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Mobile Communications upon Digital Signal Processing systems

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***Abstract**: Within the telecommunications industry, the Digital Signal Processing; is in general as a telecommunications business for central and non-central facilities, or in little, all facilities beyond typical voice calls and fax broadcasts. Nevertheless, it is useful in whichever facility business, for facilities obtainable at slight or free or no cost, to endorse their main business. In the telecommunication's commerce, on an abstract conceptual state, Digital Signal Processing industry enhance worth to the typical facility quality contribution, urging the member to use their cells furthermore and letting the firms to guide up their ARPU. For portable cells, even though technologies similar MMS, SMS, voice and GPRS are frequently measured industries, a discrepancy might also be completed among typical (peer-to-peer) subject and premium-cost subject. These are named portable mobile value-added services (MVAS) which are habitually just denoted as VAS. With the increase of the usage and the need of computerized machines, the necessity of the digital signal processing increases. So for that, to use a computer with an analog signal, this last must be digitized with an analog-to-digital converter. Besides, studying a digital signal would be in a domain that considered experts choose based on the representation of the essential characteristics of the signal in question. When referring to filters, if we are handling a digital signal, so the results will be far superior when using Digital filters versus the Analog Filters. It is noticeable that Telecommunications services are required whichever inside-home by the cell net company themselves or by a tiers value-added service donor, else acknowledged as a subject furnisher like All Reuters. Regarding the communication medium, Services Providers naturally join to the service provider within protocols as SMPP(on mobile networks); Short message peer-to-peer protocol, joining whichever straight to the SMS Center or, gradually more, to a gateway of messaging that contributes the service provider well monitor of the subject contents.*

Introduction

Cognitive Radio System means, for us as humans, *Smart* and *Alert.* These systems are able to work dinamicaly in a different service provider systems; starting from a simple Global Positioning Systerm, to detecting what services could be available in a given environment and which could interest more the users, it also lead us as technicals and experts to know the current degree of needs and future likelihood of needs of the system users, also, these systems proved their ability of learning and recognizing the patterns usage from the users. Cognitive Radio Systems also are able to apply at their environments the *Model Based Reasoning* about user needs, local content, environmental context...

intelligent radios are considered to be Cognitive Radios, though they can be cofigured and programmed dinamically. Only here, and regarding that the **walkie-talkie** (also called as a **handheld transceiver)** and their main activitity is on an electronic card; which plays the role of the receiver/transmitter, and also regardless of the cellular network providers that offer a push-to-talk handset on their equipement that allows walkie-talkie-like operation to be happening over the cellular network, without the need of dialling a call each time.

In summary here, in this presented paper, we would like to answer a question that we asked before implementing the idea and giving it life; would we be able to prove the wealth of implementing a Cognitive Rdio based System that works on a mobile plateform, which detects the nearby cells or nodes and transfer us from a cell provider network to an ad-hoc network automatically?

I. IMPLEMENTATION

A. Ease of Implementation

Regarding the studies we made on the Cognitive Radio we proved that this last is programmable and we are able to configure it upon our needs. Also, Motorola company has released the MOTO Talk product, which consists on making a short-range 'push-to-talk' calls to the similar tool sets. Here comes the idea of creating a such of software to realize the necessary tasks. We had to start with the SDR (software Defined Radio) as per the basic platform in order to build the Cognitive Radio.

We referred to a variety of technological tools; we just here present the definition of our necessity to use them with our project implementation;

Used and adapted technologies:

• DSP (Digital Signal Processors) that do provide a virtually nonfinite programmability

• Within the Application all cryptography, modulation, protocols, and the source coding are accomplished based on a software

• So many types of modulation could be accomplished over a broad-range of frequencies, thereby an SDR is able of providing more than one class of service

• Field-range is serviceable, at the moment that the requirements change, upgrades and modifications are basically easy to execute

• SDR Standardized Architecture Supports Both Current and Future Applications

• FDMA, TDMA, CDMA, TDD

• AM, FM, MFSK, MPSK, MQAM, CPM, SSB, DSSS ...

• DES, 3DES, AES, MeXe

• Trunked Radio, APCO-25, GSM, Iridium, 802.11..

• Tone Coded Squelch, CVSD, LPC, VSELP, AMBE, ...

Fig. 1. It is just a software matter.... [1]

All we use is only Radio Waves here, that provide us with all necessary data to run the project.

B. Preliminary constraints:

In this project we are not dealing with the radio waves study, neither with Digital Signal Processors, yet we are implementing a newly developed system.

II. Results Accomplished:

Fig. 2. Finalized system and caverage area

This is the final diagram we are implementing;

capabilities

Services	Services' recognizers
Ad-hoc connectivity	Unlimited nodes
Cell-network access	Through regular cell-network providers
Transfer through platforms	Radio network VS cell-network

[a] Services inside the system.

Algorithm steps Architecture:

Alg *name*:
Start

vars

IF Radio_Range = Empty Then

regular call

Else

Push-to-talk call

End IF

End Alg

Through the finalized equipment, we can make direct connection through cellulars, we can make regular calls through cell-networks, and the software is the responsible one for transferring and selecting the convenient network to use; either a push-to-talk network or cell-network.

The project is subdivided in to two parts;
1- Electronic card realized to play the role of receiver/transmitter on a wireless radio network.

2- Soft Application done to work on the cellular; to control outgoing calls and make transferring, if needed, to the electronic card.

A. Resources:

Operating Systems: Android for Samsung, Symbian for Nokia mobiles and iOS for apple.
Linux Mint, Ubuntu for testing source codes.
MS Windows XP, 7, 8 also for testing source codes.

Mobile cells: Nokia E71 & E72, and apple cell phones.

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The application worked successfully to transfer a regular call to a radio(push-to-talk) call in a range of 30 meters, this is based on our electronic device and the indoor position (inside a building).

B. Realization:

from the beginning we intended to make the system with a high level of activity; means no failure in it, thus, we referred to program our device, which is able receive and transmit digital signals, since it is equipped with a DSP processor;

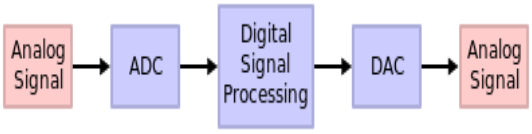

Fig. 3. Digital signal Processing(DSP) Diagram.

And as per the studies made on the Digital Signals, the future of the Digital Signal Processing when making a signal under studies proves to us the diversification of the properties types that we can resolve. Hence this is, when working with the Digital Signals, the probability of a data collision is reduced.

Here we are requiring what would we think regarding to the upcoming future that would appear as, so if it would be deprived of the Digital world and the digital signal use in telecoms?

If we are able to draw that situation, you for probably will assume what quality of services telecommunications before has on our current regular daily lives [6, 7].

Regarding that the data transmissions and data transmissions concepts are basically a collection of services provided within a communication medium, so for that the Digital signals Processing is having an enormous important future coming to be under consideration[12].

Besides, it would be more and more universal and joint with usual life. Objects that are means used to work as stand-alone will be linked as well (all of; your car, your doors, the school's blackboard, your TV/ all-in-one-device / stereo, your oven, your watch,..), and with a high quality of services provided.

We will be rectified by presenting here the Signal classes;

- Finite-length
- Infinite-length
- Periodic
- Finite-support

→ Finite-length signals

- Sequence notation: x[n], n= , ,...,N-
- Vector notation: x = [x x ... xN-] T
- Practical entities, good for numerical packages (Matlab and the like)

→ Infinite-length signals

- N-periodic sequence: x[n], n in Z (Complex numbers)
- Abstraction, good in proving theorems

→ Periodic signals

- Sequence notation: x[n] = x[n + kN], n, k, N in Z(Complex numbers)
- Natural bridge between finite and infinite lengths
- Same information as finite-length of length N

→ Finite-support signals

- x[n] = A [n] if ≤ n ≤ N- , n in Z (Complex numbers)
- Another bridge between finite and infinite lengths
- Same information as finite-length of length N

right after we come to developing the reception/transmission functions, which is usually based on the signals status;

WITH THE FOLLOWING NOTATIONS:
One dimension
Notation: x[n]
Two sided-sequence: x: Z → C
N is dimension-less "time"
Analysis: periodic measurement
Synthesis: stream of generated samples

The Delta Signal:

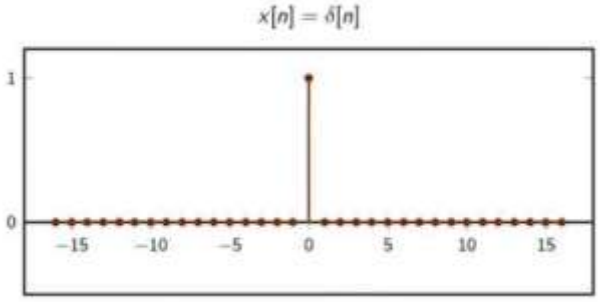

Fig. 4. The delta signal graph

The Exponential decay Signal:

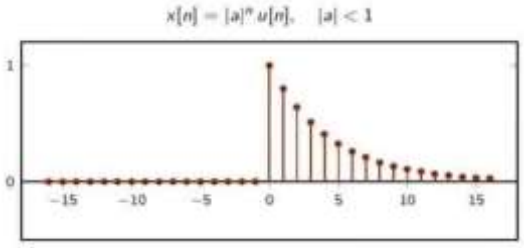

Fig. 5. The exponantial decay signal

The sinusoid signal:

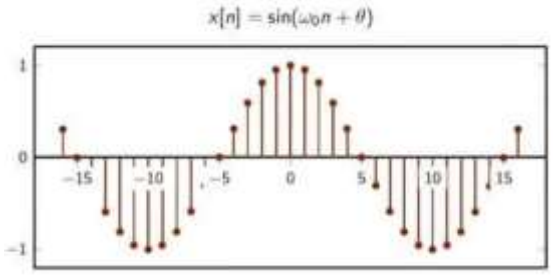

Fig. 6. The sinusoid signal

C. Guiding principles and Recommendations:

Keeping in view the market trend across the globe and the current telecom requirement of the country specially the interest of the consumer, the licensing/spectrum auction should be carried out at the earliest possible, so that the benefits of Technology can be passed on to the consumer and the industry.

The policy should allow preferential and rationalized treatment of 4G spectrum to existing operators. Rationalized 4G licensing can help overcome the existing fears of the operators and would help them in early adoption of the new regime. In case, still some of the existing operators resist than only licensing of green field operators be considered. Spectrum provided to the operators for 4G should be free of interference and sufficient for the operator to provide consumer oriented services. Irrational allocation of smaller chunks can seriously mitigate the benefits of technology.

A long term spectrum strategy should be adopted to ensure that maximum operators are accommodated. A rational and long term spectrum strategy shall ensure that 4G Spectrum Auction does not in any way used to the disadvantage of current operators, who miss out on the initial distribution/auction if this is to be done in Phases.

D. Abbreviations and Acronym:

DAC: Digital-to-Analog Converters
ADC: Analog-to-Digital Converters
DSP: Digital Signal Processors

III. CONCLUSION:

The research literature surveyed provides a comprehensive view of the current trends and advancements in wireless communication technologies, with a particular focus on the evolution towards 5G networks and beyond. The documents highlight the employment potential of Information and Communication Technologies (ICTs) and the transformative impact they have on various sectors, including mobile industries and wireless networks.

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