PID controller were recorded and used for the training purposes.

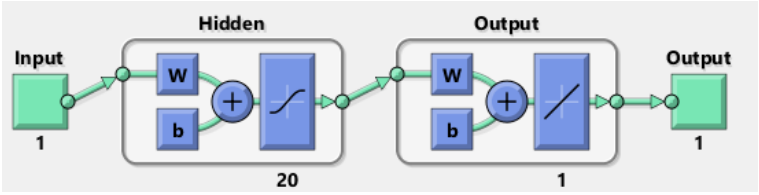

Fig. 12 Neural network structure for the controller

The structure of the obtained neural network controller had 20 neurons in the hidden layer. The predefined error was set to 0.0005.The training process took 10 epochs to reach the predefined error.Fig. 12 shows the obtained neural network to represent the PID controller and Fig.13 shows the completed neural network control scheme designed in Matlab-Simulink.

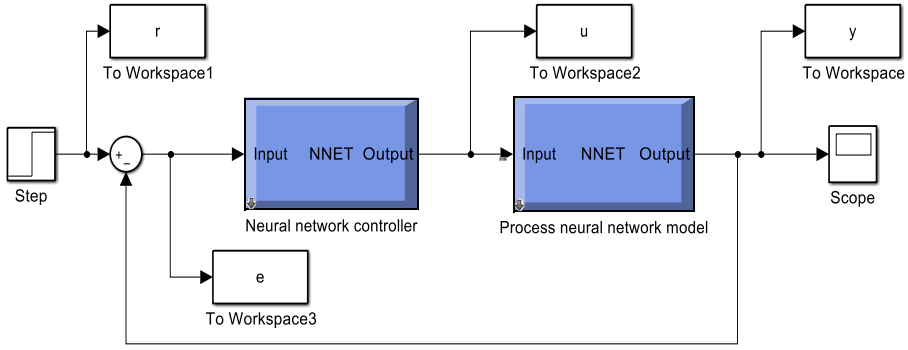

Fig. 13 Simulink diagram for the complete neural network control scheme

Fig. 14 shows the response of the complete neural network controlled system. It is clear the neural network control system performance is better than with any

of the PID controllers treated in the first part of the simulations. Resulting performance criteria for the neural network control scheme was rising time $t_r = 42$ seconds, settling time $t_S = 110$ seconds and overshoot $M_r = 5.2\%$.

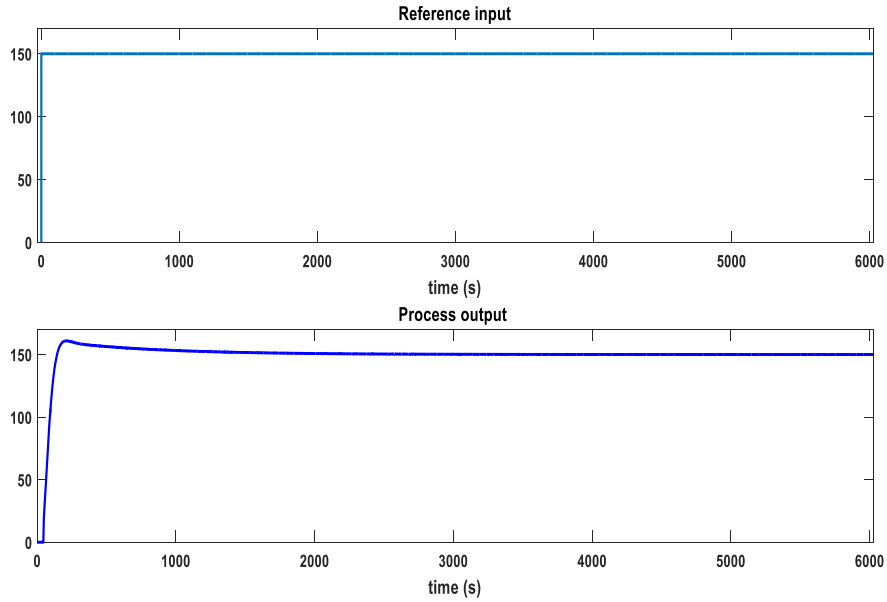

Fig. 14 Neural network control system response

5. Conclusion

From the performed simulations, it is concluded that the proposed intelligent neural network controller is very efficient in achieving a better control performance compared to classical PID controllers, for the temperature control process, which is a time delay process. Especially performance criteria achieved with this control method, like rising time t_r and settling time t_S are reduced approx. 20 times compared to the values of the process, and are lower than the best values achieved with CHR and WJC control methods. This indicates that the proposed control system with neural network controller reacts quickly to the input disturbances of the system. The system behavior with neural network controller has no oscillations, compared to the behavior achieved with the classical PID design methods.

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INVERSE REINFORCEMENT LEARNING FOR COMPUTING NAVIGATION ACTIONS FROM DEMONSTRATIONS

Evis Plaku
Department of Electrical Engineering and Computer Science
The Catholic University of America, Washington, DC

Abstract
The goal of this work is to equip a mobile robot with the ability to successfully navigate in complex unstructured environments without providing a manually generated cost or reward function. In contrast, it allows for learning navigation actions from a set of trajectories demonstrated by a human supervisor. Given observed optimal behavior, this work relies on inverse reinforcement learning to recover a reward function that closely mimics demonstrated behavior. This allows the robot to efficiently navigate in unknown hazardous environments. Experimental validation in which multiple scenarios of various environmental settings are modeled using a realistic simulator show that the robot learns to navigate collision-free in challenging terrain.

Keywords: autonomous robot navigation, inverse reinforcement learning, 3D point clouds

1. Introduction

Robot navigation plays an essential role in an extensive number of applications in robotics, including self-driving cars, searchand-rescue missions, space exploration, and animation in gaming and virtual reality among others. Planning the trajectory of an autonomous robot is notoriously difficult. The robot must navigate amidst numerous obstacles, narrow passages, and unknown environmental settings. A successful planner requires computing a sequence of navigation actions that allows a robot to move collision-free towards its desired destination, while obeying additional constraints imposed by the robot's kinematic properties.

To address these challenges, the proposed method relies on Inverse Reinforcement Learning (IRL). The main contribution of this work is an approach that enables a mobile robot to autonomously navigate in complex environments without providing a manually generated cost or reward function. Rather, the robot learns navigation actions from a set of demonstrated trajectories by a human supervisor, and uses this knowledge to adapt its behavior when encountering unknown scenarios. This approach has two phases: in the learning phase, the robot is manually guided by a human supervisor to certain destinations. Assuming this to be (near)-optimal policy, the task is to learn to predict similar navigation actions. In the testing phase, the robot is placed in previously unknown environments, and is required to find a successful trajectory given its start and end positions. The conducted experiments demonstrate the capabilities of this approach in closely mimicing demonstrated behavior while navigating collision-free in complex obstacle-rich environments.

2. Related Work

Recent research has shown that developing techniques to learn navigation models from demonstrations tends to work very well in a variety of applications. Ng and Russell and Ziebart*et.al* research is focused on inverse reinforcement learning to recover a reward function that mimics demonstrated behavior when a policy is known only through a finite set of trajectories [1]. An application includes navigating a robotic car in a parking lot [3, 4]. The maximum margin planning problem over a space of policies is addressed in [2]. Another work models the cooperative navigation behavior of humans by considering both the discrete navigation decisions and the natural variance of human trajectories [6]. Another framework for dealing with socially adaptive path planning in dynamic environments in the case of social or assistive robots is proposed in [7]. Our work builds upon these techniques to learn a reward function that best explains the (optimal) decisions made by the expert in demonstrations.

3. Approach

The goal of this work is to interpret raw data and extract from them semantically meaningful information that a mobile robot can use to navigate efficiently and collusion-free towards the desired destination. By building upon the principle of inverse reinforcement learning, the key idea is to manually guide a mobile robot towards the goal region in various environment settings and feed these example paths to the learning algorithm. Such paths are described by a set of features that explain the environment. We then recover the reward function that explains these decisions made by the expert in demonstrations and is able to mimic this behavior when dealing with unknown navigation scenarios

3.1 From Point Clouds to Navigation Features

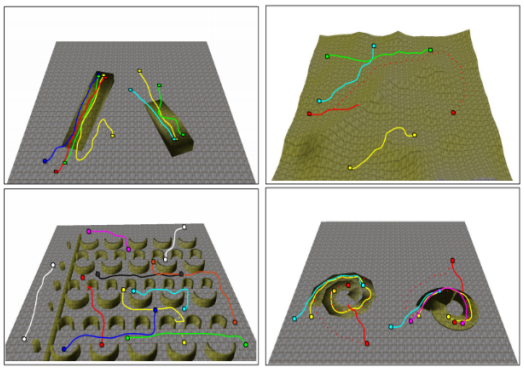
The robot used in our simulations is equipped with a Microsoft Kinect camera, which records point cloud data of the surrounding environment. As defined by Rusu, a point cloud is a set of points$Z_t = \{z_t^i\}_1^n$, where $\{z_t^i\} = (x, y, z)$is a single point lying in the 3D Euclidean space [5]. To have a data representation that is computationally feasible, this work down-samples the point cloud using a voxelized grid method without having a negative influence in extracting suitable features. Next, data irregularities and noisy points are also removed from the dataset. The set of geometric features extracted includes surface curvatures - which measure the degree the object deviates from being flat; surface normals - which are calculated as the vector perpendicular to the tangent plane of the surface at that given point, and point feature histogram descriptors - which encode the neighborhood's geometrical properties using a multi-dimensional histogram of values. This set of features is fed to the learning algorithm

3.2 Inverse Reinforcement Learning for Computing Navigation Actions from Demonstrations

Formally speaking, given a finite state space$S$, a set of k navigation actions $A = \{a_1, a_2, \dots, a_k\}$, transition probabilities $P_{\{s,a\}}$a discount factor α, a partial policy π (which is accessed only through a set of demonstrated trajectories), and an initial state distribution$D$, the objective is to find the set of possible reward functions R, such that π is an optimal policy in the Markov Decision Process$M = (S, A, P_{\{s,a\}}, \alpha, R)$. To learn the appropriate reward weights such that it can be able to generate an efficient planner, this work relies on the Inverse Reinforcement Learning principle. To this end, it is necessary and sufficient for the expected feature counts to match the observed feature counts in the demonstrations. We aim to find the parameters that maximize the likelihood of the observed traces $\theta^* = argmax_\theta \Sigma_{\{\gamma \in \Gamma\}} \log P(\gamma|\theta)$where γdenotes a recorded trajectory.

This problem is addressed using a gradient-based approach, where the gradient for any trajectory γ is the difference between the observed features counts and the expected feature counts. This principle allows to choose navigational behaviors that match feature expectations, while following trajectories imposed by environmental constraints. The gradient maxima is found when the learning behavior performs equivalently to the demonstrated behavior. Given the state space frequencies, the algorithm for computing the gradient takes as input the start and goal state, and a reward feature weight vector from the demonstrations and returns the expected reward feature vector. The algorithm starts by "backing-up" from the goal state and computes the probability distribution associated with each branch along the way. These branches yield local action probabilities which can be further used to estimate state frequencies at each time-step. This method maximizes the probability mimicing demonstrated behavior and applying it to novel scenarios

4. Experimental Results and Discussion



A series of experiments is designed to evaluate the performance of the proposed approach. TurtleBot, a simulated robot, equipped with a Microsoft Kinect camera is required to navigate in rough terrain and multiple environment settings containing numerous obstacles shaped as irregular objects, ramps or spirals. The conducted experiments show that the mobile robot is able to effectively plan its pathand learns a navigation policy from a set of demonstrated trajectories. The planner generalizes over the set of training environments and is able to navigate

collision-free in previously unseen terrain. Future work include extending the range of environment settings and scenarios to make the approach more robust, and enriching the set of geometric features used by the learning algorithm

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COMBINATIONS OF REAL-TIME LABVIEW MODELS WITH PHYSICAL SYSTEMS

Gentian DUME[1], Gëzim KARAPICI[2]
[1]Polytechnic University Tirana, Faculty of Electrical Engineering
gentian.dume@gmail.com
[2]Canadian Institute of Technology, Faculty of Engineering
gëzim.karapici@cit.edu.al

Abstract
Virtual Instruments are becoming indispensable part on daily engineering problems solutions in particular in the area of Automatic Control of Industrial Processes. Due to continuous increasing of performance and flexibility of PC combined by their cost reduction, the virtual instruments are successfully concurring the traditional instruments. In this paper, we present a real-time control system where the controller is a LabVIEW model and the process is an analog model of a real process. The process is considered as a "black-box", while the controller parameters are defined using the HIL (Hardware In the Loop) technique. Experimental results are satisfactory and promising from practical point of view.

Keywords*: virtual instrument, LabVIEW, control, real-time control, Hardware In the Loop*

1. Introduction

Development of the technology rise the opportunities to facilitate the teaching aspect as well as the acquisition of knowledge by students. However, the speed of changing of the technology in various fields of science, creates some problems for academic instititutions, particularly engineering disciplines. This requires a constant updating and extension of teaching materials, which represents the greatest difficulty in engineering fields, where the experimental support is required.

The main problem remains the same: To provide students valuable practice experience, being limited in laboratory equipment and infrastructure. One solution to this problem would be: to make use of techniques based on computers, so that the students interface with the real world. This manner allows further, the sophistication and flexibility, because the main part of the application is created in the computer and so it can be modified without the need for additional physical devices [1], [2].

In the past years, in some engineering courses are implemented personalized, computer-based techniques [3], but it is noticed that they have many limitations. They were not flexible, programming structure not easily understandable by the user, high cost, limitations in the hardware and non-compatible for short and long time. However, with the latest technological developments these problems are almost overcome.

From the teaching point of view, to build the applications in the laboratory, all engineering problems deal with some physical quantities such as potential difference, electric current, temperature, pressure, speed, position, mechanical torque, moisture level etc. We can see these quantities by using a computer coupled with conditioning circuits, data acquisition, transducers and a software. Moreover, these data can be processed, stored and even we can publish them on the Internet. Figure 1 illustrates an experimental test bed supported by the computer in real-time.

From the figure below, it can be seen that the part of this system, which can be changed easily, is the application created for the purpose. It is understood that the choose of the software is very important, because except the engineering discipline where the students deals with computing techniques and can be simple regardless of software used, for the other disciplines this presents the greatest difficulty.

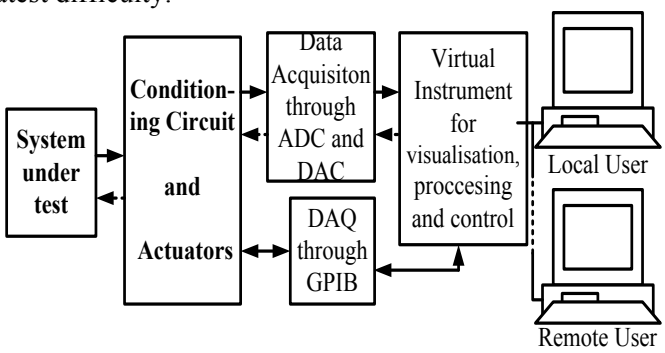


Fig.1. Block diagram of a laboratory test-bed based on PC

2. The right software?

With the development in science and technology, the multimedia tools are being used more and more. However in terms of engineering disciplines, which required that the student must acquire practical parts of the technology and to develop his experience, the perception is that these tools are not suitable.

However with the latest developments on the market there are a significant number of computer softwares that can simulate, design and implement the control system for the industrial solutions. They can also make scientific visualization reported in [3].

To choose the right software that will implement the virtual instrumentation in engineering education it is recommended to meet these criteria [4]:

- Modularity, enables testing the modules individually and a quick development of the applications.
- Multi-platform portability ,gives to the designers the opportunity to work with separate individual parts and compile them together on the same platform.

- Compliance with existing code, allows the combination with the previous application, moreover with the previous version of the software.
- Compliance with the hardware, is the ability to get data from the hardware interface of different types.
- Extended libraries, enabling designers to build low level routines library and linking later in a high-level systems.
- Advanced programming features, to optimize the product design and determine bugs on the code.
- Executable, to avoid alterations, to hide the code or to create independent applications.
- Performance, To ensure that the final product has the required performance.
- Intuitive graphical user interface, enables the users that with a glance to understand what to do.
- Multimedia capabilities for further developments.

The best software must have all the features listed above. In fact, commercial software packages in help of engineering courses that are on the market, are too complex and do not provide all the functions required for certain tasks. Some of them are too expensive.

In this work we chose LabVIEW as the most comprehensive and versatile tool for solving a very large number of engineering problems. It is a graphical programming language, which gives engineers and scientists the possibility, to develop specific virtual instruments, without the need to have in-depth knowledge of programming languages. This tool is not only flexible and modular, but also economic. Moreover, this software (LabVIEW) meets almost all of the above criteria. In the paragraph below will make a summary of the possibilities provided by this program.

3. Introduction to LabVIEW

LabVIEW is the acronym of the words: **L**aboratory **V**irtual **I**nstrument **E**ngineering **W**orkbench. It is a programming language in which programs are created using graphical symbols (functional nodes are connected through wires, in which the information flows). It differs from traditional programming languages like C, C ++, Java, in which the program is written in text form.

However, LabVIEW is more than a programming language. It is an interactive program especially for scientists and engineers who must program because they need it in the work they do. The LabVIEW programming environment is compatible with Windows operating systems, Mac OS X and Linux. LabVIEW can create programs that run on platforms such as Microsoft Pocket PC, Microsoft Windows CE, Palm OS and a variety of special platforms like FPGA (Field Programmable Gate Arrays), DSP (Digital Signal Processors), etc.

Many users call this graphical programming language (LabVIEW), the "G-code" (graphics).

With LabVIEW it's very simple to program because its graphical interface. It is also ideal for simulations, ideas presentation, to program or even just to give basic concepts of programming.
LabVIEW has a large library of functions and subroutines, to help us in many tasks during programming, thus avoiding problems arising in conventional programming languages. It also contains library of codes for specific applications, for collecting data (DAQ), for GPIB (General Purpose Interface Bus), for controlling the instruments with the serial communication,data analysis, data presentation, data storage and connecting through internet
Built-in LabVIEW programs can be transferred from one platform to another. For example, we can build a program on a machine that uses Windows operating system and then load and execute it the Macintosh, for most applications without changing anything.
Nowadays it is also a fact that applications created in LabVIEW are improving operations in every field of industry, any form of process control, biology, farming, psychology, chemistry, physics, teaching and many other fields [5].
Programs created with LabVIEW take less time to be completed than with other software, due to its graphical nature. It is becoming an industrial standard for creating new devices prototype [6].

4. Control design

In order to control the desired output of a real system, one must have its mathematical model. Then the stability analysis is done to see if the real system, represented with the mathematical model, is stable or not and further we check if the output of the system (without controller) remain inside desired limits and performance, when we change with known signals the input of the system (usually the set-point value).
In most of the cases the system may be stable, but rarely it remains inside limits in terms of desired settling time and steady-state error. So, a controller must be inserted in the forward path and its coefficients must be determined in order that the closed loop control system forces the output of the real system to remain inside limits we wanted. The classical block diagram of the closed loop control system is shown on figure 2.

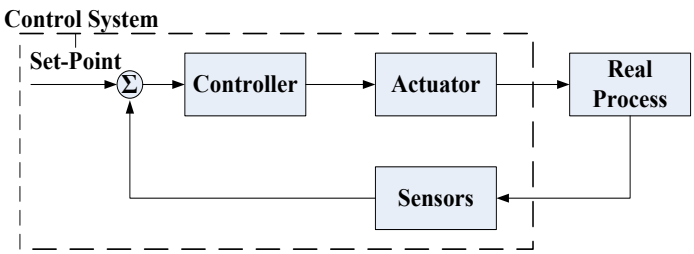


Fig. 2. Closed loop Control System

Sometimes it is difficult to have all the parameters in explicit form for the model. In these cases it is better to identify the transfer function (mathematical model) for desired input-output and then designing the controller, to maintain the system output inside required limits and performance [7].
Another way of designing the controller is to identify first the mathematical model of the real process by seeing the process as a black-box, because this approach has the advantage to estimate different model structures. The appropriate mathematical model then is chosen by a comparison of the models identified [8].
Summarizing, it can be seen that in different methods we design the controller, we almost rely on the mathematical model of the real process. But what if the real process is difficult to be modeled mathematically? Of course we can say:- Let place it in the closed loop and try directly to figure out what is the appropriate controller. For example, we can place a PID controller and try to find the acceptable coefficients using any known technique (Ziegler-Nichols empiric tuning rule) [9].
In the next paragraph it is shown how to use the LabVIEW capabilities to interact with the real world, by creating an application to find in real-time the coefficients of a PID controller, connecting the virtual instrument to a real physical model of the real process through a multifunctional data acquisition card (DAQ), by using the Ziegler-Nichols empiric tuning rule.

5. LabVIEW application for system control design using the HIL technique

Since it is needed to test the application accuracy, firstly we need to build a physical model of the real-process. The schematic of the circuit built-on Operational Amplifier is shown on figure 3.

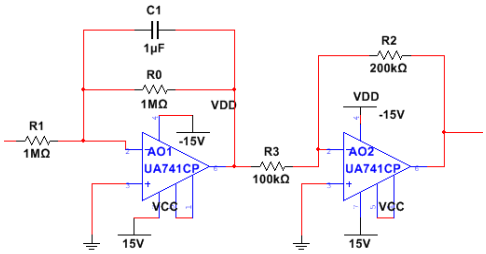
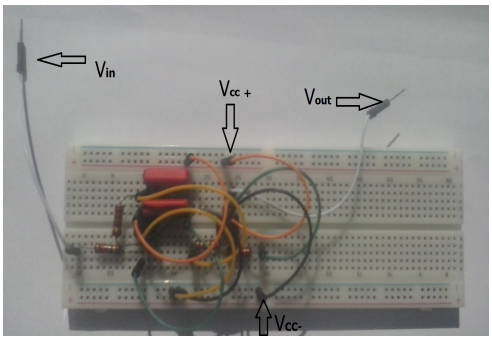


Fig. 3. Electric diagram of the physical model of the real process**.**

Doing some calculations we can find the mathematical model (transfer function) of the circuit. It is shown on expression (1)

$$G(s) = -\frac{R_0}{R_1}\frac{1}{R_0C_1s+1}\left(-\frac{R_2}{R_3}\right) = \frac{2}{s+1} \tag{1}$$

It is a first order model, but we don't want to follow the classic way of designing the controller. It is needed only for testing the Virtual Instrument during the test with known theoretical results.Then we build the circuit, but of course its electronic elements can't be precisely to those shown in fig. 3.The circuit is shown in figure 4, and the schematics with real values measured one by one with calibrated high accuracy instruments is shown on figure 5.



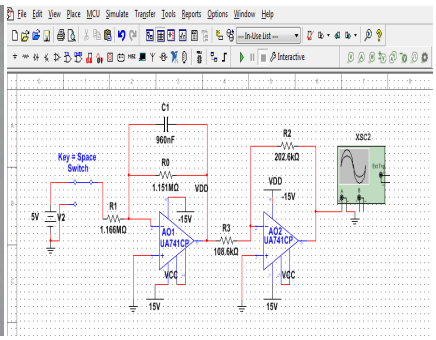


Fig.4. Physical model of the real process with real values.

Fig.5. Electric diagram of the circuit built-on electronic elements.

The circuit of fig. 4 was connected to the application created in LabVIEW for controller design purpose through the NI DAQ 6008. Figure 6 shows the experiment of finding the PID controller coefficients by interaction in real-time between LabVIEW model with the physical model.

The PID controller coefficients are found using the Ziegler-Nichols empiric tuning rule. First, in the application we set the overshoot, settling time, steady-state error, etc. Then we changed the proportional coefficient, integral constant and derivative constant till we got the step response desired as shown in figure 7.

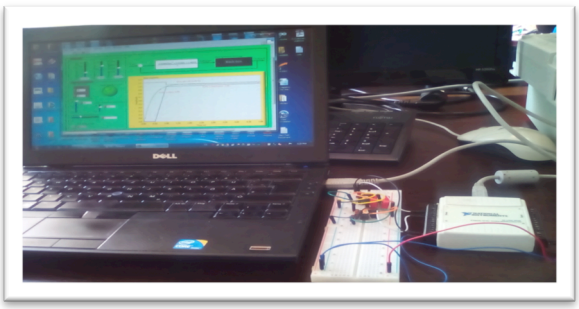


Fig. 6.Testing the PID controller experiment

The application plot the configured analog input 1 (AI1) of the NI DAQ 6008 (connected to the output Vout of the circuit) in time domain and in the same time it changes in step the voltage in the configured analog output 0 (AO0) of the same DAQ which is connected to the input of Vin of the same circuit.

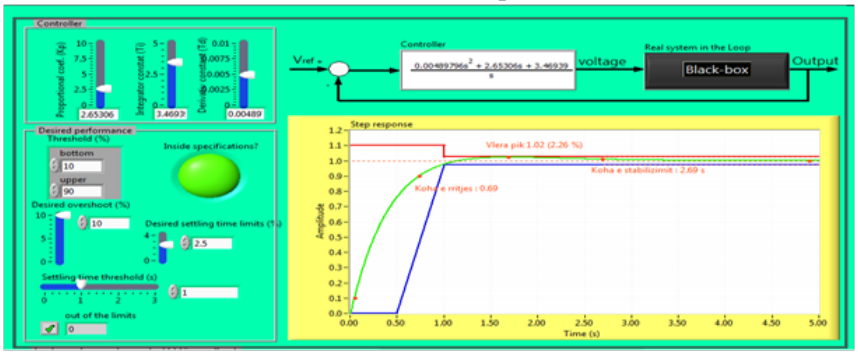


Fig. 7 Virtual Instrument for PID controller design using HIL technique

As it can be seen, controller coefficients are: Cp=2,65; TI=3,47 sec; TD=0,049 sec; and the PID controller model is shown in the forward path of the block diagram in real-time (fig.7).

6. Conclusion

In this paper we showed that LabVIEW is the best choice to use virtual instrumentation to aim engineering education, because it met the criteria cited above. This program is the most comprehensive and versatile tool for solving a very large number of engineering problems.Being a graphical programming language, LabVIEW enables engineers and scientists to develop the personal virtual instrument, without the need to have in-depth knowledge of programming languages.The application of PID controller design (Fig. 7) is universal. So, if we would like to design any type of controller in real-time, for a large number of physical models, we only need to put the controller model in the application graphical code and following the recommended procedure for that controller design.

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SECURE BANKİNG TRANSACTİONS THROUGH A HARDWARE - SOFTWARE COMBİNED SOLUTİON

T.Yaich and H. Hammam
EMAT Lab,Université de Moncton, NB, E1A3E9,Canada
Corresponding email: ety3537@umoncton.ca

Abstract:
Purpose: The credit card frauds increase with the use of online banking, presents a serious challenge. It requires intelligent solutions based on research. Method: It consists in 1) Using customized hardware (portable device) for on-line transactions (and private data exchanges in general). 2) Making the software more secure by rendering the password time-dependent. The device is provided by the bank, which saves the list of passwords for one year in the memory of the device. The bank keeps a copy of this list. Whenever a requested of transaction arrives to the bank, the latter compares the arriving password to the corresponding one in the database of the bank. Of course, we can add encryption stages in the process. An addition level of security could be performed. This stage consists in biometric authentication by using the finger prints for example. By research we designed a combined hardware-software system. Results: We designed a research-based demonstrator and carried out successful experiments in research laboratory. Conclusion: It turns out that the hardware/software solution turned out to be insurmountable. In perspectives, we intend to extend the hardware-software combined solution to other applications of security.

Introduction

The use of credit and debit cards is nowadays an integral part of the life in modern societies. At the time where more than 40% of small Canadian businesses do not possess Web sites, Canadians were among the countries with largest rate of use of debit cards per capita in the world (56%). This rate situation is obviously higher today. According to the Canadian Internet Registration Authority (CIRA), 42% of people buy clothes online and 40% of travelers buy their tickets on-line. Books, music products, computers, accessories, office supplies, … are also often bought on-line. 95% of Canadian small business reported having made online purchases. Businesses do travel booking and purchase tickets on-line (61%). On-line governmental services are incessantly increasing [1].

With the growth of online commerce, administration and services, there is also proportional increase of fraud especially when executing monetary transactions. There is plenty of ways to secure banking data which are the most sensitive data for customers. Among others, we enumerate data encryption using keys or certificates are commonly used. While the wide use of on-line monetary transactions is an economic advantage, it presents a source of vulnerability.

The aim is to develop, by research, a system improving security, by means of a combined hardware/software solution.

Related work

In the domain of security of data transfer there are many solutions which may be divided into two main categories: software based security and hardware based security. In literature, researchers are focused on security protocols and/or encryption software to reach higher levels of security. As they presented an efficient application well enough to run on current smart phone devices [2], and easily extensible for payment and banking functionality. This system relies on QR code to ensure security with the DAB machine, also a notion of signature to secure message with servers and it uses password and fingerprint. The problem with this simplification method which is complicated in the real case, and they use the internet to exchange data with a server. However E. Muniel and others proposed the MICRO PKI (micro public key infrastructure) method [3]where only the base station authenticated by the nodes using a public key which also used to decrypt some data sent by nodes, instead of the base station uses private keys. Instead of one, the evolutionary techniques [4] is based on two keys, the gene key and the fragment key. The genetic key is generated by the evolutionary algorithm, and its size is very important. The fragment key is generated by the fragmentation algorithm. Its application improves the security of the system against attacks based on the study of frequencies. These keys are session keys and randomly generated by the system. Besides, M.Haifeng and others used the hashing technique on the binary tree using a single key [5]. The results of the performance analysis and the simulation showed that the method they proposed has better efficiency (improvement of 2 to 12%) than the hashing. It can detect most of the behaviors of physical attack. Finally, K. Raj et al. applied a new encryption method on the MANEL network [6]. It is about an ad hoc network in which mobile nodes cooperatively route traffic to nodes that are beyond their direct range. The technique involves encrypting data using a symmetric cryptographic technique and also generating the digital signature of the data using the asymmetric cryptographic technique from the hashing of the data. The encrypted data is transmitted by the network to the destination where the received data and the digital signature of the data are validated using symmetrical and asymmetric cryptography.

Proposed method

Our method is based on the combination of software and hardware techniques. The hardware part consists in implementing a hardware device containing a list of passwords, a copy of which is preserved by the bank. Each password is valid for only one transaction. The passwords are entered in an off-line mode so that hacking is impossible. On top of that, comes another level of security, symmetric encryption is used.Our idea is to use the password to secure

transactions without using any information from the internet or any service that can be exploited by hackers. To customize the use of the hardware device, containing the list of passwords, we add a biometric reader, such as a fingerprint reader.

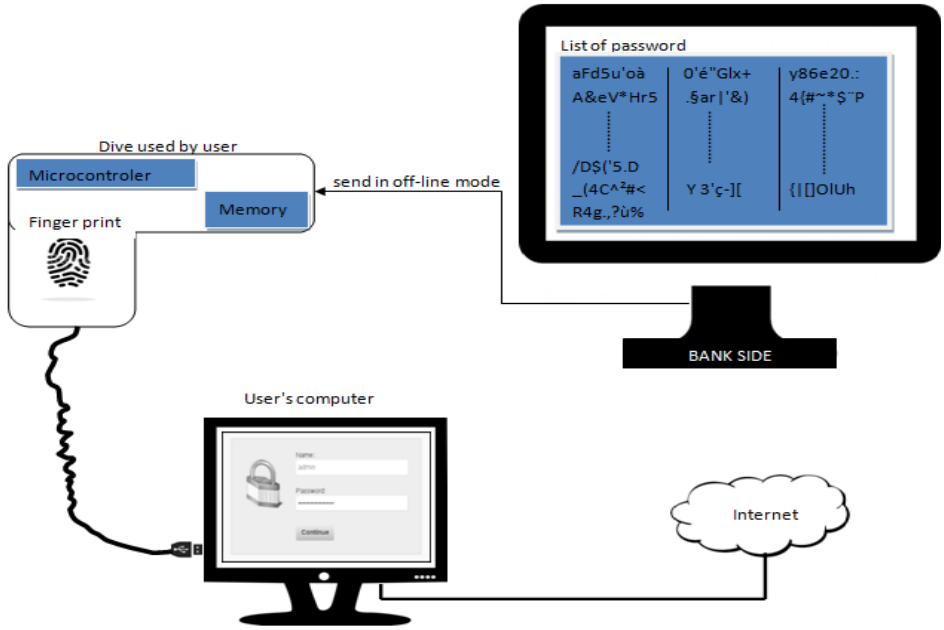

Figure 9: Illustration of the proposed solution

Results and discussion:

Banking phase:

An interface has been designed so that the banker can write all the passwords in offline mode. These will be saved in the key. A code has been designed and implemented in the interface to ensure serial communication (USB port) between the PC and the key.

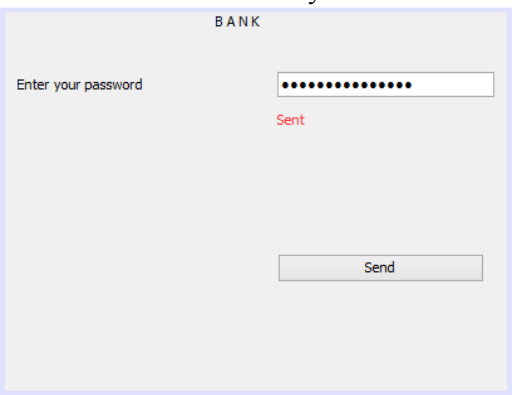

Figure 10: Banker interface

Customer phase:
Once this step is completed, a symmetric encryption system is then put in place. An online payment interface has been also designed. To test the system we enterdata by means of the keyboard, and the system will communicate with the key by using an USB port to have the passwords that will be used as encryption keys. Then we see the results on a display, where we can see that each letter / character is presented by an encrypted message that is unique.

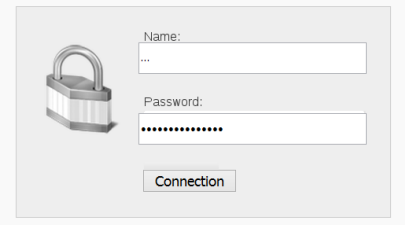

Figure 11 :Client connection interface

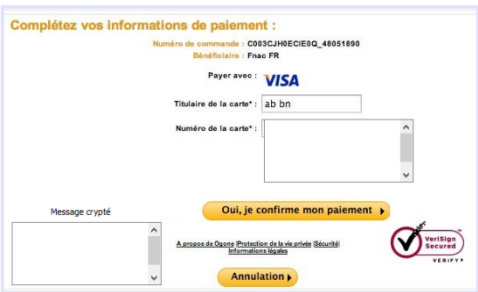

Figure 12:Payment interface

Our system is characterized by simplicity. It is easy to implement in an already existing system. It also provides all security services.

Conclusion

Our main contribution consists in advancing a combined hardware/software solution to improve security of on-line data transfer. Special attention has been given to monetary transactions. Moreover, we proposed an additional level of security by using symmetric encryption. The security level is further enhanced by using fingerprint authentication. The system has also the advantage to be portable.

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DENİAL OF SERVİCE
Explaining and testing DOS on a server.

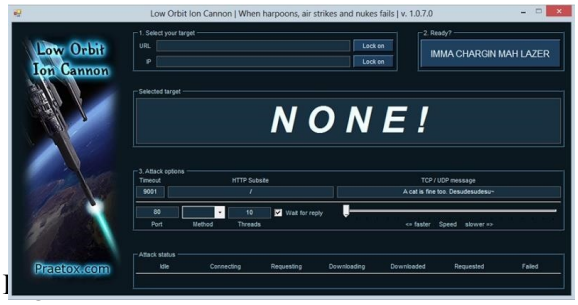
Fatmir Prenga , Daniel Muca
Student, Faculty of InforamtionTechnology-UAMD
Fatmirprenga7@gmail.com, Daniunion123@gmail.com, support@technospaces.com

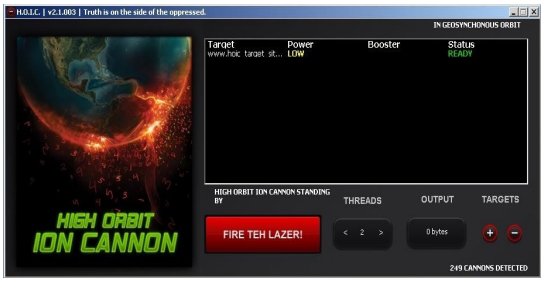
Abstract
Using low-tech brute forces to overflow get/post requests at servers to cause failure. The main reason is to get a certain server to fail trying to respond to all of the request because the large number of trading packets. The whole project is focused on bringing down a server with nothing more than its own network.
There are a lot of methods to proceed with this project, including here "LOIC, HOIC, XOIC, HULK, and many more. We will be using 4 of them at the same time to increase the efficiency of the attack. Also, we will use four different computers with high speed internet and latest switching and routing devices. Our focus is using less time, hard drive space, and less resources to bring down a server.
We attacked using LOIC, HOIC, XOIC and HULK, and we got the server on rundown. When we tried to access it, it results as unavailable or temporarily down.
After two weeks of studying "dos", "ddos", "ddos software and tools", we arrived at bringing a server down, included with that we also understood what capacity, the server that we attacked had.

Keywords: *DOS, DDoS, LOIC, HOIC, HULK, security.*

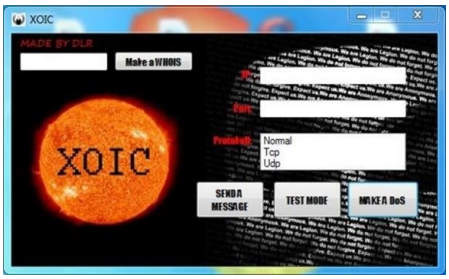
Introduction
DOS is the form of exploiting securities and attack them, but harmlessly because you can't get any data, but efficiently because you can discover network flaws or technical incapacities that might help fix security problems. Our path that we are pursuing is "cyber security engineering" , which is also the main reason why we went through with this project idea. We are interested in security and protecting the network from unwanted access.

-Used resources

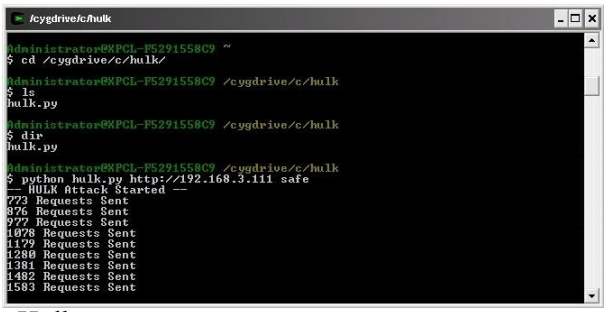




Low Orbit Ion Cannon



Exploit Orbit Ion Cannon



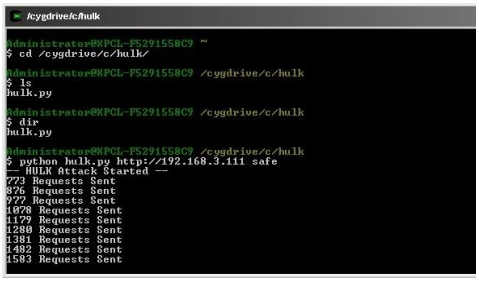
Hulk

Our project is security oriented.

The whole project is network security related. The servers we have for this dos attack are the latest and one of their internet speed goes up to 64GBPS. Still we managed we distribute an attack for a long period of time to bring that down too.

Analysis and developing.

We divided the plan in steps. We ran the analysis. We made sure we had every statistic, every requirement needed so we could successfully finish this. Then we developed a clean concept on what this project is going to do, how we were going to handle errors during implementing, and what were we going to do afterwards. So we developed our own Linux terminal bash based scripts and algorithm in Python, also we used Dos tools like Loic etc.



Software-s that we used are : LOIC, HOIC, XOIC, and HULK.
Computers that ran these software-s and tools are up to date with requirements on hardware and operating systems.

Conclusion

We managed to make the web server fail after 12 hours of persistent attacking, and we managed to make the file server fail after only 1 hour of persistent attacking.

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CHOOSING THE BEST VARIANT OF CLASSIFICATION ALGORITHMS IN DATA MINING

Edjola NAKA, Senada BUSHATI, Emiliano MANKOLLI, Anxhela GJEÇKA
Department of Computer Science, Faculty of Information Technology, "Alexander Moisiu" University ofDurrës
E-mail: edjolanaka@uamd.edu.al

Abstract
Classification is one of the important and most used techniques in data mining. The classification model map a set of input attributes on a nominal attribute class. The aim of this paper is to compare some of the most important algorithms of classification for estimatingwhich classifier provides more accurate predictions. All algorithms are going to be tested with a real dataset in data mining softwareWeka. We use criteria like accuracy, speed of algorithm, confusion matrix, ROC Areato select the algorithm that classify better the data.

Keywords:*classification, algorithm, classifier, estimation, data set*

1. Introduction

One data mining technique is classification, a supervised method and a form of data analysis where the data are composed of several numerical attributes and an attribute class which is nominal. The model of classification will predict new classes if we know all the attributes values. In this paper we analyze some of the mostused classifying algorithms to testtheir characteristics based on realdata.Classification techniques include a set of methods where some of them are probabilistic methods, instance-based learning methods, support vector machine and artificial neural network [1].

2. Materials and Methods

Classification is a two steps process that are learning step and the classification step [2]. In the learning step, a classification model is built that learns from the training set which is part of the data set and we know the values of the attribute class. In the classification step, the accuracy of the classifier will be evaluated on a given test set whichalso are records in the data set, but are not included in the training set (fig 1).

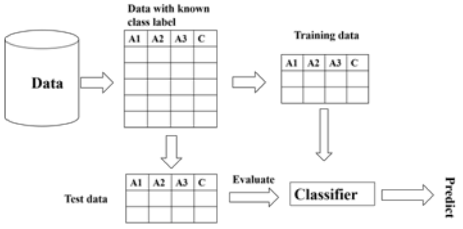

Fig.1: Classification process

An option for dividing the dataset is the utilization of *k*-fold cross-validation [3] where the original data are partitioned into *k* independentand similar subsets.The dataset that we have considered contains data about the clicks from advertisement of an offer in several different websites for 528 hours.The attributes are: total number of clicks, number of clicks for the offer,

conversion,revenue, cost, profit. A new attribute is created, called "Profit from Offer",which is nominal and takes three values: low, medium and high.The first method of classification is instance-based learning and a representative algorithm is:k-nearest neighbor[1,2,3] where k tells the number of neighbors.From probabilistic methods,Bayesian classifier[2,6] isan important representative.Support vector machines (SVM)[1,2]is another method that search for the linear optimalseparating hyper plane(decision boundary) separating the tuples of one class from another.Back propagation is a neural network learning algorithm[2,3]. Each algorithm is compared with estimators [3,4] that are also present in Weka. Some estimators areconfusion matrix, accuracy, kappa statistics, Mean Absolute Error (MAE),AUC area.Weka is an open source software for data mining developed in the University of Waikato, New Zealand which has diversity algorithms for classification technique [4,5].
The parameters of the computer in which are executed the algorithm are: RAM DDR 3 1666Mhz 6GB, 64 bit/sec.

3. Results and discussion

The algorithm from Weka are: Naïve Bayes classifier, MultilayerPerceptron (backpropagation algorithm), IBk (k nearest neighbor classifier), andSMO(Support Vector Machine). 10-fold cross validation is applied andresults are summarized in table 1.

Algorithm/ Estimation	Naïve Bayes	IBk (k=2)	SMO	Multilayer Perceptron
Time	0.01 sec	0 sec	0.03 sec	0.39 sec
Kappa Stat	0.9106	0.948	0.9078	0.9827
Accuracy	94.12%	96.59%	93.93%	98.86%
MAE	0.0438	0.0272	0.2357	0.0139
ROC Area	0.985	0.984	0.963	1.000

Table 1: The results of algorithms in Weka

From the results we can see that time for building the model is lower for IBkalgorithm while MultiLayerPerceptron request more time and has the smallest MAE. ROC area has the upper value for the back propagationalgorithm. Algorithms SMO and Naïve Bayes give approximate values for accuracy and kappa statisticsbut they give different results for the others. Also we have illustrated the confusion matrix for each algorithm (fig. 2) where the values in the main diagonal reflects the correct predictions and the other values reflect the incorrect values.

IBk

```
=== Confusion Matrix ===

   a   b   c   <-- classified as
 155   3   0 |   a = LOW
   4 213   2 |   b = MEDIUM
   0   9 142 |   c = HIGH
```

Naive Bayes

```
=== Confusion Matrix ===

   a   b   c   <-- classified as
 151   7   0 |   a = LOW
   2 204  13 |   b = MEDIUM
   0   9 142 |   c = HIGH
```

MultiLayer Perceptron

```
=== Confusion Matrix ===

   a   b   c   <-- classified as
 155   3   0 |   a = LOW
   3 216   0 |   b = MEDIUM
   0   0 151 |   c = HIGH
```

SMO

```
=== Confusion Matrix ===

   a   b   c   <-- classified as
 151   7   0 |   a = LOW
  10 202   7 |   b = MEDIUM
   0   8 143 |   c = HIGH
```

Fig.2: Confusion matrix for each algorithm

4. Conclusion

Technique of classification is an important tool because it can help the business to give solutions for their problems. Web analytics is a field that has evolved very much with the increasing of using the internet services. Our aim was to analyze the data with the adequate methods of data mining. Classification algorithms seem to be useful because they help to build and to test a classifier and they givesatisfying results.

From the algorithms we tested, neural networks seem to be the most appropriate classifier because except the time, the other estimators are within the permitted boundary. In the future this model can be used forpredicting the class value for new instances from advertisementin the internet. The lower number of rowscan affect the accuracy of the model and we have to consider large datasets.

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EFFICIENT CALCULATION OF TRIGONOMETRIC FUNCTIONS USING CORDIC ALGORITHM

Ajakida Eski
[1]*(Ph.D candidate, Department of Electrotechnics,Politechnic University of Tirana,)*
ajakidaeski@yahoo.com

Abstract
The real -time measurement performance is very dependent on digital signal processing. In digital signal processing, elementary function operations, such as trigonometric function are performed. Although, the enormous improvements in computing technology have occurred, it is still important to reduce complicated operations to simple one. How to make these elementary function operations more fast and efficient has become an important theory. In this paper, we have presented the implementation of Coordinate Rotation Digital Computer (CORDIC) algorithm in a ARM Cortex MO, PSoC4, CY8C4245AXI-483 architecture to calculate the sine and cosine functions. The CORDIC algorithm provides an efficient method of computing trigonometric functions by rotating a vector through some angle, specified by its coordinates. This rotation is obtained by performing a number of micro rotations through elementary rotation angles, into which the total rotation angle has been decomposed. By comparison between CORDIC algorithm and math.h which is a standard header file of the C language, we conclude that CORDIC algorithm is 2.3 times faster and a architecture of 32 bits CORDIC algorithm can successfully be applicable to the real time operation.

Keywords:*CORDIC, speed, trigonometric function,Vector Rotation*

1. Introduction

The digital real-time measurement performance is very dependent on digital signal processing in which the sine and cosine function evaluations have been used. Therefore, it is an important problem to get the value of sine and cosine functions of high precision, smaller area and faster. To get the values of sine or cosine, the most common methods [1] are looking up table, polynomial approximation,evaluation of Taylor series. Looking up table gets the values directly, but it has low precision and sometimes it will exceed the resource of FPGA. Calculating the values in polynomial approximation needs a lot of areas and many polynomials, hence the whole system will be complicated. The processing can be accelerated by using CORDIC algorithm, invented by Jack Volder in the late 1950s. The CORDIC method is a recursive algorithm that reduces the problem of computing apparently complicated functions, such as trigonometric functions, to a succession of simple operations. Specifically, these simple operations are shifting and adding. By varying a few simple parameters, CORDIC algorithm [2] could be used as a single algorithm for unified implementation of a wide range of elementary transcendental functions involving logarithms, exponentials, and square. However, in spite of the age of

the method, it is still important. The method is one of those great ideas that is able to survive despite technological changes due to the simplicity and efficient low-cost hardware implementation.

2. CORDIC Algorithm

The conventional CORDIC is a high sequential algorithm in which the output values of the present iteration act as the input to the next iteration. The theory of CORDIC computation is to decompose the desired rotation angle into the weighted sum of a set of predefined elementary rotation angles, each of which can be accomplished with simple shift-add operation for a desired rotational angle θ. It is commonly used when no hardware multiplier is available (e.g., simple microcontrollers and FPGAs) as the only operations it requires are addition, subtraction, bit shift and table lookup. The CORDIC algorithm can be described as follows:

$$X_{i+1} = X_i - s_i Y_i \cdot (2^{-i}) Y_{i+1} = Y_i + s_i X_i \cdot (2^{-i})$$
$$Z_{i+1} = Z_i - s_i \cdot arctan(2^{-i}) s_i = \pm 1$$

3. Results and discussion

In this paper, we have presented the implementation of the CORDIC algorithm in an ARM Cortex MO, PSoC4, CY8C4245AXI-483 architecture.Are used 32 iterations to calculate the sine and cosine values in the fixed-point version with the CORDIC algorithm. Using 32 iterations, values have a high precision and the increasing step is 1°. It verified by measuring the accuracy of the CORDIC algorithm with the math.h processing result of sine and cosine which is a standard header file of the C language.Table 1 shows the results of the implementation of the CORDIC algorithm and math.h on the device.

Table 1

Angle (degree)	Sine	
	CORDIC	Math'h
10	0.1736481800	0.1736481800
30	0.5000000000	0.5000000000
60	0.8660254100	0.8660254000
90	1.0000000000	1.0000000000

Table 2

Methode	Time execution
CORDIC	0.023656 sec
Taylor	0.056059 sec

4. Conclusion

Using a method for rapid evaluation of sine and cosines, become more and more serious when performing real-time digital signal processing.A detailed comparison between the CORDIC algorithm and math.h for the calculation of the sine and cosine functions have been evaluated. By verification of results, was concluded that there is a accuracy equivalent of CORDIC algorithm and math.h. Through Table 2 we prove that, the CORDIC algorithm can calculate 2.3 times faster than math.h algorithm. It is clear that a architecture of 32 bits CORDIC algorithm can successfully be applicable to the real time operation.

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NETWORK INCREASED AIRSPACE CAPACITY – WATEN

Ilir Mehmedi[1], Muhamed Krasniqi [2]
[1] College of applied technical science TEMPULLI, Pristine, Kosovo, *Phd*
ilir.mehmedi@tempulli.org
[2] College of applied technical science TEMPULLI, Pristine, Kosovo, *Phd candidate*
meti@tempulli.org

Abstract
This work describes, explains and proves necessity for stabile global air track network World Air Track Elastic Network – WATEN to accommodate future air traffic and enable full automation in process of control and separation of civil aircraft during en route phase of flight under instrument flight rules - IFR.
According to long term forecasts global air traffic will rise in average of 5% per year threatening to overload the airspace and limit future development of civil air transport. New solutions for improving the safety of the flight by automation and **increasing airspace capacity** through more efficient airspace use will enable continuous increase of number of flights. More then 70% of incidents and accidents in civil aviation are caused by human factor therefore a strong need exists for higher level of automation in civil air transport especially in process of control and separation of civil aircraft that are flying under instrument flight rules. Automated systems will separate traffic by using appropriate equipment, software and procedures. The first phase will exclude air traffic controllers' and their active control of traffic and in the next phase pilots will be excluded too. One of basic conditions for full automation in process of control and separation of air traffic is setting of permanent global network of air tracks named: **World Air Track Elastic Network – WATEN** as a physical base for aircraft systematic movement and matrix for separation procedures. It will be established as permanent but with physical and commercial elasticity and based on direct tracks that are part of earth's great circles connecting the most important destinations in the World as a **Strait Line Network**. Other destinations will be included in **Secondary Network**. Aircraft using this network, Global Navigation Systems and **WATEN MODE** equipment on board of aircraft will have possibility to separate themselves from the other aircraft in same or opposite direction of flight as well as to cross the track of other aircraft in horizontal or vertical plane without external help. Lack of airspace capacity will additionally stimulate a need for completely new approach to aircraft separation. **Group flight**, which is now reserved for other types of flight, will become legal part of regular procedure for commercial aircraft.
Automatically separated traffic will enable for higher level of safety, reduction of number of occurrences, **greater capacity of the airspace** and more stabile flow of civil air traffic.
Keywords: network, airspace, safety, separation, aircraft

I. **Introduction**

Airspace capacity relevant to this work is greatly dependent on such airspace organization conditioned by needs and influences of the airspace users.
According to the users' demands, on macro plan, the airspace organization shall be done in a way to satisfy, to the greatest extent possible, users' global needs and in the same time adjusting the portions of airspace to the local needs of the Member States. The needs to be satisfied are generally set to the possibilities to finance ATM() system of a Member State or group of Member States, if the function is united at functional block, FABA() level or joint services and to assist the financing of regulatory and supervisory function of the Member States.
The initial losses of capacity are occurred during the global planning due to the fact that all portions of the airspace are without homogenized regulations, technical equipment and procedure development, so the capacity of a portion of the global network may be expressed through the capacity of its weakest part. This is the reason for homogenizing of the airspace characteristics of the specified elements.
In certain States the developed regulation has enabled certain parts of the commercial aviation to be relaxed from unnecessary costs by applying certain savings in respect of manpower and equipment according to the law. Examples for this may be found in more intensive use of electronic self-serving of the passengers (computer reservations system, e–booking, remote e–banking, e–check–in etc.).

II. **Eurocontrol technical development**

Technical development of control system and monitoring of the air transport have cut the costs in respect of manpower. Modern communication systems and aviation supervision have enabled the possibility to organize the civil and military air traffic controls and monitoring service in centers covering more and more territories. Sophisticated regional centers so called functional airspace blocks will follow and control air transport in some joined Member States only from one center thus ceasing the need for organization of smaller area control centers in each country, and in some more than one center there is only a tendency to unite in future air traffic controls of all European air transport from one center EUROCONTROL [(1)].
High level of procedure development enables the traffic operations, at less important airports, to carry out and without presence of air traffic control authority. Such procedures are based on principles of airspace classification according to the criterion on various needs for different types of air services operation, from which two of them are basic, that is, visual flight rules and instrument flight rules; for carrying out the supervision/control of the air services operation according o the needs of users. Sophistication of aviation

[(1)] EUROCONTROL – The European Organization for the Safety of Air Navigation

(approach and departure, as well as missed approach) procedures has achieved such high level enabling the commercial flights operated with commercial transport aircraft for carriage at medium distance to be carried out at airports without air traffic controls.

Member States are with various social system/order, great differences in respect of the state administration organization and efficiency, differences regarding the aviation practices and infrastructure development which directly affect on the differences of capacity of the respective airspaces. Negative influence on capacitance results from the elements such as territorial aspect of certain Member State (the ratio of a dimension of state territory or a portion thereof may be 10 : 1 or worse as the case is with Chile), in which a part of airway network has been arranged to its character aiming to set up the most frequent destination along its longest dimensions thus enabling a successful commercial effect and at the same time reducing the unit rate (unit rate is a right of every country to establish, through the cooperation with the neighboring countries and international organization and aviation industry associations on the base of a unique mathematical coefficient, the base for calculation of air traffic services charges on the territory and airspace for which the respective air traffic control is in charge). Due to the various methodologies used for calculation of coefficients and differences in applying stimulating and disincentive tariffs regarding the services charge are occurred which in addition to the influence on the scope and frequency of the air services within the respective country, that is, within the part thereof, determine the commercial efficiency of the neighboring countries even of physically detached countries which consecutively due to the deviation of the traffic by the change of the charge collection structure in certain countries may increase the served traffic or decrease it, and in extreme cases may dense the airspace or block the air traffic flow.

III. **Political and economical factor**

In certain cases the political and commercial factors are contradicted in certain neighboring members (there are examples of such contradictions of interests even in members which are not neighboring, but the consequences of intervention on network portions may set them on contrary positions because such interests of different members are complementary, that is, there is no possibility to accomplish all of them in the scope, but they form constant value and they may only share such constant value in various ratios. Direction network which would be set only according to the global indicators criteria would create different political and commercial effects to various members. Such a different would be defended by common global interest reconciling respective interests unlike local network development which could not avoid local influence, and thus it may not be led to the common overall benefit criteria. By comparison of possible and realized routes commercial losses caused by political reasons may be illustrated in Figure 1.

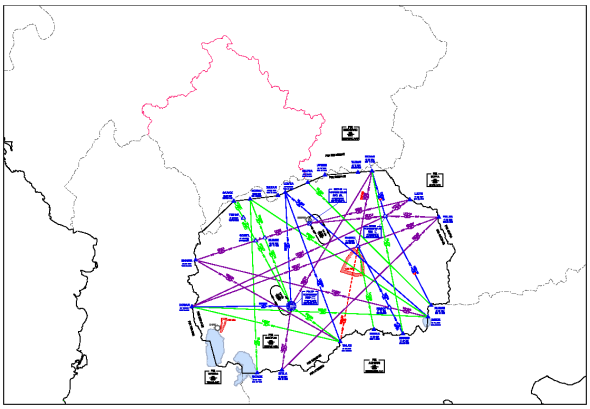

Fig.1 Image of Macedonia and Kosovo border with routes used by aircraft taking-off and landing at airport in Pristine.

A sufficient number of ports/connections at global network are left for local purposes, while the local created networks with described characteristics condition the ports/connections quality, so the difference in allocation of accessibility to global network and main traffic flows could not be compensated. (Global traffic flows are variable due to the influence of a great number of factors, so the position and influence of the members conditioned by the same global criteria will be variable).
For the purpose of conducting the efficient airspace organization and its capacity increase at global community level, it is necessary to establish common principles based on mathematical calculations representing commercial interests of the airspace users (even though they are owned by certain Member States or are part of their economic system, thus, to a certain extent, being representatives of the interest of that members), as well as objective criteria. (objectivity is a subjectivity conditioned by the participation intensity and possibility to influence on decision making process, which should be substituted by a consensual decision by the Member States instead of majority decisions. It could be possible by means of compensation of injured members, because the air transport would achieve an additional value enabling the compensation by increase of capacity and thus the conditions for commercial efficiency).

IV. **Increase airspace capacity**

Meteorological influences on airspace capacity would be to the greatest extent possible compensated by globalization of network routes unlike the existing practice in which the traffic diverting has due to meteorological obstructions been carried out within the borders of one (each respective and often in contrary to or discrepancy to the diversion carrying out in the neighboring Member State, because there is no standardized procedure regarding the united diverting in the region, nor in certain countries with several area control centers, which are not

coordinated in that sense) Member State or at most in cooperation between two Member States at the borderland, while the global network would have the possibility to avoid adverse meteorological conditions by turns which involve a great number of members, regions even continents.

Favorable meteorological conditions are a unit measure of meteorological influences, that is, they are a minimum of such influence enabling the maximum airspace capacity measured by means of such criteria, and this is called basic airspace capacity according to the meteorological influence criteria.

Fully agreed commercial influences are commercial influence unit rate enabling maximum airspace capacity measured by such criteria and it is called basic airspace capacity according to the commercial influence criteria.

Allocation of the airspace capacity allocation and management systems capacity and traffic control are territorially different. The most successful approach can be carried out by means of application of a global strategy. Capacity increase of airspace capacity as well as of operative systems capacity, at local level, within one member or group of members would be nullified by insufficient capacity of the neighboring member or group of members.

Airspace capacity decrease shall increase the loading of control system and air traffic management by increased activity of system resources, first of all, of human resources.

All above mentioned factors and influences make the airspace capacity to have dynamic changes. Dynamic changes shall have backward effect on the basic capacity.

Conventional networks of air markings decrease the total capacity due to the fact that the aircraft are laterally separated by minima routs separation, while in using of elastic marking, the lateral aircraft separation has been achieved by minimum aircraft separation from aircraft. Conventional networks achieve maximum capacity per unit of time thus preventing traffic flow in desired term. This imposed measures which decrease the network load by equal traffic allocation during 24 hours. The elastic networks may, by increased capacity, handle/receive traffic increase during peak periods/terms. In such a way, the commercial effect of the traffic users has been increased, both individual and total.

Having in mind the fact that the airspace capacity is a dynamic value, an available instrument for future capacity prediction is required. Total capacity at conventional networks increase, limited by capacities of network parts. Due to the fact that there is possibility for local influence on great number of the said factors, global control of such network, which satisfies the contradicted demands of local communities, is impossible to be carried out. By establishment of global network such global influence would be eliminated (if the weather influences are not seen as local factor, because they in their nature are not such) and the number of capacity limitation factors would be decreased, as well. Such smaller number of factors would be possible to control at a global level by a single network management system. Smaller number of factors would also be

possible to predict, thus enabling a successful forecast of the future airspace capacity in a tactical, utility, strategic and development sense. Reducing the capacity decrease factors (we are not talking about increase of capacity, because a single capacity is in the same time theoretical maximum capacity that is undisturbed capacity. The task of future investigators is to show airspace capacity in a form of equation/formula which variables would be globally controlled capacity decrease factors).Any activity in the field of airspace management is directly dependent on its capacity. In present state there is a diverse direction of influences that is the capacity depends on airspace management, as well. Such a state will be present until there is local influence on the global capacity, as described above. When such influence ceases to exist, final airspace organization and modeling will be possible such moving it to the maximum capacity according to this criterion that is according to the airspace organization and classification

V. **Automatic support**

Technical requirement for such management is support of semiautomatic and automatic support systems.

Processing technique and software solutions have achieved the required speed and capacity level to support the operation of such systems. Due to the lack of prerequisites till now there has been impossible to set such aims till now. Control and air traffic management semi–automation has to the great extent increased the airspace capacity.

Further improvements may be expected by aircraft optimization and standardization. Present commercial fleet is composed of different aircraft types. It is worth mentioning that special effect on capacity has the difference in speed as well as the difference of the effect of turbulent air movement on aircraft on routes because suspension of reduced vertical separation minimum, RVSM[(2)] may be caused by which the airspace capacity is amounted to 2002 when this program was realized and when by its application the growth of number of flight levels by 6 was achieved thus improving the airspace capacity enabling the increase of flights number in regions where the program was realized and in 2011 during which a return to standard increase of over flights number in Europe of 3 – 4% per year according to the IATA[3] Report (International Aviation Transport Association – IATA), was noted. In addition, the effect of air mass turbulent movements is dangerous for airspace capacity due to the different weights of aircraft engaged in commercial air traffic by which application of method for aircraft separation in turbulence conditions per different categories (ICAO [(4)]Doc 4444, ATM Chapter – Separations) has been

[(2)] RVSM - Reduced Vertical Separation Minimum

[(3)] IATA - International Aviation Transport Association

[(4)] ICAO – International Civil Aviation Organization, Document 4444

caused. Anticipated future work on optimization of commercial aircraft types would, due to the decrease of such risks, effect on increase of airspace capacity.
Eexperientially and use of commercial aircraft led to empirical knowledge (visual at products sold by the two biggest commercial aircraft factories in the world, Airbus and Boeing), that the future development of commercial air fleets will not be based on offers diversity trying to cover greater number of segments demand for aircraft types used at various routes and different load capacity, but by spreading of Hub and Spoke airport network organizations the needs of most airlines would be covered by two basic types for long and regional distances. Having in mind that those two basic aircraft types are not used within the same airspace portions (aircraft engaged in regional operations use lower altitudes unlike those connecting Hubs that is carriages on sub-continental and intercontinental routes) so a greater fleet percent is unified in such segmented airspace portions enabling the increase of capacity.
When total unified of two types covering the needs of Hub and Spoke transporting systems were achieved, the separation applying the unique separation minima and thus homogenized use of the airspace at volumetric unit enabling increase of airspace capacity would be allowed. The subsequent phase would be the decrease of such separation minimum by applying of new safety models by which additional production standards resulting in additional homogenization of transport commercial aviation would be enforced.

VI. **Summary**

Airspace capacity has been defined as capacity of a portion of the airspace handling/serving certain phases of aircraft operations, air transport as well as of military planes operations. Such capacity shall be calculated on the base of aircraft physical characteristics such as airspeed, size and weight and their mutual influence while using the common airspace by required application of vertical separation minima on the ground of above mentioned characteristics as well as legal restrictions and influence of adverse weather conditions.

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NANOTECHNOLOGY ON THE HORIZON

AnilaMehmeti
Canadian Institute of Technology

Purpose
The main purpose of the abstract is to enhance and inform about the big importance of science of nanotechnology.We need to be aware about the impact and the enormous help that this doctrine science has in relationship to other fields, like surgery , medicine and not just those but a several number of other sciences.

Method
The method used here is the analyses of several researches and the consequences derived from implementing new technologies in medicine, surgery by the help of nanotechnology.By all means we can say that nanotechnology represents a revolutionary industry in the forthcoming years.Indeed fresh and new amazing technologies will continue to appear time after time on the horizon.Lots of new products and inputs technologies will improve our life, making it much easier, practical and even amazing.

Results
Nanotechnology is the process of involving crafting machines from individual atoms to build microscopic massively parallel computers that are more powerful than supercomputers today.The big importance of these computers is that they can be programmed to replicate themselves and can be infused in human body to hunt down deadly viruses or cancers and destroy them.The science today allows us to create carbon nanotubes that are 100 times stronger and 100 times lighter than steel.Using various ways to twist the tube manufactures can fashion them into insulators, conductors, or semiconductors.

Conclusions
In late 2001 IBM announced that its scientists had built a computer circuit consisting of a single molecule.Although the circuit could perform only one simple operation (True/false) the development has nevertheless seen a huge progress in the field of computer circuitry because it could eventually lead to the creation of processors that hold up to 10 000 times more transistors in the same amount of space.In 2003 a Woburn Massachusetts, company called Nantero Inc. introduced a nonvolatile random access memory (NRAM) chip that uses single-walled carbon nanotubes only 20 billion of a meter wide.The miniscule tubules are arranged in a grid that holds 5 billion bits of data inone square centimeter, which is several times the density of current high-capacity memory chips.Because the NRAM chips are about five times faster than today's speediest memory chips and they are nonvolatile the chips are considered an exciting development for use as flash memory in digital cameras and cell phones.The federal government of US predicted that by the year 2015, nanotechnology would be a trillion –dollar-a-year industry and that one in four jobs will be Nano related.

COMPUTATIONAL SCREENING OF TETRA PHENOXY-SUBSTITUTED PHTHALOCYANINES AS BULK HETEROJUNCTION SOLAR CELL MATERIALS

Meral Ari[1]
[1]*Department of Software Engineering, Canadian Institute of Technology, Tirana, Albania*
meral.ari@cit.edu.al

Abstract
Tetra phenoxy-substituted phthalocyanines were screened computationally as bulk heterojunction organic solar cell materials of phthalocyanines (Pcs) with the aim of finding more efficient products. The electronic absorption spectrum and the molecular orbital properties of peripherally and non-peripherally tetrasubstituted Pcs were investigated by DFT/TDDFT calculations and substitution effect was screened. The screened compounds were found to be promising for providing good performance on BHJ solar cells with their small band gaps, red-shifted absorption bands in near infrared region, deep HOMO energy levels and high electron mobilities. Furthermore, the model of Scharber*et al.* was used for open-circuit voltage (V_{oc}) prediction for Pcs as the donor moiety and [6,6]-phenyl-C_{61}-butyric acid methyl ester (PCBM) as the acceptor moiety. Peripheral Pc provides higher calculated eVoc value of 0.53. Both Pcs were found to provide energetic driving force for Pc-PCBM cells computationally. The moleculesshow red-shifted calculated absorption bands which are in good agreement with the experimental wavelength values. Non-peripherally substituted Pc has more red-shifted calculated absorption band than the peripherally substituted one as expected.

Keywords:*Phthalocyanine, Bulk Heterojunction Solar Cell, DFT/TDDFT*

1. Introduction

Organic solar cells (OCS) have been the focus of increasinginterest due to their potential as a low cost photovoltaic energyproducing source. The performance of OSCs has been greatlyimproved by introduction of the bulk-heterojunction (BHJ) concept. Materials innovation is one of the major forces driving the performanceof OSCs.

Phthalocyanines (Pcs) are good p-type semiconductorsand present rich redox chemistry, which, once photoexcited, are capable of acting either as electron-donors when they are connectedto appropriate electron-acceptor moieties such as fullerenederivatives [1], or as electron-acceptorswhen linked to donor systems such as polythiophenes[2]. Furthermore, it has been shown that the electron mobility in Pcs can be as high as the hole mobility [3]. Recently, Torres et al. has demonstrated the clear contribution of the Pc around 700 nm to the photocurrent [4]. All these features render these compounds valuable photoactive materials.

In this study we have screened tetra phenoxy-substituted phthalocyanines computationally as bulk heterojunction organic solar cell materials of phthalocyanines (Pcs) with the aim of finding more efficient products.

2. Methodology

The electronic absorption spectrum and the molecular orbital properties of peripherally and non-peripherally tetrasubstituted Pcs were investigated by DFT/TDDFT calculations and substitution effect was screened. Furthermore, the model of Scharber*et al.* [5] was used for open-circuit voltage (V_{oc}) prediction for Pcs as the donor moiety and [6,6]-phenyl-C_{61}-butyric acid methyl ester (PCBM) as the acceptor moiety.

3. Results and Discussion

Calculated excitation energies (ΔE) of the Q band with the highest oscillator strength, related main active MOs with their contributions (%) and oscillator strengths (f), frontier molecular orbital energy levels (E_{HOMO}, E_{LUMO}), band gap (Δ), open-circuit voltage (V_{OC}) and energetic driving force (ΔE_{L-L}) of studied Pcs were shown in Table 1. $eV_{OC}$and ΔE_{L-L} were calculated assuming that PCBM is the acceptor moiety in the cell. E_{HOMO} and E_{LUMO} of PCBM were calculated as -5.41 and -3.94 eV respectively.

Table 1. Calculated values for Pcs.

Pcs	ΔE (nm)	Main active MOs (%)	f	E_{HOMO} (eV)	E_{LUMO} (eV)	Δ (eV)	eV_{oc} (eV)	ΔE_{L-L} (eV)
ZnPcOPh (np)	697	$H \rightarrow L_{+1}$(87.9)	0.394	-4.71	-3.40	1.31	0.47	0.54
ZnPcOPh (p)	678	$H \rightarrow L$ (86.2)	0.364	-4.77	-3.40	1.37	0.53	0.54

From Table 1, it's seen that Pcs were found to have small band gaps (≤ 1.37 eV), absorption bands (≥ 678 nm) in red UV region and deep HOMO energy levels (≤ -4.71 eV) which makes them suitable candidates of donor materials for OSCs with any acceptor moiety. Non-peripherally substituted Pc has more red-shifted calculated absorption band than the peripherally substituted one as expected. Pcs provide minimum 0.3 eV ΔE_{L-L} value. Furthermore, the LUMO levels of the molecules are higher than -3.92 which is also a stated parameter for highly efficient donor-PCBM solar cells. Pc (p) has a deeper HOMO energy level, hence provides higher calculated eVoc value of 0.53.

4. Conclusion

The screened compounds were found to be promising for providing good performance on BHJ solar cells with their small band gaps, red-shifted absorption bands in near infrared region, deep HOMO energy levels and high

electron mobilities. Peripheral Pc provides higher calculated eVoc value of 0.53. Both Pcs were found to provide energetic driving force for Pc-PCBM cells computationally. The molecules show red-shifted calculated absorption bands which are in good agreement with the experimental wavelength values [6]. Non-peripherally substituted Pc has more red-shifted calculated absorption band than the peripherally substituted one as expected.

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SOME ADVANTAGES IN USING THE SEPTENARY NUMERAL SYSTEM

Afrim Alimeti
Canadian Institute of Technology,
Industrial Engineering Department,
Tiranë
Afrim.Alimeti@cit.edu.al

Abstract

The decimal (base-10) numeral system is currently the most widely used numeral system by humans, perhaps, due to the fact that humans, as many other tetrapods, have typically ten fingers in their hands. There is a biological bias toward decimal system; however, humans have realized that there are other numeral systems such as the binary system that have advantages in usage over the decimal system on a variety of situations, e.g. binary being useful in modern computer architecture. Several situations where a base-7 (septenary) numeral system would be favorable in usage are given in this paper. An effort is made to impartially define the unit of time in terms of frequency and a sensible corresponding numerical system that goes well with the new time unit is explored. It is shown here in this paper that the septenary numerical system would be suitable in quantifying time scales in powers of seven. The balanced (signed) septenary system is also explored for potential applications in computer engineering. Considering the ongoing transitioning from analog to digital systems, in particular the one from a point-based geometrical system (a point being a mathematical construct occupying no space) into a cell-based system which is closer to representing reality, i.e. real things, since cells are spacious, one would find the septenary numeral system very useful in tiling flat surfaces and three-dimensional space with regular shapes in ever-increasing/decreasing clusters of cells and cells made of clusters in a fractal-like pattern. The number of the situations presented in this paper where the septenary system might be advantageous over decimal or other numerical systems is by no means complete.

HIGHER EDUCATION CONTRIBUTION AND APPROACH TOWARD GOVERNMENT PUBLIC SERVICES DELIVERY: RETIREMENT CALCULATION SOFTWARE - CASE STUDY

Ibrahim Cekirri[1], Fabjan Lashi[2]

[1,2] Faculty of Engineering, Canadian Institute of Technology, Rruga Sulejman Delvina, Tirana, Albania

Abstract

The close corporation collaboration between education institutions and government's public sectors has been strengthened in the two last decades. This type of collaboration is more visible and consolidated in developed and under-development countries as there is a great, increasing sensitivity on social responsibility, but also the government policies on economy or other fields are driven mainly by universities' academic research. The "project oriented" approach of educational institutions tends to solve real problems in public institutions by creating new tools or solutions in order to increase the effectiveness and quality of public services and putting students in realistic problem solving situations driven by customer demand offering user centric solutions. Based on other studies exists a gap between the academia, industry and governmental intervention toward policies and flexibility. The triple helix (academia, industry, government), is a hot topic and an emerging theoretical and practice problem to be resolved. Albania has demonstrated a readiness from all parties in the triple helix to find collaboration using these concept, referring particularly latest interventions of PPP (Public Private Partnership) initiatives launched from Albanian government for projects of various nature. This case study tend to identify issues that can narrow this gap, address solutions through areal case simulation, see the collaboration framework between entities involved in the case study and finally give results for the findings of the offered software solution to the Albanian government from the university students.

Keywords: *Triple-helix, PPP, public service, Project oriented education, web application, higher education development, government, retairment calculation*

Introduction

Starting from the year 90', where there was an economic upswing and an increase in academic freedom in many developed and under-development countries, influenced by substantial geo - political changes(Consolidation of the EU, the democratization of the former Soviet republics), it caused the increase of the role of academic institutions (already well funded and almost autonomous) in determining economic policy and not only of different states.It is clear every day more and more the role of universities in the design and implementation of specific projects to come to the assistance of public services in state institutions as well, and not only.

But what is the impact of the academy to the improvement of public services in the world and in Albania specifically ?
How much has been accomplished and it has functioned the "Triple Helix" cooperation model in solving various problems ?
In Albania even the country is experiencing a difficult transition since years 90' (the fall of the communist system) and where corruption, economic and academic freedom have problems and are not yet consolidated, we have good and real examples of the fruitful collaboration of educational institutions and gonvermental entities. The "Retirement Calculation Software", developed by Canadian Institute of Technology students and professor, is the best example on how an academic institution can give its professional contribution to solving a problem or facilitating bureaucratic practices. Also serving the community and increasing transparency At the same time.Due to this strong connection between academia and public services, which is getting stronger every day and more, we will try to analyze the benefits and challenges that this collaboration brings and to find ways on how to increase this open collaboration, and simultaneously increase its productivity and efficiency .

Triple Helix model as an effective way to solve problems!
Before years 90's it was well konwn the concept of dyad relationship among industry and government with its dominating role in the Industrial Society. And it is understandable based on the fact that after the World War II the industry took a huge development momentum and the governments had a key role in the management of economic policies, that in those years this two entities were the the dominating key players regarding the economic development. The concept of Triple Helix had its beginnings in the 90s with the initiation of Henry Etzkowitz (1990), who gave a prominent role to the educational institutions in the restructured concept, including now three parts: Industry – University – Government.
The Triple Helix thesis is that the potential for innovation and economic development in a Knowledge Society lies in a more prominent role for the university and in the hybridisation of elements from university, industry and government to generate new institutional and social formats for the production, transfer and application of knowledge [1].
In this type of relationship is not anymore the government playing the leading role by intervening in the appointment or restricting the role of each of the other entities(Industry and University) in the creation of new development initiatives but it is a balanced configuration, where the university and other knowledge institutions act in partnership with industry and government and even take the lead in joint initiatives [2].
Furthermore its now wellknown the "success" of this type of partnership in a various fileds especially in innovation and development. A good example of this sucessful collaboration is the pharmaceutic sector which is getting each year more funds amounting from 10 to 30% of the GDP of different countries(USA,

EU etc) [3].Federal funding of basic research directly stimulates the drug industry's spending on applied research and development by making scientific discoveries that expand the industry's opportunities for R&D. [4] Speaking in more concrete terms, analyzing the the case of HIV/AIDS in USA.The government funds for the research centers of medical schoolshave been increased by 26% from 2002 to 2011 in which about 27% were allocated for HIVresearch (domestic and international research), causing an decrease of the number of new diagnosed patient during the years 2002-2011 by 6,5% [5] .
Also very interesting projects have been created and developed in the field of information technology.A good example of the collaboration between these three entities is also the development of the mos used social media and one of the most profitable company in the earth, Facebook. It started as a simple project in the laboratories of Harvard University by two students but it was the founding by a venture capitalist Peter Thiel in the summer of 2004 who made a $500,000 angel investment in the social network Facebook for 10.2% of the company [6] that gave facebook an increasing in the number of users as a consequence of big budget in advertising.
In Europe there are a lot of programmes that give to the education institutions a leading role in the innovation by interacting also with the government goals for increasing employment rate, energy supply and security and companies goals for increasing profits and competitiveness in the market. University-industry-government cooperation has a central role also in European Union (EU) innovation policies, such as the Innovation Union flagship initiative of the Europe 2020 Strategy, and is perceived as a solution to the "innovation emergency" that Europe now faces. [7].

How higher education serves to public sector - world wide

Higher Education has been described as the curator, creator and critic of knowledge. To fulfill this multiple role, higher education has devoted itself to teaching, research, and public service. Since the foundation of the first universities(Bolognia and Paris University, 1220), the role of these new institutions was clearly emphasized. University foundation charters offered as reasons the universal thirst for knowledge and the benefits to society of men learned in different subjects and full of mature counsel. And reference to mature advice meant that university training would give those who later served ruler or town the scholarly perspective with which to approach complex issues [8].Improved public services promise to enhance public welfare, reduce public expenditure, promote economic growth [9] and since these are some of the essential needs of people, the contribution of universities has been and continues to be always welcoming.Throughout the years since the universities have been established, their role and contribution for increasing the quality of public services has always been increasing. These types of projects designed, conceived and developed in academic institutions under the auspices of the "project-oriented education" concept, among others have increased awareness

of young people in taking initiatives to help others. One of the latest programs developed by an academic institution which runs a Project on Municipal Innovation by identifing and promoting the replication innovative ideas from across the city of Cambridge (and not only)is developed by Havard University and it is called "Data Smart City Solution".Data-Smart City Solutions is working to catalyze adoption of data projects on the local government level by serving as a central resource for cities interested in this emerging field.Their research focus is the intersection of government and data, ranging from open data and predictive analytics to civic engagement technology in order to promote the combination of integrated, cross-agency data with community data to better discover and preemptively address civic problems[10].

Retirement Calculation Software

Good examples of the contribution of universities in increasing the quality of services in public instituions can be found also in under-development countries, such as Albania.Developing a web application for online calculation of the value of the pension is an excellent indicator of fruitful cooperation between an academic institution and the government.

Figure 1 : *Calculate Pension Software*

Conclusions

The Triple Helix model is one of the most effective ways to solve many of the current problems. The close collaboration between university, industry and government generates new institutional and social formats for the production, transfer and application of knowledge.

The projects designed and developed by the academic institutions influence not only the enhancement of the quality of public services, but also the raising of youth awareness to help others.

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THE EFFECT OF TAX REGIME CHANGE INTO MIDDLE INCOME AND POOR HOUSEHOLDS; A MICROSIMULATION ANALYSES USING HBS 2008-2014[1]

A. Demi and M. Agolli
Canadian Institute of Technology
Mimoza.agolli@cit.edu.al and albana.demi@cit.edu.al

Abstract
Emerging into a strong growth path after transition when most of the structural reforms were implemented brought about a noticeable reduction of poverty and a revival of the middle class. This path was reverted under the impact of the global economic downturn. While research studies have shed light on what happened to poor households during economic downturn, there is no evidence on how economic conditions and economic policies have been influencing the middle class. This study uses synthetic panel methodology and simulates the influence of income tax regime on middle class welfare. A large body of literature argues that growth of the middle class is a positive driver of the development processes. The simulation of household welfare under tax policy change shows that combining economic and social conditions with the fiscal policy has triggered movement in the middle class. Overall the middle class has expanded through out 2008-2014, however if no tax policy change a broader middle class would be observed in 2014.

Introduction

Emerging into a strong growth path after transition when most of the structural reforms were implemented brought about a noticeable reduction of poverty and a revival of the middle class. This path was reverted under the impact of the global economic downturn. With growth rates reduced to just a mere natural growth, since 2008, the fraction of the population who's real per capita monthly consumption is reported below 50 USD (in 2002 prices) increased from 12.5 % in 2008 to 14.3 % in 2012 (see figure 1). While research studies have shed light on what happened to poor households during economic downturn, there is no evidence on how economic conditions and economic policies have been influencing the middle class. There is extensive literature arguing in support of the hypothesis that the middle class is a positive driver of development processes. This study uses 2008 and 2014 household budget survey to examine the influence of the tax policy change among middle income households.

Literature Review

The latest change in the income tax regime of Albania introduced a progressive taxation, which in principal would recover the equity distortion of the flat tax and induce higher payment for those receiving more income and lower payment for those living on low income. The discussion on this tax regime shift didn't

pay attention on the effect on the middle class income and welfare. There is extensive literature arguing in support of the hypothesis that the middle class is a positive driver of development processes. A large body of literature argues that growth of the middle class is a positive driver of the development processes. Amoranto et al. (2010) argue that middle class demand for greater accountability of political decision makers has been a source of economic growth. Loayza et al. (2012) found that a growing middle class improves democratic participation, reduces corruption, increases spending and efficiency of public investment on health and education. This study tries to compare household income in 2008 with income in 2014 and trace individuals with middle level income identifying if the tax change has induced a transition of middle income families to poor or vulnerable to poverty, and inducing a narrow down of the middle class.

Methodology

In order to perform transition analyses of an household panel dataset are needed, which Albanian lack currently. Lack of longitudinal data has been a major constraint to fiscal policy welfare analyses, however development in data processing and analyses helps to overcome this constraint. This report relies on the "synthetic panel" methodology to explore household income transition pre and post policy intervention.The methodology for the construction of synthetic panels follows Dang et al. (2014) which enables estimation of household consumption in a future year based on cross-sections information of household. The consumption equation included variables on age and years of schooling for the head of household, region and employment status complemented by sources of non labour income at family level such as remittances, capital income and any social transfer received by the household (consumption equation are part of the appendixes).

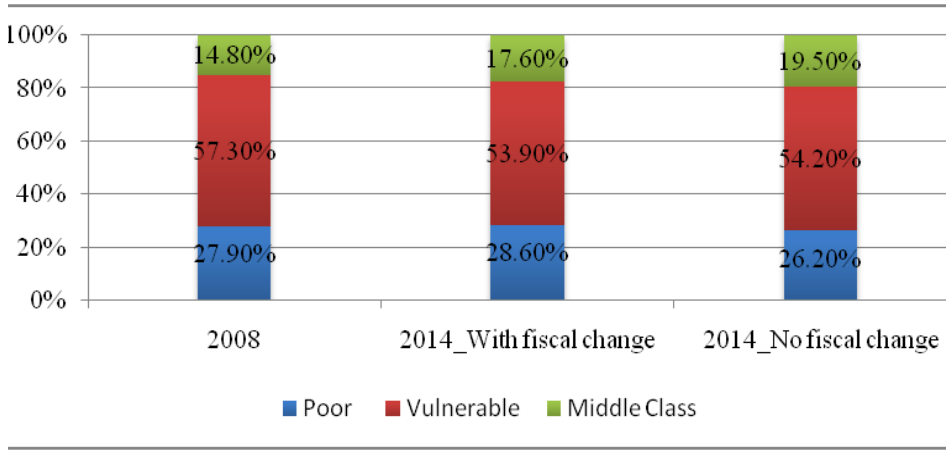
The estimated consumption was performed pre and post tax policy change and household welfare was analysed comparatively. For each household, consumption per capita is estimated using total consumption (in real term), dividing the number of household members. Using consumption per capita a middle class was defined as household with consumption per capita between 10 and 50 USD. Household consumption before and after tax policy was compared and status of households with respect to the income threshold was identified as a transition state from middle class to vulnerable. Two transitions state were constructed, (i) transition from poor in 2008 to vulnerable or middle class in 2014 and (ii) transition from middle class in to vulnerable or poor in 2014.Estimations and analyses were performed using HBS 2008 with 5600 observations and HBS 2014 with 6565 observations. Consumption measures and transition state were generated with and without change in income taxation as a way to account for the fiscal policy effect. Albania applied until 2012 a flat tax rate on income and profit income of 10%. In 2013, the tax system shifted

from to progressive taxation system on personal income[5], while tax on profit income was lifted up to a rate of 15% in 2013. We used observed consumption after progressive tax in 2014, to re-estimate consumption[6] as if a flat tax was applied.

Discussion of results

Predicted consumption for 2008 and 2014 were compared with actual consumption and distributions of households per consumption groups were generated. (see figure 4). Consumption was estimated with and without new income tax applied in 2013[1]. The result show that aggregate distribution of the population per consumption group (poor, vulnerable and middle class) hasn't changed much over 2008-2014. The middle class represent 14.8% of the households in 2008, increasing to 17.6% of the population in 2014. The progressive tax has contributed to a shrinkage of the middle class by around 2%.

Figure 13: Distribution of households per consumption groups in 2008 and 2014



Source: HBS and author own calculations

Despite the fact that consumption groups in aggregate do not reflect substantial changes, the movement among groups through the time span 2008-2014 are noticeable. It seems that most of households' movement have brought them to the category of being vulnerable to poverty in 2014 (see table 1). Half of households belonging to the middle class category of consumption in 2008

[1] Tax on personal income is progressive, from 0 to 300 USD one pays 0% tax, for monthly income between 300 USD – 1300 USD, tax on income is 13% of the income above 300USD, for monthly income above 1300 USD, tax rate is 23% of the income above 1300 USD.

[6]Households with consumption per capita of 300 USD were not changed, if consumption was between 300 USD and 1300 USD per month the flat tax consumption would be just 3% higher than the actual one, if consumption per capita was higher than 1300 USD per month than pre tax consumption would be 13% higher than the actual consumption.

became vulnerable to poverty in 2014, while 17.1% of families from the vulnerable to poverty became poor in 2014. 26.4% of vulnerable households fell in poverty in 2014, while 18.1% of them improved their standard of living to middle class. Income tax change in 2013 has sharpen the downward movement, if no tax change policy were to apply in 2013, the middle class upward movement would have been higher by 3.5% than that actually observed.

Table 1: Transition Matrix of Households 2008-2014 for Albania (with tax regime shift)

	2014 (with income tax change)				
		Poor	Vulnerability	Middle Class	Total
	Poverty	38.70%	52.50%	8.70%	100%
2008	Vulnerability	26.40%	55.50%	18.10%	100%
	Middle Class	17.10%	50.50%	32.40%	100%

Table 2: Transition among consumption groups if no change in tax policy

	2014			
		Poor	Vulnerable	Middle Class
2008	Poor	35.90%	54.30%	9.80%
	Vulnerable	24.20%	55.50%	20.30%
	Middle Class	15.20%	49.60%	35.20%

Source: HBS survey and author own calculations

Concluding Remarks

The simulation of household welfare under tax policy change shows that combining economic and social conditions with the fiscal policy has triggered movement in the middle class. Overall the middle class has expanded through out 2008-2014, however if no tax policy change a broader middle class would be observed in 2014. The net rate of middle class changes are even higher if one observes movement among social groups and not just the net result. Factors that influence households move out of the middle class into being vulnerable to poverty relate mainly to labour market resources, social care and support to enable households engage in employment, especially women. Receiving income from capital or having assets including vehicles or house appliances, ownership of dwelling and better living conditions reduces the probability of transiting in vulnerability from middle income households. This mean that fiscal policy on properties and capital, labour market measures and job contracts as well as education policies could balance income tax policy and maintain the expansion of the middle class.

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Appendix 1: Consumption equation

	Consump_2008	Consum2014	Consump_2014_tax
Age	0.012	-0.013	-0.014
	(1.684)	(-1.574)	(-1.574)
HH Size	-1.972***	-2.934***	-3.081***
	(-11.820)	(-12.665)	(-12.665)
HH Size Sqr	0.127***	0.216***	0.227***
	(8.101)	(9.656)	(9.656)
Years of Sch	0.296***	0.390***	0.409***
	(12.868)	(18.419)	(18.419)
Work in Private	-0.295	-1.229***	-1.290***
	(-1.823)	(-3.963)	(-3.963)
Region Dummy	0.445**	.424***	11.495***
	(3.080)	(7.729)	(7.729)
Employed	0.479**	1.520***	1.596***
	(2.681)	(4.449)	(4.449)
Self Employed	0.920***	1.972***	2.071***
	(4.749)	(5.932)	(5.932)
Economic Aid	-1.304***	-1.082***	-1.136***
	(-9.227)	(-6.507)	(-6.507)
Capit.Income	1.883***	1.680***	1.764***
	(4.343)	(4.322)	(4.322)
Remittance	0.580***	0.492**	0.517**
	(4.228)	(2.646)	(2.646)
Constant	7.835***	10.348***	10.866***
	(10.832)	(11.531)	(11.531)
N	5537.000	6459.000	6459.000
r2	0.27	0.33	0.257

t statistics in parentheses

* p<0.05, ** p<0.01, *** p<0.001

THE ORGANIZATION OF COMPUTERIZED ACCOUNTING IN TERMS OF AN ENTITY

MSc. Besarta Tafa, MSc.Gjergji Tafa
b.tafa@cit.edu.al, gjergjitafa@gmail.com

Abstract
This paper explains the computerized accounting program, called ALPHA Business. The purpose is to explain to users the link between the accounting and informatics in the ongoing process of an entity.
The method used is a tutorial from the creation of the company, on recording step by step each of the transactions of the entity in the program, to the yearly reports any entity needs.
The result of this tutorial shows how to construct financial statements of a company. The program helps also to generate miscellaneous analysis any investor asks for.
This program is a good solution for linking accounting, which is the basic of the activity of an entity, with informatics. These types of informative systems make it easy for a company to take records of its transactions and also to generate important reports. It makes the information easier, safer and more appropriate.

Keywords: *ALPHA Business, accounting, informatics*

1. Introduction

The reason why this topic is chosen is because of its relevance regarding the challenges of a company. The basic for a company is the accounting. Without accounting no company can go forward. But, the way the accounting has been used before is too much tedious, non secure and sometimes even irrelevant. That's why today's businesses need computerized systems to take records of their daily activity.
This tutorial shows that, if we make all the records properly during the year, it will be very easy to construct financial reports. Even the analysis of these reports can be easily done bay this program. The paper compares it with some other similar computerized economic programs, stressing its strengths. In sum we can say that ALPHA Business is the program an entity needs in order to better comply with all its stakeholders' needs.

2. Related work

About this topic there are a number of themes written by the Institution of the Business Modeling, which offers ALPHA program manuals for different types of businesses. It includes Alpha Start, Alpha Business, Alpha Budgeter, AlphaPharma etc. These are user manuals which explain in details how the program works. We are focused on Alpha business and give there more detailed information by explaining also the way the accounting works.

3. The subject of your work

3.1. The configuration of a file with the name of the enterprise.

The first thing we have to do when we start the program is to configure the enterprise. In other terms it means converting the real entity into a computerized one. It is represented by a static soft which will have the characteristics and general data of our company.

The main elements of an enterprise are;

The code, which is unique for any enterprise and represents it in abbreviated form, the form of business determined by the low, depending on the organization's activity, the description contains the whole name of the company, the location, the administrator, the NUIS(Tax ID number), the license, the fiscal code and telephone no. fax, e-mail and web page.

3.2. Configuration of the currency

The basic unit of the transactions of a company is the currency. Nowadays, with the globalization, many enterprises collaborate with each other all over the world. That's why a need for different currencies exists. In order to keep tracks of each transaction, the program permits you to configure all the necessary currencies the company uses in its transactions. We can even lock a exchange rate determined by the central bank on the first day of the fiscal year..

3.3. Configuration of taxation

Any entity, wherever it is located, is subject of governmental taxations. In order to be in accordance with the lows and to properly pay the obligations to tax authorities, we need to declare those. Prior to this, we configure them to the system, name them and calculate the percentage depending on the type of the tax.

3.4. The opening of the accounting plan

The accounting plan is the basic of the accounting. It is configured as a tree. There are eight primary classes: 1. Shareholders' equity, 2.Long term assets, 3. Inventory, 4.Third parties, 5.Cash and liquidity, 6.Expenses, 7.Revenues, 8. Special accounts. Each one of them has its subclasses which includes all the types of transactions of the company.

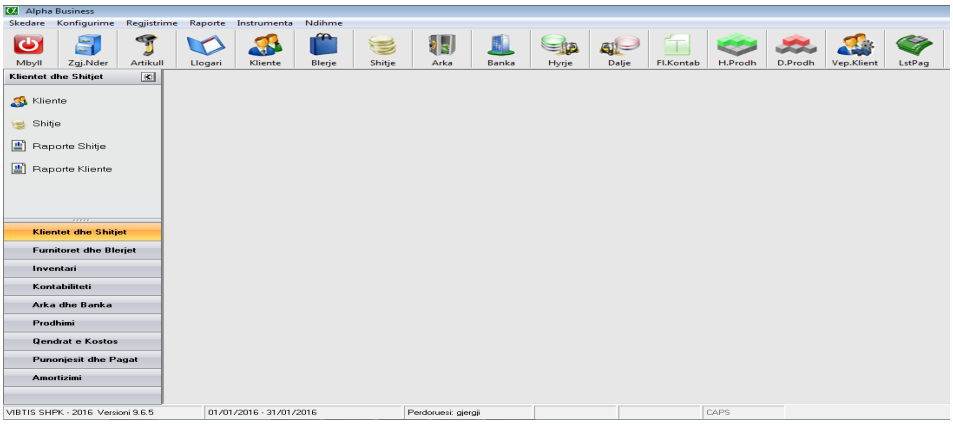
In accordance with the type of the activity we can also configure the warehouse, the inventory, suppliers and customers.

After the configuration, so the construction of the company, we can record any transaction in the respective accounts. The final product will be the financial statements and different analysis derived from these records, depending on the scopes of the stakeholders.

4. Proposed method

The method used in this paper is the tutorial. We use the program to explain in reality how we can configure the necessary elements of a company and how to make records of all the transactions.

That is how the program looks like when we open it.



After this we move with arrows in all the cells of the program in order to explain step by step all the configurations and records we make there.

5. Results and discussion

The result of this tutorial is the financial statements. If we could follow step by step the instructions, the program is able to self generate the financial statements. Four main financial statements of a company are: 1. Balance sheet; a snapshot of the situation of the business. 2. Income statement; the financial performance of the company. 3. Cash Flow; the movement of the liquidity during the year and 4. Retained earnings; the movement of shareholders capital. Based on these financial statements experts can even make different analysis.

6. Conclusion

In sum we can say that this program is a very useful tool for an accountant. It makes the link between the language of the business; accounting and the technology. The use of the program saves time, money, space and even human resources. In advance with other programs like Financa 5.0 it is easier, more advanced and more relevant.

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THE INFLUENCE OF INFORMATION TECHNOLOGY ON SECTORIAL EFFICIENCY: A STOCHASTIC FRONTIER APPROACH

M. Agolli and E.Demaj
Canadian Institute of Technology, Tirana Albania
Mimoza.agolli@cit.edu.al and enida.demaj@cit.edu.al

Abstract

The structural reform of the Albanian economy and its struggle to improve productivity and competitiveness are closely related to the process of upgrading and updating technology, including ICTs. The level of ICT usage in Albania has shown furious growth in the recent years, especially among medium and large companies. This work focuses on exploring the effect of private sector ICT investment on the efficiency and productivity at sectorial level using stochastic frontier methodology. Strong positive impact of ICTs on sector efficiency was found, an increase in ICT by a percentage points is being mirrored on 0.5 percentage points of improvement at sectorial efficiency level. Overall the economy seems to be away of its production frontier, with room for technological and efficiency improvement and strong impact on growth.

Introduction

Information and communication technologies (ICT) has significantly altered social and economic life of humanity. How ICT has impacted economic transactions, the structure and organization of industry, labour and jobs, the ability to innovate and R&D are aspects of enormous research interest and contribution to economic and growth inducing policies. The structural reform of the Albanian economy and its struggle to improve productivity and competitiveness are closely related to the process of upgrading and updating technology, including ICTs. This study is exploring the effect of private sector investment in ICT on the efficiency and productivity at sectorial level. The productivity at sectorial level is decomposed using stochastic frontier methodology. Data on access and usage of ICT at business level are used to described general patterns of ICT, while stochastic frontier model uses a Cob Douglas production function with data from ASN to estimate productivity effect of ICT.

Literature Review

There is a large literature that documents the existence and determination of firm heterogeneity in terms of productivity. This literature has been reviewed in Bertelsman and Doms (2000), and highlights the part of quite a lot of supply-side production factors that determines the productivity at firm level. Technology shocks, management skills, R&D investments, among others, are shown to strongly affect firm level productivity. Aboal and Ezequiel Tacsir (2015) on their study found a positive and consistent correlation between firm level productivity and its decision on the size investments in innovation. They also argue in their study that the different innovation expenditures resulted on ICT investment economies of scale explaining the higher investments by larger and foreign firms. This finding seems to be related to the fact that many investments on ICT take the form of fixed cost. for the example, once new software is bought for the production of new goods (services) it can be used for the production of as many units as it is wished. ICTs affect growth and productivity both directly and indirectly. Improvement and productivity growth in ICT-producing sectorhas a direct effect on aggregate productivity level as well. But, as they play a substantive role in the generation, storage and transmission of information and in the decrease of market failures related to information asymmetries, ICT are also affecting productivity in sectors that use them. (Jorgenson, Ho and Stiroh, 2002 and 2008, Gordon, 2000 and 2012 and van Ark, O'Mahony and Timmer, 2008).

Purpose of this Work

In Albania, progress in the diffusion of Information and Communication Technologies (ICT) is mixed. Albania has been catching up in terms of Internet use and mobile subscriptions, which are about 60-70 percent of European averages. Previous study argue that ICT usage in Albania, as measured by the use of computers and internet depends on the company size. Generally large enterprises have a higher use of computer and internet if compared to small and medium enterprises. However the extension of using ICT at business level is expected to have impacted productivity. This work tries to empirically investigate the influence of ICTs on industry level productivity and efficiency using stochastic frontier modeling. We are using industry level data to examine empirically how investment has in technology and ICTs has impacted the productivity of different industries for Albania. This is an empirical investigation that to our knowledge has not been performed.

Methodology

We are using industry level data to examine empirically how investment has in technology and ICTs has impacted the productivity. Balance sheet data consolidated at industry level classified on two digit NACE classification are made available by Enterprise Survey for the period 2006-2014 (ASN www.instat.gov.al). We have first estimate a Cob-Douglass production function, involving capital and labor inputs through a stochastic frontier model for panel data.

$$\ln Q_{i,t} = \beta_0 + \beta_1 * \ln\{\text{Capital Stock}_{i,t}\} + \beta_2 * \ln\{\text{Labour}_{i,t}\} + v_{i,t} + u_{i,t} \quad (1)$$

Capital stock is broken into different investment type including investments in technology and ICT. The frontier model is then used to generate the technical efficiency variable or the production frontier. (Green, 2008).

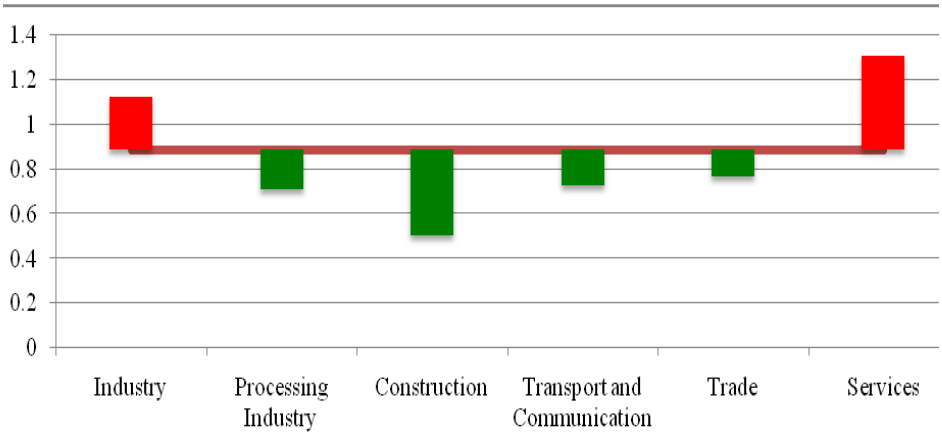
$$\mathbf{TE_i} = \frac{\mathbf{Q_{i,t}}}{\mathbf{e^{(x_i\beta + v_i)}}} \quad (2)$$

The inefficiency term could be then calculated based on conditional expectations using JLMS method for exponential distribution of the error term (Green, 2008 p.177). The analyses were run through STATA.

Results and Discussion

The Cob Douglass production function estimated through s stochastic frontier with time varying random effect are selected. Capital and labor mix in generating value added seem to be dominated by labor input. The frontier production function shows that the Albanian economy has potential to improve its efficiency. The model is used to generate the technical efficiency /inefficiency indicator. The sector distribution of the inefficiency indicator shows that services and manufacturing industry are at low end regarding efficiency. The effect of investment in technology and ICT is investigated using the technical efficiency measure. The results of the analyses manifest a significant positive impact of investment in technology on firm efficiency level. A 1% increase in technological investment improves efficiency by 0.5 percentage points. The fixed effect model best fit means that technological effect on efficiency is also strongly affected by the nature of the industry.

Figure 14: Sector Inefficiency as compared to economy overall inefficiency



Source: INSTAT and author calculation

Table 3: Technological and ICT Investment effect on industry efficiency, panel analyses results

	Investment in Technology		Investment in ICT	
	Random Effect	Fixed Effect	Random Effect	Fixed Effect
Constant Term	6.968** (12.18)	7.366*** (10.00)	7.631*** (15.44)	7.973*** (12.61)
Technical Efficiency	.5508*** (8.31)	.503*** (5.78)	.550**** (6.31)	.503*** (5.78)
Rho-coefficient	.455	.493	.455	.493
R-square	0.7458	0.7458	0.7458	0.7458
F-statistics		33.37 (0.0000)		33.37 (0.0000)
Wald Statistics	69.02 (0.0000)		69.02 (0.0000)	

* 10% level of confidence, **5% level of confidence, ***1% level of confidence

Conclusion

In conclusion, the fast diffusion of ICT technologies among businesses have brought positive impact on efficiency at industry. The stochastic frontier model, provides evidence that an increase in 1% increase in ICT technological investment improves the efficiency of the industry by 0.5 percentage points. The effect of ICT on industry efficiency is reliant on the industry since fixed effect model best fits the data. The technological investments are gradually surfacing since industries are significantly labor orientated. It is proven that ICTs bring about development of the labor efficiency at industry and firm level by reducing transaction costs, improve time efficiency of information flow and enhance innovation and spillover effect. Similar results are found through literature , which regardless of the difficulties on measuring the ICT contribution on the economic efficiency have establish way to evidence on the impact of ICTs in changing in the world we live in, including our society in Albania.

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COMPANY ACTIVITY ON FACEBOOK. THE CASE OF ALBANIAN COMPANIES

Eldi Metushi[1] PhD, BlendiShima PhD[2], Siana Ahmeti[3]Msc
Faculty of Economy, Canadian Institute of Technology, Tirana, Albania
[1]eldi.metushi@cit.edu.al[2]blendi.shima@cit.edu.al[3]siana.ahmeti@cit.edu.al

Abstract
In this study we analyze Facebook reporting practices of a sample of 200 Albanian companies during the period of one year. In specific, we focus on the content of the posts shared by the companies. Posts content is then classified in seven categories. We find that only 44% of the companies do have a Facebook page and companies mainly use Facebookfor marketing purposes. In addition, we find that companysector,audience and revenues might explain their Facebook activities.

Keywords:*Social media, Internet, Voluntary disclosure, Digital reporting*

1. Introduction

Company use of social media represents a new means of communication to stakeholders. In fact, social media has radically transformed company reporting practices due to the several benefits associated with its usage. Improved dialogue with stakeholders, increased interactivity and information disclosed, and promotion of products and services are only some of the benefits associated to social media. In addition, social media increases the stakeholder engagement. Thus, stakeholders now can take an active part on social media by sharing the information disclosed by companies, being part of discussions, giving their opinions and also sharing those with others, and consequently becoming important factors for the company strategy formulation and implementation.

Considering the benefits above mentioned and the increased use of social media by companies worldwide in this study we focus our attention on Facebook activities of the Albanian companies. In particular, the aim of this paper is to analyze whether the Albanian companies use Facebook and their main purpose of usage. To do this we consider the metrics developed by Bonsón and Ratkai (2013)for analyzing the reporting practices on Facebook, for a sample composed of the 200 largest Albanian companies. Big companies may be more willing to increase their engagement on social media because they may bear the costs associated with this activity and also because of the information asymmetries existing between managers and stakeholders. To the best of our knowledge this is the first study analyzing the social media reporting activities for the Albanian companies. The results of this study could further contribute to the existing literature analyzing the companies' reporting practices on social media. In addition, the majority of the papers analyzing the companies' use of social media consider companies from developed countries. Thus, it becomes

interesting to observe if the results still hold for developing countries where it is expected that the capital market is still not yet developed.

2. Literature review

Thus far, scholars have widely analyzed the role of social media for marketing purposes. Hence, social media Websites are becoming increasingly popular and in the near future they are likely to evolve into primary online travel information sources (Xiang and Gretzel, 2010). Companies use social media especially to interact with customers, increase brand awareness, customer engagement, promote sales and acquiring new customers (Tsimonis and Dimitriadis, 2014). Furthermore, customer participation in online brand communities it is found to positively influence the customers' purchase frequency even though this is only true when the participation is moderate (Wu et al., 2015). Similarly, social media usage is found to have a significant impact on brand equity (Bruhn et al., 2012). The authors using a standardized online survey from three different industries suggest that while traditional media has a stronger impact on brand awareness the social media usage strongly influences brand image. Another interesting study that demonstrates the importance of social media marketing is also the study of Leung et al., (2015), suggesting that when the customers' attitude towards the hotel's social media page is positive he will in turn have a favorable attitude towards the hotel brand. For specific social media, Risius and Beck (2015) find beneficial effects of companies' activities on Twitter and users' word of mouth and attitudinal loyalty. In addition, Xu and Wu (2013) suggest that the more interactive the communicative process on Twitter has been during company crisis periods, the less crisis responsibility the company will bear and in addition, the more favorable the organizational reputation and customers' purchase intentions will be. Similarly, for Facebook Du et al., (2015), find that companies' activities are associated with higher sales and when the Facebook posts will increase this will also be accompanied by an increase in companies' sales.

In addition, there is an extensive research focusing on the use of social media and stakeholder engagement (Lewis et al., 2008; Men and Tsai, 2013; Ruehl and Ingenhoff, 2016). In this study we focus our attention on the companies' reporting practices in Albania by analyzing their activities on Facebook. Previous studies have already analyzed the company reporting practices on social media for Europe (Bonsón et al., 2014) and US (Barnes, 2010; Tao and Wilson, 2015), and also for specific industry sectors (Bonsón Ponte et al., 2015; Escobar-Rodríguez and Bonsón-Fernandez, 2017). In general these studies focus on the companies' communication strategies and stakeholder engagement suggesting positive outcomes between company activity on social media and stakeholder engagement. To the best of our knowledge, for Albania there are no previous studies analyzing the company reporting practices on social media. We find only the studies of (Perri and Allko 2015; Lamani and Cepani 2011) which are mainly focused on Digital Accounting and banks Internet financial reporting but notspecifically on social media reporting.

3. Methodology

The sample chosen represents the 200 biggest companies operating in Albania as of March 2016. The sample is published by Monitor[7] journal in its official webpage and the companies classification is made based on their revenues. The number of companies distributed by sector is provided in below in Table 1. As we may observe, there is a considerable variability of the number of companies per sector. The Retail, Construction and Materials, and Oil and Gas sectors are those most represented in the sample while there are only few companies from the sectors of Technology, Media, Basic Resources and Personal and Household products.

Table 1. No. of companies distributed by sector

Sector	No. of Companies
Banks	12
Basic Resources	3
Construction & Materials	36
Financial Services	5
Food & Beverage	5
Health care	9
Industrial goods & services	7
Insurance	4
Media	2
Oil & Gas	28
Personal & Household products	3
Retail	62
Technology	1
Telecommunication	6
Travel & Leisure	10
Utilities	7
Total	**200**

Using a content analysis, we analyzed for all the companies, whether they had an official Facebook page, the year of adoption, the number of likes and followers for each Facebook page, the type of information shared on their page and the number of likes and comments for each post. Our research questions are as follows:

RQ1: Is company activity on Facebook influenced by the company's sector?

RQ2: Is there any relationship between company Facebook activity and its audience?

RQ3: Do company revenues influence its Facebook activity?

To collect the data we manually analyzed the official Facebook pages posts of

[7] www.monitor.al

the companies during a period of one year. To categorize the type of Facebook post we used the set of categories suggested by Bonsón and Ratkai 2013. The authors categorize the Facebook posts between, Corporate Social Responsibility (CSR) information, marketing, customer support/ customer services and other. In turn, the CSR information is composed of four categories represented by, environmental, social, financial and governance. Thus, we have a total of seven categories to divide our final Facebook posts.

4. Results

Analyzing the number of companies having a Facebook page, contrary to our expectations, we find that 88 out of 200 companies use Facebook. This is an interesting finding considering that big companies are usually expected to use more communication strategies as compared to the small and medium companies. However, it seems that this is not the case for Albanian companies considering that only 44% of them do have a Facebook page. In table 2 we provide descriptive statistics of the companies' Facebook posts.

Table 2: Descriptive statistics of the companies Facebook posts

	Average	Median	SD	Min	Max	Total	% of Total
Governance	0,02	0	0,15	0	1	2	0,07
Environmental	0,32	0	1,4	0	13	28	0,97
Social	1,22	0	4,7	0	35	106	3,68
Financial	0,46	0	0,21	0	1	4	0,14
Customer	0,93	1	1,58	0	15	81	2,81
Marketing	18,05	1	120,5	0	1095	1570	54,55
Other	12,5	1	81,05	0	730	1087	37,77

As we may observe from the table above, there are considerable differences in terms of how companies use Facebook for their disclosure purposes and also on the type of posts they share. In fact, as we may observe from Table 2, more than half of the total Facebook posts are done for marketing purposes suggesting that Albanian companies use Facebook mostly for marketing activities. With regard to "Other" it refers mostly to photos or quotes posted by the companies for the simple objective to engage their followers. However, for both categories the median and the standard deviation suggest that there is a considerable variability on the number of posts shared by the companies for these two categories, and few companies may influence these results. In general, Table 2 suggests that Albanian companies do not prefer to use Facebook for disclosing information on their CSR activities.

In Table 3 the results of the statistical analysis are reported. We perform non-parametrical tests considering the fact that our dependent variable does not present a normal distribution.The results show that company activity on

Facebook varies according to its sector. In addition, we test also the relationship betweencompany activity on Facebook and its audience, as measured by the number of Likes and Followers a Facebook page has, as well as company revenues. The results show that active companies present higher audience. Furthermore, companies with high revenues are also more active on Facebook.

Table 3: the relationship between company activity and its sector, revenues and audience

Dependent variable	Independent Variable	Method		
Activity	Sector	Kruskal-Wallis		
		χ	df	Sig
		33,625	14	0,0023*
	Audience	Spearman's		Sig
		0,3877		0,0002*
	Revenues	Spearman's		Sig
		0,3298		0,0017*
				*p< 0,01

5. Conclusions

In this study we analyze company reporting practices on social media for a sample of 200 Albanian companies. We focus our attention on their Facebook posts. ClassifyingFacebook posts by their content we find interesting results.

Thus, only 44% of the Albanian companies have an official Facebook page and when they do have one, it is mostly used for marketing purposes and customer engagement. In addition, we find that Albanian companies do not use Facebook to share information regarding their CSR activities.Furthermore, we find that companies activity on Facebook might be influenced by their industry sector, audience and company revenues. Hence, in line with the findings of previous studies, it makes sense point out that the social media engagement has benefits for the companies.

This study represents the very first study analyzing the company reporting practices on social media in Albania. It is interesting to point out that there is a small number of companies using Facebook for their disclosure purposes. However, our results suggest potential benefits for the companies adopting social media disclosure practices and in line with that, we expect an increasing number of companies using social media in the coming years. Furthermore, the fact that our sample represents companies from different industry sectors makes our results more representative by showing the social media activities for all the industry sectors. Finally, these results could be of interest for Albanian companies to further improve their disclosures on social media.

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SOCIAL MEDIA RISKS AND SAFETY – A STUDY DONE AMONG CHILDREN AGED 12-16 IN DURRES

Paola Topi, Ingrit Kau
Student, Faculty of Information Technology, UAMD
topipaola21@gmail.com, ingridkau123@gmail.com

Abstract
The purpose of this study is to have results as close to the truth about children's knowledge in social media safety and how protected they are from Cyber attacks.We conducted several surveys to 12-16 years old children of various schools in Durres, respectively in "Isa Boletini" High School Vora, "16 Shtatori" high school Shijak and "JusufPuka" Durres. Being a social subject, it is impossible to have absolute results, they are relative according to different locations, and the honesty of the answers given.

Keywords: *social networks, security, cyber attacks, children, Durres district.*

1. Introduction

A cyber attack is an attempt by hackers to damage or destroy a computer network or system. As our study shows, nowadays children are very familiar to computers or internet. What they may not know is anything about viruses, phishing, social networking etiquette, privacy, and any other internet safety or security issue you can think of.We surfed the net and noticed that there lacks a proper study on the subject at the area of speaking.Since Cyber attacks (including Cyber bullying) have become important matters, we decided to study about how informed and exposed are the children in Durres to these attacks.

2. The subject of our work

Our survey included 200 children that had a direct survey made in their classrooms. They are from three different schools, one in the city and two others in the countryside. Questions are formulated in order to draw conclusions that show us how much they are involved in social networks and how much knowledge they have about online security.

3. Results and discussion

As we mentioned before, we analyzed the answers of 200 questionnaires, and evacuated the results in percentages dividing our pupils in different classes.
Of all respondents, 8% of them have no access to the Internet and 92% of them claimed to have access to the Internet, 48% of which say that they mostly use internet for social network. 17% of the children that use internet do not have social networks. They use it only for study purposes. 35% of them use internet for different purposes, such as social media, school projects, social games, music and other types of entertainment.

Based on another partition, 77% of the children are social media users, and only 23% of them have no social networks.

From the students that have social media accounts, 44% said that they were sexually harassed on social networks, no gender division noticed. 24% of them admit that their accounts have been stolen, and 9% of them confessed that other people created fake accounts with their names and photos. These numbers show how unprotected they are against cyber attacks. But, does this mean they take into consideration increasing their privacy?

91% of the students' answer to the sealed question: "do you know what cyber-attack means?" was no, which is an alarming result. The rest of them gave no precise definitions to the sub question whether you have been affected by cyber-attack. That makes us think that even those who think they know the definition actually do not.

79% of students who use social media have low security settings. We have this conviction based on their choice to have public accounts, the level of passwords used, mostly of which were meaningful names, or simply a sequential string of numbers. Also the lack of cellular numbers on social networks, which is also an important key to security, the frequency of password change (some of them even claimed that they never changed their password), the fact that they do not have someone to give advices to them. Some of them confessed that their parents aren't aware of their children's social profiles. 20% of the students were in a considerable level of safety, secondary. Only 1% had high security passwords.

69% of the surveyed admit that they feel threatened in social networks. 18% of them admit that they have fallen victim to violence launched by social networks, generally verbal abuse, dominated by boys.

Among male students, to the question when they created a social media profile for the first time, the most frequent answer was 9 years old. While for female students, the most frequent answer was 11-12 years old.

12 to 16 year olds are very exposed to cyber attacks, being very attracted to technology, internet, and social networks. As everything else, even technology andinternet has its positive and negative sides. Negative sides of the internet are stealing private information, risk of exposure to different sites with sexual/pornographic contents, being reached by strangers with bad intentions etc. The lack of information about these dangers has very serious consequences on children's psychology. Some children admitted to having experienced psychological violence because of the theft of personal information. Some cases indicated the opening of false profiles by malicious people, including photos and personal information of these children. Some of them did not think they were in risk because according to them no one dislikes or hates them. Such unprecedented responses are easily understood if we take into account our target group. For this reason, counseling is required from an adult, parent or teacher.

4. **Conclusion**

We encountered a little refusal to participate, and lack of knowledge of the terminology.

From our observations, we notice that most students are not well-informed of the dangers of the internet. Many of the few who have explained what cyber attacks mean,think that they are viruses. Creating very weak passwords and not changing them in time shows how vulnerable teenagers are from these attacks. Even though they admit that they feel threatened in social networks, they do not even apply the minimum of privacy policies available. Only 1% of them have strong passwords and change the passwords frequently. Some of them have public accounts which everyone on internet can have access to. All these facts show us that the teenagers are not informed about the risks of cyber attacks, or that they do not know the consequences of these attacks.

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SOCIAL IMPACT OF FINANCIAL CRISIS – THE CASE OF CREECE

Ph. D. (c). JonaPuci; Canadian Institute of Technology,Tirana, Albania; Email: j.puci@cit.edu.al;

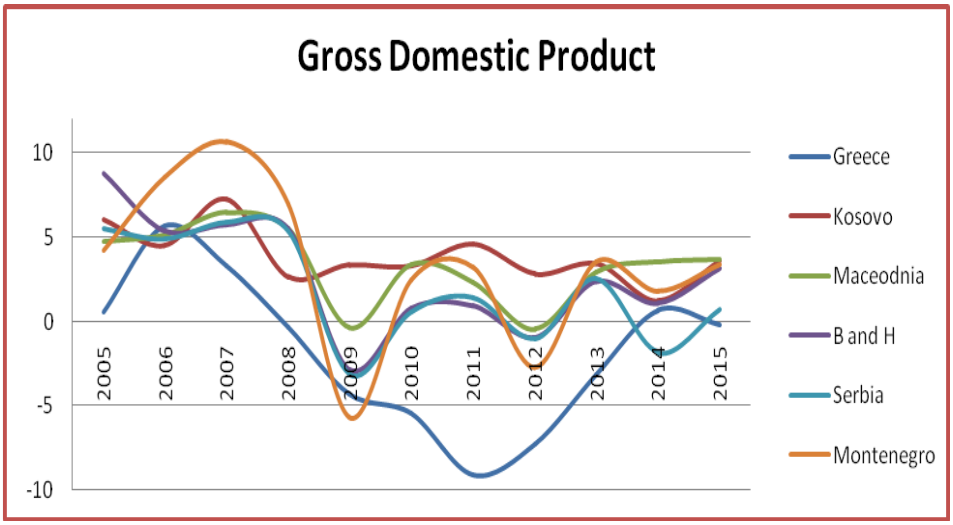
Financial and economic crisis can cause many costs to the development of a country and may have serious consequences in both economic and social life of the countries and people. Unemployment, the absence of a regular salary, and economic hardship - all have an impact on people's physical and mental health. The current paper mixes qualitative and quantitative techniques and tries to analyze the effect of financial crisis on families that have lost their jobs, native ones or migrants, who had to turn back home. As it is shown, from an economic point of view, crises diminish economic activity, decrease investment and consumption, resulting therefore in economic growth declines, higher unemployment, decrease in the average level of income, and reduced benefits. In a social context, consequences include alcohol abuse, increased psychological distress, changes in life style and suicides thinking 2-3 times more than the public.

Key words: Financial crisis, Social effects, Psychological distress, and Economic growth

Introduction

Greece covered all newspapers headlines in 2009 when a fiscal crisis turned into a sovereign debt crisis, which led the country into a full recession. The first step was an announcement from socialist government about a misreport in fiscal data by the end of 2009. Recalculated figures increased public debt to 130 percent from 100 percent of GDP and budget deficit increase to 16 percent from 4 percent of GDP. At once, borrowing became harder and the rates increased to excessively high levels. That is when the crisis heated up. More to the crisis contributed the downgrade of Standard and Poor agency to below investment grade. This caused Greece to lose some access to IFM, International Financial Markets, and threatened the sovereign debt to turn into a solvency debt. The revised Greek Bailout Program managed to satisfy international markets, however, brought about strong national reactions. On May 2010, three employees lost their lives as extremists set a bank on fire in Athens. This disaster threw doubt on Greece's future and on the effectiveness of bailout package. Moreover, as the demand for services and goods declined, several companies bankrupted, others displaced, whereas the rest those still on board turned to temporary suspensions. These led to a rapid increase in unemployment rates to about 28 percent in 2013 from 7 percent in 2008. This study examines the effect of the Greek crisis on people who were most affected by mixing qualitative and quantitative research. The next session gives a brief review of the literature review focusing more on the social effects that crisis cause. The third section describes the methodology used. The fourth section analyzes the

data from the interviews combining them with some quantitative indicators. The last section summarizes the main findings.



Literature Review

The inability to manage the risk effectively can damage the ability of poor to take advantage of development opportunities. According to the study of Backe and Gardo (2012), Albania is the country that has been more affected by the Greek crisis compared to other countries in South East Europe. The study also concluded that the crisis had affected more the financial and the banking sector rather than the real economy. Floro and Oktay (2010) revealed that, crises hit mostly women, elders and the ill. These crisis diminish economic activity, decrease investment and consumption, resulting therefore in economic growth declines, higher unemployment, decrease in the average level of income, increased unhappiness and reduced benefits. Banks struggling to adjust balance sheet numbers, create credit gaps weakening so the economic performance and increasing unemployment. According to Bartley M. (1994) joblessness is the root to poor mental health due to the lack of financial and nonfinancial benefits provided by one's job, such as the salary to take care about the family, social status, mental and physical activity, the use of skills, and self – esteem. In the short run, the crisis increases alcohol abuse, influences depression, and suicidal thinking two to three times more than people who have not lost their job. Dee TS (2001) and Herttua K, Mäkelä P, Martikainen P (2007) emphasized that, joblessness leads to changes in life style. Studies indicate a connection between economic recession and changes in human attitude. High debt, due to the lack of a job, has been pointed out as a critical factor for mental disorder, as to the study of Taylor MP, Pevalin DJ, Todd J (2007). The higher the quantities of money people borrow, the higher is the chance for mental disorders. Individuals with more debt are more likely to suffer from depression than general people. Poverty, as to the study of Middleton N, Sterne JAC, Gunnell D (2006) is a key

socio – economic factor for mental health problems at children as well. Children raised in extreme poverty have more emotional and physical problems throughout their life. Children in general cannot understand the complication financial loss within their family. This creates a feeling of confusion, anger, and helplessness, which might affect their attitudes towards the school, parents, and the rest of the world.

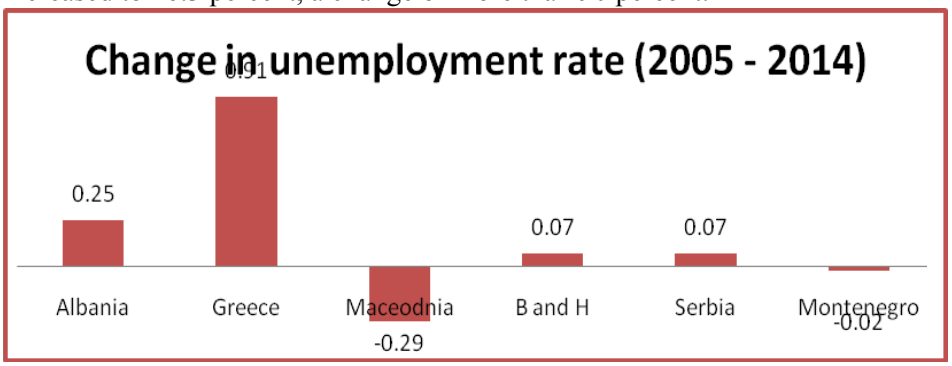
Methodology

In order to analyze the main effects of the Greek crisis on people the Case Study Design is used. It is considered as the best approach since it does not have to be people focused only, but rather analyzes in depth relationships, events and impacts or consequences as well. The sample used is consistent with purposive sampling strategies. It is an approach used when in-depth information is needed, and the concern is not about generalization but instead a deep comprehension of the effects that a certain program or event might have caused. Quantitative data are gathered from well - known institutions such as the World Bank and EUROMOD. According to the validity, the results do make sense from an economic point of view and the results can be used to answer the question addressed; whereas the analysis of the interviews go in line with most of previous studies about the effects that crisis have on society.In order to analyze the main effects of the Greek crisis, a mixed method is used. The first part of the analysis focuses on the economic impact that the Greek crisis had, using macroeconomic indicators such as economic activity, GDP per capita, investments, consumption, and unemployment rate among others. The second part of the paper is a qualitative research, where the data gathered from in depth interviews were further analyzed, to get a more detailed landscape about the social effects of the crisis.For the purpose of our study four interviews were conducted; one with a Greek family that had to shut down their business, two others with Albanian migrants who turned back, and the last one with an Albanian family that still have one member in Greece but the rest had to turn back in Albania due to hard economic conditions. Interviews were conducted in Albania. Through their life story approach, we asked interviewers to narrate their story until the moment of the interview. Prior to the crisis all the members where employed, and after the crisis heated up women lost their jobs first (as shown gender discrimination), and after a while the husband as well. Duration of interviews ranged from 60 minutes to 2 hours, and they were conducted in the Albanian language. Interviews are not presented in this paper; only through the interpretation of the data are provided useful insights.

Results and discussion

The effect of the Greek crisis on jobs has been asymmetric in many aspects. Sector - related, most of the jobs have been lost in industry rather than in services, whereas the continuous increase in unemployment in agriculture sector seems to have ended. Professionally speaking, it seems that the crisis have altered the skill structure of the labor force. High skilled professions, such as

managers, accounted for more than half of the total increase in unemployment. Skilled professions also experienced large job losses. Whereas, job losses among lower - skilled professions, were to an extent, offset by employment growth among sales and service workers. In terms of time horizon, part - time job has grown, natives are being favored, while females are experiencing the biggest holding back from the labor market.With no doubt the main feature of the Greek social outlook is the sharp rise in unemployment. The rate of unemployment had varied at about 10 percent and started to fall at around 7 percent by mid – 2008. By the end of 2014, the unemployment rate had increased to 26.3 percent, a change of more than 90 percent.



Another feature of the crisis was “the protection of male” – considered as the ones responsible to take care about the family – forcing women to stay housewives, therefore preventing them from a professional progress and young adults from leaving their homes. Nevertheless, this did not translate into direct poverty, meaning that the joblessness involved mainly wives and after that elder in rural areas. Regarding the country of origin, migrants have carried the worst part of the crisis. As interviews indicate nonnatives were the first to be fired, even though some of them were more qualified then native ones. Most of them felt discriminated, because on the contrary of the case where for Greeks the man was still working, for Albanian migrants, both of the members got fired. This worsened their economic situation and some of them had to turn back home. According to inequality of income distribution, Gini coefficient is used. A coefficient equals to one indicates complete inequality, whereas zero is an indicator of complete equality. The data are taken from EUROMOD. As the below table indicate the inequality in Greece has changed since 2008, and increased substantially in 2012. Are the poor becoming poorer and the rich people richer? Indeed, that is a big question, with political implication and to be considered in a longer time horizon.

	2008	2009	2010	2011	2012	2013	2014	2015
Gini	0.361	0.35	0.347	0.353	0.368	0.371	0.375	0.382

Hardship is another area of social concern. Many families and individuals are facing extreme suffering. Migrants, social workers, disabled individuals, single parent with small children and pensioners among them. For example, one of the children of the families being interviewed could not concentrate in class because of the psychological consequences that family disputes-because they had nothing to eat – transmitted to him. In addition, some families were unable to purchase the basic goods for living. They got some help from their friends or relatives, some of them sold their assets, and some others went into debt with the uncertainty that future brings. Shortages of income have been translated into declines of health care access. Families that lost their jobs reported a decrease in health routine controls; whereas some of them had to borrow money to provide the medicine to their children when they were sick. Compared to 4 or 5 years before the onset of the crisis, life satisfaction and happiness (as perceived by them) had decreased. Most of them gave a lower score to the questions: "How happy are you?", or "How much satisfied are/were you with your economic situation?" after the crisis then before it. In addition, the general trust in the legal system or anything related to the government had fallen; considering trust as a strong indicator for subjective wellbeing. Summing up, the feeling of misery and without any hope in their everyday life it is crossing the line of economic consideration.

Conclusions

Economic crises can have significant long – term and short-term social costs. They affect people not proportionately, affecting more the poor, since they have restricted capacity to protect themselves and to recover from the shock that crises cause. The inability to manage the risk effectively can damage the ability of poor to take advantage of development opportunities. Facts indicated a decline in social and economic well – being, reduced economic activity, decrease in investment and consumption, resulting therefore in economic growth declines, higher unemployment, decrease in the average level of income, and reduced benefits. The main social risks of the Greek economic crisis increased alcohol abuse, increased psychological distress and increase in suicides. What leads to healthy society in industrialized countries is not growth or wealth but how the country's resources are allocated among the population. Therefore, the impact of reduced wealth can be improved by policy measures, strengthening social protection and social inclusion.

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CUSTOMER PREFERENCE FOR RED MEAT PERCHUASE İN ALBANİA BASED ON THEIR INCOME LEVELS

Fabjan Lashi[1]
[1]*Canadian Institute of Technology*
fabian.lashi@cit.edu.al

Abstract
The purpose of this study is to analyze data collected from a structured survey, on customer preferences for red meat in Albania. The red meat is an important food for the Albanian customers, and has a relevant weight on their family budgets. The willingness to pay (WTP) and a clustered level of money that customers are ready to spend on labeled and reliable information about the meat they consume is study. A statistical data elaboration is used testing the five clusters of ranges minimum – maximum price surplus, that proceed once a customer express interests and willing to pay for reliable label and valuable information on it. These clusters are than tested using cross tabs, correlation test and Chi-Square statistical test. The same data analyses is done also for the willingness to pay for organic meat, produced and monitored in the entire value chain as an organic meat. The WTP is measured in a binary logistic regression model using factor analyses and other test for model selection and model predictability. The results shows that the income level is a significant factor in the analyses and has impact in the WTP. The elasticity of WTP in relation with price increase seems to be 20%m so if the price is increased with 100 ALL, the WTP is decreased with 19%. If the income level is increased also the WTP is increased, and with incomes growth, consumers with higher incomes are WTP more, so they have choose the highest clusters in price surplus range. In conclusion opting to modernize and offer a reliable traceability system for Albanian customers in the red meat value chain is a good opportunity for the government to regulate the sector, for customers to consume better and more secure food, but the return of investment for such large scale, expensive information systems may be longer than can be afforded from the meat industry. Incomes are not the only indicator that can help on resolving the problem of poor information for meat and meat stuff. Other subsidy schemas and awareness should be offered to the industry and customers, possible form the government.

Keywords:traceability of food, meat, customer preference

1. Introduction

Albania has a tradition in producing red meat form small ruminants like lambs, goats and beef. Albanian customers produce important quantity of meat more than twice per week and in some cases every day at least for one course. These data lead to understand better if they are interested to care more on meat quality they consume. The meat sector is not regulated, many unauthorized traders are slaughtering the animals with no hygienic and veterinarian checks. The

customers are used to buy in this slaughter spots, even they have no information about the animal health before being slaughtered or other relevant information about their origin or if was treated with intensive food, antibiotics or other substances. It seems that customers trust mainly the word of butcher.

2. Related work

There are a number of studies done in Albania and in other regions with the aim to understand customer behavior, food safety and traceability systems in general. In the study done from Imami et al. the fat, the meat origin and the butcher word play an important role in customer preference [1]. Stranieri et al. conclude that having information in fresh meat labels is important but the quantity of information should not be very broad or too much because customers in that case may have not time and interest to read all details. Education level is also important to map and understand the interest of customers for labels in meat [3] their understanding of information and general culture is also assets. Organic meat as a new way to eat healthy in larger markets [5] and in Albania [6] is also a relevant factor to understand customer behavior toward food safety [7]. Traceability systems are indicated as factors that will improve the overall food information and will have impact also in better customer awareness [8].

3. Proposed method

The information analyzed in this study are collected in a structured survey that interviewed customers in proximities of food markets, or meat shops. Customers are asked to express their interest to pay an extra premium for reliable label and organic meat. And also they are asked to offer information about their net income per month. As you can see form the results the cross tabs, correlation test and Chi-Square test is done using statistical software. The data are entered into this statistics after the positive analyses we have done to the WTP dependent variable, measured with a number of reduced independent variables produced form a factor analyses using the PCA method and VARIMAX rotation. Once the WTP was measured that is influenced from cultural, marketing factors, animal origin and a number of other factors we testes the price levels, in order to understand if there is significance and impact of income levels from the costumers interviewed.

4. Results and discussion

Table 1: Crosstab analyses

Count

		P25. Net family income								Total
		1) 15000-25000 LEK	2) 26000-50000 LEK	3) 51000-80000 LEK	4) 81000-120000 LEK	5) 121000-150000 LEK	6) 151000-200000 LEK	7) Over 200000 LEK	8) NA	
P27. WTP for reliable label if the price is 800 ALL how much you would pay?	1.Po 2.Jo	9	35	50	58	25	13	16	16	222
		8	14	18	9	1	1	1	1	53
Total		17	49	68	67	26	14	17	17	275

Table 2. Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	24.112[a]	7	.001
Continuity Correction			
Likelihood Ratio	25.086	7	.001
Linear-by-Linear Association			
N of Valid Cases	275		

a. 4 cells (25.0%) have expected count less than 5. The minimum expected count is 2.70.

As seen from the table 2 the income level is significant with significance level 0.001

Table 3. Crosstab on premium clusters

Count

		P25. Teardhuratfamiljare (ne LEKE/muajneto - pas taksave)								Total
		1) 15000-25000 LEK	2) 26000-50000 LEK	3) 51000-80000 LEK	4) 81000-120000 LEK	5) 121000 - 150000 LEK	6) 151000 - 200000 LEK	7) Mbi 200000 LEK	8) Pa përgjigje	
P27.1 Nese PO (P27) sa do temundtepagua ni me shume, zgjidhnjengaops ionet:		8	11	16	8	1	1	1	1	47
	1) +200 leke	1	4	4	12	8	1	4	2	36
	2) +150 leke	1	3	5	10	9	2	3	2	35
	3) +100 leke	2	12	23	16	5	8	6	8	80
	3) +150 leke	0	0	0	0	1	0	0	0	1
	4) +50 leke	5	19	18	20	2	2	3	3	72
	5) any other shumetjeter	0	0	2	1	0	0	0	1	4
Total		17	49	68	67	26	14	17	17	275

Table 4. Chi-Square Tests on extra premium clusters

Value	df	Asymp. Sig. (2-sided)
79.370[a]	42	.000
71.652	42	.003
275		

a. 39 cells (69.6%) have expected count less than 5. The minimum expected count is .05.

Even in this case the factor is significant with 0.003

5. Conclusion

There is a significant relation to the level of income and the WTP for reliable labels information and for certified organic food. For the implementation of the traceability systems a consideration of price surplus should be considered, only families with higher income may answer positively to trusted and reliable information in labels for meat and meat stuff. The government can help to subsidy the sector for creating the culture of labeling and traceability systems as a need for higher food safety and reediness to manage epidemic outbakes.

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