**SEGMENTATION IN RETINAL IMAGES BY COMPARATIVE STUDY OF MOMENT INVARIANTS – BASED FEATURES WITH PCNN USING SUPERVISED METHOD**

B.S.V.Swati (121333001) (Digital System)

Project Guide: Yogita M. Vaidya

**ABSTRACT**

This project presents a supervised method for blood vessel detection in digital retinal images. This method uses a PCNN and SVM for pixel classiﬁcation and computes a 7-D vector composed of gray-level and moment invariants-based features for pixel representation. The method is evaluated on the DRIVE databases, since they contain retinal images where the vascular structure has been precisely marked by experts. Method performance on both sets of test images is better than other existing solutions in literature. The method proves especially accurate for vessel detection. Its effectiveness, robustness with different image, together with its simplicity and fast implementation, make this blood vessel segmentation proposal suitable for retinal image.

Blood vessel extraction from retinal fundus images is one of the important tasks in the development of computer-aided diagnostic system for ophthalmologists. Here we have presented an algorithm for extraction of blood vessels of retinal fundus images and the comparison of different moment invariants used for the extraction of features for the vessel pixels. The algorithm uses PCNN for distinguishing between vessel pixels and the non-vessel pixel. The moment invariants used are geometric, complex, Legendre and Zernike.

Chapter 1 gives a brief introduction to the Diabetic Retinopathy and the databases used.

Chapter 2 gives the literature review of the previous works conducted.

Chapter 3 discusses about the proposed methodology for the conduct of work.

Chapter 4 contains results and discussion in the form of tables, figures and graphs.

Chapter 5 summarizes the work and concludes with further work presented.

Keywords: Retinal fundus image, Moment invariant, PCNN, SVM.

***Hybrid Depth Map Generation Algorithm for 2D to 3D***

Akshata Bagwe

Mis NO. 121333002

In recent years, many new progresses in the 3D imaging have been made but most of them provide more practical solutions to comply with the commercialization efforts of the 3D imaging. Based on time-multiplexing, revisiting the stereoscopic imaging methods is one of the solutions to make possible each view image has the full panel resolution. The rapid progresses of high speed LCDs and the initiation of stereoscopic imaging service to mobile phones have made the method possible. There is a lot of research work going on the recent technologies for DIBR and 2D to 3D conversion. However, traditional 2D video contents are captured by one camera, and in order to synthesize the left and right views as the behavior of two cameras, depth map information is required. In this report we propose an algorithm to generate a depth map from the monocular view using the motion information between the two consecutive frames, the linear perspective and the temporal difference. The generated depth map by this proposed algorithm also takes into account the motion information of the moving objects as the object which moves attracts more attention. From the experimental results, execution time can be reduced by 30% and the depth perception score is between 80 and 90. Thus, the human eye cannot sense the noticeable differences from the final 3D rendering. Furthermore, it is very suitable to apply our proposed hybrid algorithm to 2D-to-3D conversion in 3D displays.

**STUDY OF VARIOUS FACTORS AFFECTING THE ELECTRONIC SYSTEM AND THEIR TEST AND STANDARDS**

**Rangnath S Girhe (121333004) (Digital System)**

**Guide: Prof. P. W. WANI**

**ABSTRACT**

If you see the every laptop charger or every electronic goods you will find there are certain symbol are mark on this like CE,CCC and U/L and many more. The every symbol used is having particular significance and give customer assurance that the product they are using is safe and reliable. This symbol you can get by following certain rules set by International Electro-technical Commission (IEC), Federal Communication Commission (FCC), and International Special committee for Radio Interference (CISPR) .This project is basically study of those rule and designing the product according to those rule and verifying whether the product it meet all rule. The aim of this project is to increase the reliability of electronic product used in control system and study the concept of robust electronics system design to enhance the immunity to various failure parameter by studying the various causes of failure in some control system and also to study associated IEC standard and their test procedure. This project is study about what are the effects of temperature, vibration, humidity, and electromagnetic noise on the electronic system. And most important EMI/EMC standard that is legal aspect required if you want to sell product in any country. This project is study about IEC 61000-4-2, IEC 61000-4-3, IEC 61000-4-4, IEC 61000-4-5, IEC 61000-4-6 EMI/EMC standard and the test related to this like electrostatic discharge test(ESD),Electrically Fast Transient (EFT)Test, Conducted RF test,

**Bidirectional Single Phase Inverter**

Pooja S. Gulavani

121333005

Guide: Mrs. Vaishali Ingale

**Abstract**

This dissertation report presents the design and implementation of a MOSFET power switch based bidirectional single phase inverter for domestic use using RL78G14 microcontroller of Rennes’s make. The same power stage works as inverter when mains supply is not available and works as charger when mains supply is available. Pulse width modulation technique is used to generate gate pulses for the MOSFETs. Efforts are made to obtain better load regulation. Five stage algorithms are employed for efficient charging of battery.

**Keywords: PWM, Dead band, control, charging algorithm**

Design and Generation of Architecture for 2-select Arbiter

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Name of Guide: Dr. Vibha Vyas

ABSTRACT

This work is focused on architecture design and implementation of area efficient 2- select arbiter. Generally Arbiter resolves conflict for single resource by multiple clients. In high throughput systems multiple requests must be resolved in single cycle. This work propose new architecture with optimized area design for 2 selector block of arbiter which is designed by modification of parallel prefix networks used in fast adder designs. Previous designs implemented using such network were using two layered topology to select two high priority requests. Also their basic unit block was not scaled with increase in request vector. This design is able to select two request using optimized area tree networks by using duel pointers to select each request.

The architecture is designed in such way that in every arbitration cycle up to two active requests will be granted. This work also proposes new method of arbitration for 2 selector\ block which is similar to Round Robin method. This method is able to maintain fairness among requesters by RRA definition.2 selector blocks is used to update the pointers such that the fairness is maintained for next arbitration cycle.

The attempt in work is to provide an introduction to the basic concepts which will provide the foundation for today’s arbiter design techniques and to summarize the current practice. The focus of this document is on previous arbiter designs and their implementation along with new design. Some work is done to write generator code to generate each design including proposed design for variable request vectors as per user requirement. Finally comparison results with various architectures in terms of area and timing is provided.

# Project title: Automatic determination of DDLS for glaucoma detection

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Specialization: Digital Systems

Guide: Mrs. Y. M. Vaidya

# ABSTRACT

In this thesis we propose the algorithm for automatic detection of the Optic disc and cup in the retinal fundus images and find the rim to disc ratio and evaluate DDLS i.e. stage of glaucoma.

Automated retinal fundus image analysis is emerging as an important screening tool for early detection of eye disease. In this automated analysis, some factors need to be considered in order to get better analytical results. We present in this project methodology to extract exact boundary of OD & Cup in digital retinal fundus images. Using this OD candidate we find area of interest i.e. area surrounding OD & cup. Then removal of blood vessels, which is major reason for distraction of finding OD candidate, using Bottom Hat Transform using linear structuring element at different angles. Active Contour model algorithm is used to find exact boundary of optic disc. Circular Hough Transform is used to define initial approximate boundary to implement Active Contour model algorithm. Optic cup shows better contrast in ‘a’ plane of Lab color space which is used for detection of cup. First this ‘a’ plane is eroded to smooth cup and then threshold to detect cup. Edge detection of detected optic disc and cup is done evaluate DDLS.

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Content Aware Based Motion Estimation For x265

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MIS No:121333008

Guide:

Prof.Mrs. V. N. More

**Abstract**

Multimedia has experienced massive growth in recent years due to improve-

ments in algorithms and technology. As the costs for both processing power and memory

have reduced, network support for coded video data has diversiffed,and advances in video

coding technology have progressed The need has arisen for an industry standard for com-

pressed video representation with substantially increased coding effciency and enhanced

robustness to network environments. An important underlying technology is video coding

and in recent years, compression effciency and complexity have also improved signiff

cantly.

Broadcast television and home entertainment have been revolutionised by the ad-

vent of digital TV and DVD-video. These applications and many more were made possi-

ble by the standardisation of video compression technology. Video compression or video

encoding is the process of reducing the amount of data required to represent a digital

video signal, prior to transmission or storage. This allows a more effcient storage and

transmission of the data. The opposite operation, decompression or decoding, recovers a

digital video signal from a compressed representation, prior to display.Video compression

is essential for any application in which storage capacity or transmission bandwidth is

constrained.

The problem with H.264,is that while it can handle various types of encodes, it

cant do so while simultaneously keeping file sizes low. A new standard is necessary to

push file stream sizes back down while driving next-generation adoption, and thats where

H.265 comes in. It is designed to utilize substantially less bandwidth thanks to advanced

encoding techniques and a more sophisticated encoder model. x265 is to become the

best open source H.265 encoder,with the highest compression effciency at the highest

performance,while also allowing commercial use.

The proposed motion prediction and estimation (MPE) algorithm uses the local

statistics of the neighbouring motion vectors to adapt automatically to the varying motion

fields encountered in real world video sequences. The content based MPE algorithm

projected here will be analysed using different types of standard video sequences provided

by International Telecommunication Union (ITU).The analysis will be solely based on bit

rate, peak signal to noise ratio (PSNR) and total time. The algorithm is implemented in

X.265-1.4 revised on 31st Oct 2014.

**Delay Co-ordinate and Embedding Dimensions for Different Chaotic Systems**

Suhel S. Mulla (121333009) (Digital System)

Project Guide: Prof. Emiretus A. B. Patki

ABSTRACT

The cities in the world are going big and bulky day by day. In order to improve the life of people in cites, smart city project by government of India sounds to be a good option. Smart cities can only be generated by smart devices having their own intelligence and decision making power. Also these devices have to be connected for producing a chain of connected decisions. ‘Internet of Things’ provides a great help in developing smart cities. Under IoT, an attempt is made to develop tools for Healthcare IoT which is used.

In our day to day life, we came across various systems such as atmospheric temperature or pressure, and it will beneficial for us if we know the prior behavior of the system. We have various tools which analyze the linear processes whereas non-linear tools are somewhat limited in number. But, the natural processes occurring in the world are inherently non-linear. Thus, making prediction of such systems by linear analysis tools become a tedious task and also the results obtained by this approach are not faithful. Thus, nonlinear techniques are required to do the correct analysis.

In this project, various chaotic (complex non-linear) systems are analyzed. The chaotic system data is taken from the system and from that the current status of the system is observed. Depending on the chaotic data, the mutual information in the chaotic data is calculated. The system behavior cannot be predicted if the inherent system variables within the system are not known. For that purpose the embedding dimensions are calculated to find out depth of the system variables. The system used can be any chaotic system viz. Lorentz, Rossleror Henon System. Also, an EEG data can be taken as input to study the inherent mechanism behind generation of EEG data.

The platform used is Microsoft Visual Studio 2010 and Matlab 2013a. The code regarding Lyapunov Exponent (a parameter to study behavior of non-linear systems) is written in C language is implemented on ARM cortex M3 processor Development Board. The code is successfully compiled on Keil IDE µVision V4.00d. The evaluation of embedding dimensions is carried out through matlab driven code.

**Reconfigurable System for Signal Processing**

ARVIND B MUNDE (121333010) (Digital System)

Project Guide: Prof. P.W. WANI

Abstract

In the past two decades, FPGA has been witnessed from its restricted use as glue logic towards real System-on-Chip (SoC) platforms. Profiting from the great development on semiconductor and IC technologies, the programmability of FPGAs enables themselves wide adoption in all kinds of aspects of Embedded Design.

Modern FPGAs provide the additional capability of being dynamically and partially reconfigured during the system run-time. The Runtime reconfigurability enhances FPGA designs from the sole spatial to both spatial and temporal parallelism, providing more design flexibility for advanced system features.

This paper describes the use of current day low cost Field Programmable Gate Arrays (FPGAs) for real-time signal processing in radar system. Capabilities of selected device family (Artix7 and Zynq7) are discussed with regard to different connected peripherals. The overall hardware system is described, together with individual FPGA components providing analog signal input from SMA connector and it gives to Artix FPGA through ADC convertor. Artix FPGA used for the data acquisition. We will look at the trends in signal processing that are forcing developers to re-examine the architectures they have used in the past for modified algorithms for reducing complexity and improve speed. The basic idea is designing a system in which data acquisition and data processing is performed on single board for improvement of speed and reducing total area and power.

**FPGA IMPLEMENTATION OF PAN-TOMPKINS ALGORITHM**

**MUVVA HANUMANTHA RAO (MIS No: 121333011)**

**Guide: Mrs.Vaishali.V.Ingale**

**ABSTRACT**

ECG is considered to be the standard for Heart rate monitoring and for the diagnosis of various cardiac elements. A QRS complex is the most striking feature in the ECG signal. The morphology, duration and height of QRS complex give a significant amount of information to physicians for asserting the state of art in different conditions. ECG signals are sensitive, easily contaminated by noise due to movement of artificats.

With the recent advancements in Bio-medical engineering there are number of different software algorithms proposed to automate the QRS detection using wavelets, artificial neural networks etc. There are a number of algorithms implemented using microcontrollers based designs. However it is possible to further minimize the design using FPGA. FPGAs offer rapid prototyping and reprogramming quickly.

Here in this project most popular Pan-Tompkins algorithm using digital filtering approach was implemented using Xilinx system generator. Xilinx system generator is a new tool from Xilinx to support Hardware implementation of DSP algorithms, without any knowledge onHDL languages. In this work, a series of filters likeLowpass, Highpass, Derivative, Squaring and moving window integrator are implemented on Simulink using system generator. These series of filters are helpful to remove the unwanted noise and preprocess the ECG signal.Output from this stage is input to peak detection stage where it is implemented as a FSM to locate the ‘R’ peak location. Location of ‘R’ peak is primary step in QRS interval calculation. The input to the work is downloaded from MIT-BIH Normal Sinus Rhythmdatabase available on [*www.physionet.org*](http://www.physionet.org).

**OBJECT IDENTIFICATION FROM TRAFFIC VIDEO SEQUENCE**

Chetan P. Pardeshi

MIS No-121333012

Guide: Dr. P.P. Rege

**Abstract**

Object detection and recognition are necessary components in an artificially-intelligent autonomous system. In the last few years, the advent of unmanned aerial vehicles (UAVs) for civilian remote sensing purposes has generated a lot of interest because of the various new applications they can offer. Few of them are the automatic detection and counting of cars, bikes.

Automatic Number Plate Recognition is a useful image-processing technology that identifies vehicles by their number plates without direct human intervention. It is an application of computer vision and important area of research due to its many applications. Automatic ticketing of vehicles at parking area, automatic toll collection at toll plaza, traffic monitoring, tracking vehicles during signal violation, access control in building and parking areas, border control, stolen car detection are few of the applications of number plate recognition. Such systems require the localization of number plate area in order to identify the characters present on it.

Motorcycle biker who are not wearing helmet is illegal as per law. The system which can automatically detect bikers who are not wearing helmets can have great use to traffic control department. Eventually Bike number can also be extracted and automated system to send notice for not wearing helmet biker can be designed. Here, we propose a novel bike helmet detection method.

This report describes effective methods (i) To identify moving objects and classify those objects from traffic video sequence (ii) Number plate extraction for detected cars (iii) Helmet identification from video sequence.

Keywords: **background subtraction, number plate extraction, SIFT, cascade classifier etc.**

**INTELLIGENT ORDNANCE INITIATION SYSTEM**

Aditya A. Patil

MIS No-121333013

Guide: Dr. Ashok M. Sapkal

**Abstract**

The proposed design presents a state-of-the-art design for initiating explosive devices. The design consists of a setter unit which has two level of security for avoiding mishandling of the device; two or more detonator unit consisting of an arming circuit, a disarming circuit, a firing circuit and a booster circuit for boosting the available supply voltage to the desired voltage for firing of the Electro-Explosive Devices; a communication protocol which allows two way communication with a provision for addressing each connected device with a unique identity number. A low energy Semiconductor Bridge is used in this design. The circuit is Electro-Static Discharge and Radio Frequency protected. A two stage firing trigger is used in case detonator fails to explode on first trigger. Also each detonator unit possesses decision making ability. Hence the system is referred as “Intelligent”.

Keywords: **Semiconductor Bridge, arming circuit, disarming circuit, firing circuit, boosting circuit**

**Modeling and Analysis of Self-similarity in Network Traffic**

Priyanka G. Pawar (121333014) (Digital Systems)

Project Guide: P. W. Wani

**ABSTRACT**

Prime Minister Narendra Modi’s dream of changing the urban landscape into smart cities is taking shape as the government approaches a year in office. Government of India has vision by 2022 of "100 Smart Cities - Transforming Life - Transforming India". In a smart city, energy, water, transportation, public health and safety, and other key services are managed in concert to support smooth operation of critical infrastructure while providing for a clean, economic and safe environment in which to live, work and play. Timely logistics information will be gathered and supplied to the public by all means available, but particularly through social media networks. Conservation, efficiency and safety will all be greatly enhanced.

Smart cities use information and communication technologies (ICT) to drive economic competitiveness, environmental sustainability, and general livability. By leveraging broadband as a core element of their development. The city-net is based upon wire-line and wireless broadband networks, giving access to a high-capacity (IP and optical) communications infrastructure. It becomes the basis for all government-to-government, government-to-citizen, government-to-businesses, and businesses/citizen-to-citizen communications. The smart city will invest in data-centers and a government cloud, control platforms for multimedia and machine-to-machine (M2M) communications. Combined with an open data approach and Internet of Things (IoT), these investments will enable a wealth of new applications that benefit the city and its population. Smart network design requires standard devices, good high-speed bandwidth, good architect network design, devices backup, continuous data monitoring, etc. Before implementing the actual networks in smart cities it is essential to analyze and simulate the whole network in order to ensure network performance. In this project, it is well described how to analyze any particular network, modeling of it and their simulation through self-similarity approach. So, best planning of network design should be incorporated.

Over the last 20 years, measurement, analysis, modeling and simulation of network traffic in different networks such as Ethernet LAN, WAN, video conferencing, WLAN, narrowband ISDN, E-communication, VoIP application Skype, next generation networks, network games and ATM etc. have shown presence of self-similarity which is the property of fractals, It has predominant impact on performance of networks.

The main objective of this thesis is to find efficient method which shows the degree of self-similarity and long range dependence. Hurst is the parameter which is measure of degree of self-similarity. In this thesis, I have implemented an approach using the long range dependence and self-similarity in the network traffic focused around wavelet analysis method. The algorithm is implemented in C programming language. The synthetic self-similar traffic with predefined H parameter is used as an input. Also the real-time network traffic captured using Wireshark sniffer tool is used as an input and their results are verified. Real-time implementation of the proposed algorithm using C programming language is implemented in DSP processor TMS320C6713 platform. Distribution parameters of file data sources from captured network traffic are estimated. Finally, the network traffic with estimated H parameter and distribution parameters is simulated in the most commercial telecommunication simulation tools such as the OPNET (Optimized Network Engineering Tool) modeler.

**Security Considerations in Network Traffic – Self – similarity based Approach**

Supriya M. Pharande (121333015) (Digital System)

Project Guide: P. W. Wani

**ABSTRACT**

Government of India has announced an ambitious 100 smart cities programme. A smart city uses digital technologies or information and communication technologies (ICT) to enhance quality and performance of urban services. Smart grid is one of the key components of the planned smart city initiatives in India. Internet of things (IoT) finds application in domain of intelligent energy management and smart grids.

Smart meters are the devices that autonomously collect massive amounts of data and transport it to the utility company, consumer, and service providers for different orthogonal functionalities. This data includes private consumer information and with many stakeholders has potential threat to undergo dangerous kind of security attacks. Especially, Denial of Service (DoS) types of attacks on Automatic Metering Infrastructure of IoT based Smart Grids initiatives are of serious concerns amongst the professional communities while addressing security issues. We propose a self-similarity based approach to address this aspect to detect DoS attacks.

Normal legitimate network traffic on both LANs and wide area IP networks has self-similarity feature i.e. scale invariance property like fractals. Superimposition of legitimate traffic and high intensity non-self-similar traffic results into degradation in self-similarity of normal traffic. This project uses change in self-similarity nature of network traffic to detect DoS attacks. Hurst parameter is a measure of degree of self-similarity. Rescaled range method is used to calculate Hurst parameter and its deviation from normal value.

Two inputs and one output fuzzy logic block is used to determine the intensity of Denial of Service (DoS) attack. In order to detect self-similarity, we have used synthetic self-similar data generated using Fractional Gaussian Noise process and to identify existence of Denial of Service, DARPA IDS evaluation dataset is used. This approach was used since Automatic Metering Infrastructure data sets of Smart grid are not easily available in public domain and it is estimated that it has similar characteristics like IDS Evaluation Data set. C code for statistical method is implemented on DSP Processor TMS320C6713 platform.

OPNET simulation software is used to simulate various network models. It is very large and powerful software with wide variety of possibilities that enables to simulate entire heterogeneous networks with various protocols. Simulations with this software shows the changing nature of network traffic as burstinees increases from H = 0.5 to H = 1. Thus, the whole project is to determine DoS attack intensity using self-similarity based approach.

Randomized Prediction Based Content Adaptive

Optimization For x265 Encoder

ApurwaD.Potuwar

121333016

Under the guidance of

Prof.Mrs. V. N. More

Abstract

With the explosion of digital video applications, a billion-dollar industry has developed and expanded. This trend of digital convergence creates theneed for the video encoder and decoder system, known as codec in short, thatshould support multiple video standards on a single platform.While video applications become wide-spread, there is a need for high compression and lowcomplexity video coding algorithms that preserve image quality even for UltraHigh De\_nation or 4K and 8K videos .In all video codec, motion estimation

is a key unit used for video compression which tops the chart for computational complexity and time for encoding.When considering optimization of avideo codec motion estimation unit is the most demanding considering itswide nature.Standard organizations ISO, ITO, VCEG of ITU-T, and collaborationof many companies have developed video coding standards in the past to

meet video coding requirements of the day. The Advanced Video Coding(AVC/H.264) standard is the most widely used video coding method. AVC iscommonly known to be one of the major standards used in Blue Ray devicesfor video compression. It is also widely used by video streaming services,TV broadcasting, and video conferencing applications. Currently the most

important development in this area is the introduction of H.265/HEVC standard.The aim of standardization is to produce video compression specifcation that is capable of compression twice as e\_ective as H.264/AVC standardin terms of coding complexity and quality. x265 is an open-source encoderproject which aims to deliver the worlds fastest and most computationally

e\_cient HEVC encoder.

This Masters thesis presents an algorithm involving motion estimation forx265 encoder as per the characteristics of the video sequence.Initial searchcentre prediction is done first using spatio-temporal correlation.This helps tomove the search closer to global minimum.The homogeneity analysis is the keyto this algorithm which helps in determing the search pattern to be employedas per the threshold.The early termination of the search process is adaptive

and is based on the homogeneity between the neighboring blocks. Effortsare also done to randomize the search points so as to increase the encodingspeed.The proposed algorithm provides signi\_cant bitrate saving for most ofthe video sequences while increase in PSNR is observed for high resolutionvideos.

**Title : Electronic Safety and Arming Device for Missiles**

**Name : Satish S. Shinde.**

**MIS : 121333017**

**Guide : Dr. A. M. Sapkal.**

Abstract :

Aim of this project is to design a complete electronic safing, arming and firing module  
for munitions. This module would provide means for safing operation. Depending on  
accelerometer inputs it will decide if the munitions is in the flight mode or stationary  
mode. In stationary mode arming of munitions should not be allowed as the munitions is in  
storage or have not been launched yet. In flight mode module should arm the ammunition  
only after it have travelled safest distance from launching site and also if safety timers have  
exhausted. In arming phase module should provide ambient inputs for the firing module  
to prepare the ammunition fire, Such as charging of capacitors for CDU with explosive foil  
initiator (EFI). In firing phase module should initiate the explosion of ammunition with prior  
fail-safe checks. Module should also provide means of built-in-tests to ensure the safe and  
functional working of device.

System Identification based on Chaos Theory and

Realization of a Chaotic System

Gajanan S. Thenge (121333018) (Digital System)

Project Guide: Prof. Emiretus A. B. Patki

Abstract

The current trend to implement the smart cities has its impact on vision 2020 for Digital

India. Building a smart city does restrict not to only architecture and civil construction point of view, but it has several technologic inputs, mostly from IT and electronics sector using Internet of Things (IoT). In smart cities development using IoT, Chaos Theory plays an important role. IBM is using chaos theory for Smart Cities Transportation systems. In this project system identification is done based on Chaos Theory. For the same we are generating our own data set with the help of equations. And does classification based on the data set generated. The traditional classification of system such as stable, unstable doesnt attract the researchers much. But if it falls into category of chaotic System, it gains high attention of researcher since once we are able to c assify our system in category of chaotic nature, it can be used as a pseudorandom generator or one can apply chaotic controlling techniques since conventional controlling technique fails at chaotic system. Keeping as a commercial product in view we have successfully implemented the system identification on ARM Cortex-M3 based processor Development Board. This is purely on a software side but what if, one wants to do it on hardware. On coming to part of Chaos on a hardware definitely the choice is Chuas circuit only Because of its simplicity and diversity in dynamics. This project includes the simulation results of Chuas circuit on NI Multisim. The platforms used are Microsoft Visual Studio 2010, NI MultiSim and Keil IDE Vision V4.00d. The code regarding Lyapunov Exponent is written in C language is implemented on ARM cortex M3 processor Development Board. The code is successfully compiled on Keil IDE

Vision V4.00d.