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IMPLEMENTATION ON HARMONICS ESTIMATION USING SIGNAL PROCESSING TECHAIQUES

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ABSTRACT:- : **Signal processing** is an enabling technology that encompasses the fundamental theory, applications, algorithms, and implementations of processing or transferring information contained in many different physical, symbolic, or abstract formats broadly designated as signals.[1] It uses mathematical, statistical, computational, heuristic, and linguistic representations, formalisms, and techniques for representation, modeling, analysis, synthesis, discovery, recovery, sensing, acquisition, extraction, learning, security, or forensics.[1] According to Alan V. Oppenheim and Ronald W. Schafer, the principles of signal processing can be found in the classical numerical analysis techniques of the 17th century. Oppenheim and Schafer further state that the "digitalization" or digital refinement of these techniques can be found in the digital control systems of the 1940s and 1950s.[2]

[1] INTRODUCTION

Harmonic voltages and currents in an electric power system are a result of non-linear electric loads. Harmonic frequencies in the power grid are a frequent cause of power quality problems. Harmonics in power systems result in increased heating in the equipment and conductors, misfiring in variable speed drives, and torque pulsations in motors. Reduction of harmonics is considered desirable.

Signal processing is an enabling technology that encompasses fundamental theory, applications, algorithms, & implementations of processing or transferring information contained in many different physical or abstract formats broadly designated as signals.[1] It uses mathematical, statistical, computational, heuristic, & linguistic representations, formalisms, & techniques for representation, modeling, analysis, synthesis, discovery, recovery, extraction, learning, security, or forensics.[1]

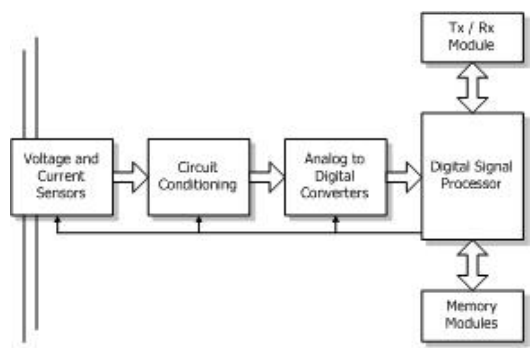

Fig 1 Signal processing

High resolution electrical mapping of slow waves on stomach serosa has improved our understanding of gastric electrical activity in normal & diseased states. In order to assess signals acquired from high resolution mapping, a robust framework is required. Our framework is semi-automated & allows for rapid processing, analysis & interpretation of slow waves via qualitative & quantitative measures including with equal frequency activation time mapping, & velocity & amplitude mapping.

Application fields

Audio signal processing for electrical signals representing sound, such as speech or music. Speech signal processing interpreting spoken words. Image processing in digital cameras, computers & various imaging systems. Video processing – for interpreting moving pictures. Wireless communication - waveform generations, filtering, equalization. Control systems. Array processing – for processing signals from arrays of sensors. Seismology. Financial signal processing – analyzing financial data using signal processing methods, important for prediction purposes.

[2] LITERATURE REVIEW

Umar Naseem Khan in 2006 written by "Signal Processing Techniques used in Power Quality Monitoring"

This paper gives a general review of different signal processing techniques which are widely used for the power quality monitoring. The majority of power quality problems can be characterized through measurements of voltage and current. To distinguish the type of disturbances, monitoring systems require the processing of signals, which concern the extraction of features and information from measured digital signals. In fact, the use of signal processing techniques can influence the way that voltage and current signals are measured and analyzed in power system field. Different signal processing techniques has been discussed in this paper. In terms of calculation RMS techniques is simple, fast, and much sensitive in sags, swells, and interruptions in the signals.

Silk Smita1, Sharmila Biswas2, Sandeep Singh Solanki in 11, November 2014 written by Audio Signal Separation and Classification: A Review Paper

Music signals are not solely characterized because of other mixed audio signals. Mixed audio signals contain music signals mixed with speech signals, voice and even background noise.Thus, mixed signals need to classify separately. Researchers have developed many algorithms to solve this problem keeping in mind with their characteristic features of music signals: by timbre, harmony, pitch, loudness etc. **3, MARCH 2002 written by Peter Asbeck, *Fellow, IEEE*, Ian Galton, *Member, IEEE*, Digital Signal Processing—Up to Microwave Frequencies**

Digital logic integrated circuits are advancing toward ever higher speeds of operation. Clock frequencies already exceed 1 GHz in some Si CMOS-based consumer products, and even higher speeds are attainable in specialized technologies, such as those based on GaAs, InP, and SiGe bipolar and field-effect transistors. Digital approaches may be used to carry out a variety of functions important in microwave systems, including signal generation, filtering, and frequency conversion.

Sasikumar Gurumurthy #1, Vudi Sai Mahit #2, Rittwika Ghosh #3 in 2009 Analysis and simulation of brain signal data by EEG signal processing technique using MATLAB

EEG is brain signal processing technique that allows gaining the understanding of the complex inner mechanisms of the brain and abnormal brain waves have shown to be associated with particular brain disorders. The analysis of brain waves plays an important role in diagnosis of different brain disorders. MATLAB provides an interactive graphic user interface (GUI) allowing users to flexibly and interactively process their high-density EEG dataset and other brain signal data different techniques such as independent component analysis (ICA) and/or time/frequency analysis (TFA), as well as standard averaging methods. We will be showing different brain signals by comparing, analysing and simulating datasets which is already loaded in the MATLAB software to process the EEG signals.

[3] Tools & Technology

Hard Ware Requirments

- CPU (1 GHZ)
- RAM (1 GB)
- HARD DISK (5GB FREE SPACE)

Software Requirement

- Windows 7/8
- MATLAB

MATLAB

MATLAB is a high-performance language for technical computing. It integrates computation, visualization, & programming in an easy-to-use environment where problems & solutions are expressed in familiar mathematical notation. Typical uses include: Math & computation.

MATLAB (**Mat**rix **Lab**oratory) is a multi-paradigm numerical computing environment & fourth-generation programming language. Developed by MathWorks, MATLAB allows matrix manipulations, plotting of functions & data, implementation of algorithms, creation of user interfaces, & interfacing with programs written in other languages, including C, C++, Java, Fortran & Python.

The rapid development of information technology has directly impacted on techniques in image processing techniques & implementation of survey processing systems. This main development has been shifted from mainframe system to PC platform. User now could easily perform all kind operations & processing techniques ranging from small scale to large scale statistical operations.

Syntax

The MATLAB application is built around MATLAB language, & most use of MATLAB involves typing MATLAB code into Command Window (as an interactive mathematical shell), or executing text files containing MATLAB code, including scripts and/or functions.

Variables

Variables are defined using assignment operator, =. MATLAB is a weakly typed programming language because types are implicitly converted. It is an inferred typed language because variables could be assigned without declaring their type, except if they are to be treated as symbolic objects, & that their type could change. Values could come from constants, from computation involving values of other variables, or from output of a function. For example:

```
>> x = 17
x =
 17

>> x = 'hat'
```

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```
x =
hat

>> y = x + 0
y =
     104      97      116

>> x = [3*4, pi/2]
x =
   12.0000    1.5708

>> y = 3*sin(x)
y =
   -1.6097    3.0000
```

Vectors/matrices

A simple array is defined using colon syntax: *init*:*increment*:*terminator*. For instance:

```
>> array = 1:2:9
array =
 1 3 5 7 9
```

[4] PROPOSED WORK

A semi analytical method would be developed to obtain energy consumption values of both virtual MIMO & SISO based sensor networks. The energy & delay efficiencies of virtual MIMO-based sensor network would be compared to traditional SISO-based sensor network.

Main objective behind research is to represent that when extra energy overhead is given for MIMO training; proposed virtual MIMO-based communication architecture might offer substantial energy savings in wireless sensor network. Simulation model of wireless sensor network using virtual MIMO could be presented.

Objective of research is to investigate that a semi-analytical method could be developed to obtain energy consumption values of both virtual MIMO & SISO based sensor networks taking into account effect of extra training overhead required in MIMO systems.

Main Aim of research is to assure that energy & delay efficiencies of virtual MIMO-based sensor network compared to a traditional SISO-based sensor network would be computed using techniques developed for different channel propagation conditions.

ENERGY CONSUMPTION IN LONG-HAUL COMMUNICATIONS

Since wireless channels could be subjected to fading it is realistic to assume that long-haul communications in second stage of proposed scheme is over a fading channel (in particular, Rayleigh fading). However, if local communications at data collection nodes are over a very short distance, it might be realistic to assume that local communications are over an AWGN channel. If data collection sensors are located in a dense scatterer environment even short-range communication channel might best be modelled by a fading channel [1].

During local communications of sensor i, for i= 1, . . ., N_T, other $N_T - 1$ sensor nodes act as receivers. Thus, circuit energy consumption in this case is $P_{i,c}^T \approx (P_{DAC} + P_{mix} + P_{filt} + P_{synth}) + (N_T - 1)(P_{LNA} + P_{mix} + P_{IFA} + P_{filr} + P_{ADC} + P_{synth})$.The power consumed in power amplifiers during local communication is $P_{i,PA}^T = (1 + \alpha_i^T) P_{i,out}^T$, fori= 1, . . ., N_T, where transmit power $P_{i,out}^T$ is againgiven by (2) within $d = d_m$ and α_i^T is computed using $M_i^T = 2^{b_i^T}$. Note that, in computing $P_{i,out}^T$ via (2) term average energy per bit required for a given bit-error-rate, denoted by $E_{i,b}^T$, is computed differently depending on whether local communication channel is modelled asAWGN or Rayleigh fading [1].

[5] RESULT AND DISCUSSION

ENERGY CONSUMPTION IN SIGNALING SYSTEM

Code for K=2

```
M=4;
n=0.35;
E=3*(M-2*sqrt(M)+1)/(M-1);
Y=(E/n)-1;
k=2;
Ml=10000;
Nf=10;
Gt.Gr=3.1622;
f=2.5*10.^9;
c=3*10.^8;
L=(c/f);
Eb=5.01187;
B=10*10.^3;
Rs=B;
b=2;
R=b*Rs;
d=0:50:300;
Pout=((4*3.1432).^2*d.^k*Ml*Nf)*Eb*R/(Gt.Gr*L.^2);
```

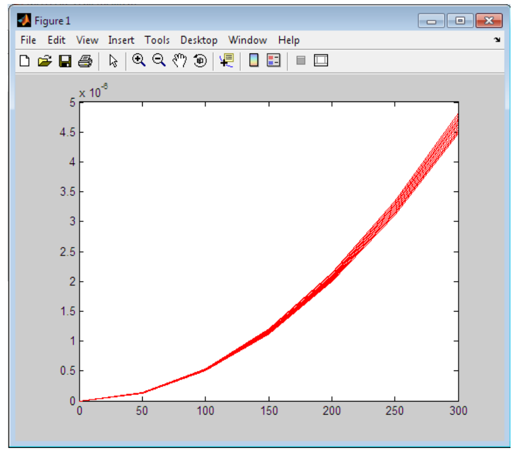

Fig 2 Energy Consumption In Signaling System for K=2

Code for k=3

```
M=4;
n=0.35;
E=3*(M-2*sqrt(M)+1)/(M-1);
Y=(E/n)-1;
k=3;
Ml=10000;
Nf=10;
Gt.Gr=3.1622;
f=2.5*10.^9;
c=3*10.^8;
L=(c/f);
Eb=5.01187;
B=10*10.^3;
Rs=B;
b=2;
R=b*Rs;
d=0:50:300;
Pout=((4*3.1432).^2*d.^k*Ml*Nf)*Eb*R/(Gt.Gr*L.^2);
PPA=(1+Y)*Pout;
n1=10;
n2=10;
```

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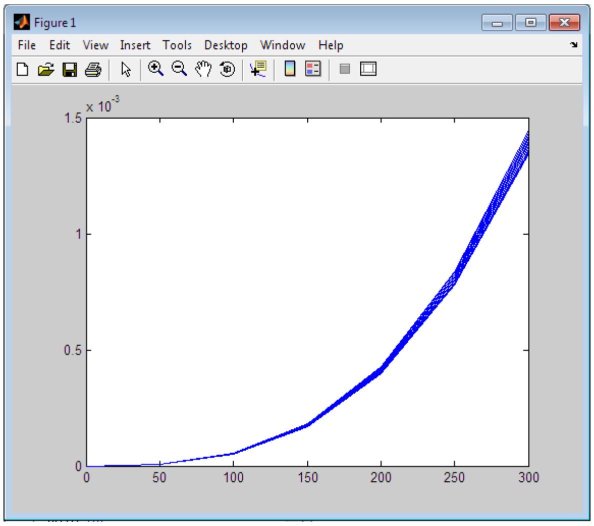

Fig 3 Energy Consumption In Signaling System for K=3

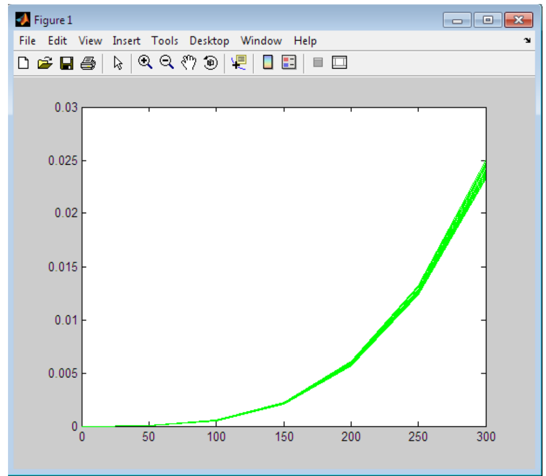

Fig 4 Energy Consumption In Signaling System for K=3.5

For k=3.5

```
M=4;
n=0.35;
E=3*(M-2*sqrt(M)+1)/(M-1);
Y=(E/n)-1;
k=3.5;
Ml=10000;
Nf=10;
Gt.Gr=3.1622;
f=2.5*10.^9;
c=3*10.^8;
L=(c/f);
Eb=5.01187;
B=10*10.^3;
Rs=B;
b=2;
R=b*Rs;
d=0:50:300;
Pout=((4*3.1432).^2*d.^k*Ml*Nf)*Eb*R/(Gt.Gr*L.^2);
PPA=(1+Y)*Pout;
```

Total Energy Consumption of 2 by 2 Virtual STBC MIMO with rate Optimized M-Qam

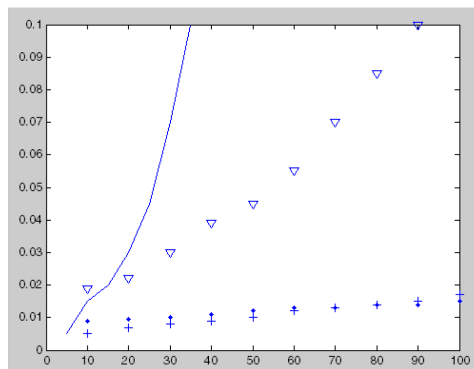

Fig 5Total Energy Consumption of 2 by 2 Virtual STBC MIMO with rate Optimized M-Qam

Long –Haul Transmission Distance in Meter (d)

MIMO: **k=3.5,p=0**	-
MIMO: **k=3,p=0**	V
MIMO: **k=2,p=0**	+
SIMO: **k=2,p=0**	.

CHANGE IN DISTANCE

We need to change distance d to represent all MIMO curve on same chart

Change in distance 300 if k=2

M=4;

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n=0.35;

E=3*(M-2*sqrt(M)+1)/(M-1);

Y=(E/n)-1;

k=2;

Ml=10000;

Nf=10;

Gt.Gr=3.1622;

f=2.5*10.^9;

c=3*10.^8;

L=(c/f);

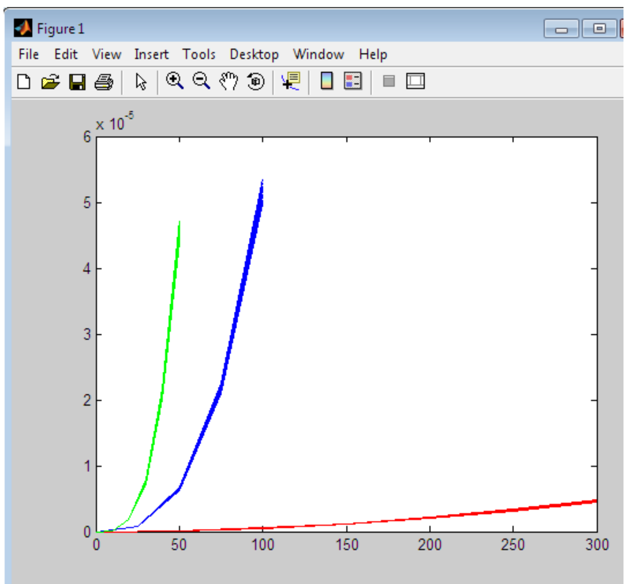

Fig 6 Change In Distance

Total Energy Consumption of 2 by 2 Virtual STBC MIMO with rate Optimized M-Qam

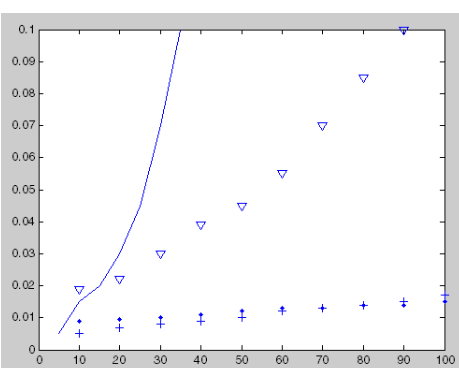

Fig 7 long Haul Transmission Distance in Meter

Long –Haul Transmission Distance in Meter (d)

SISO: **k=3.5,p=0**	-
MIMO: **k=3.5,p=0**	V
SISO: **k=2,p=0**	+

[6] CONCLUSION

Wireless sensor network has gained popularity world-wide consideration in recent years. Micro-Electro-Mechanical systems (MEMS) technology has supported the development of intelligent sensors. Networks of interconnected wireless devices having built-in processing, storage and radio-frequency sensors and antennas that are considered embedded into physical environment to provide solutions of many points over large spaces is known as Wireless sensor network. .

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