DELAY TOLERANT DATA LOGGER

Student group

ASHRAY NAIK 10ECE057

VINEET REVANKER 10ECE066

Faculty Adviser : REMYA RAHUL and Vasantha M.H.

ABSTRACT

The rural areas mostly have scares or no wireless connection of that any sort. So now to send some message from one place to another we have to implement what is known as a delay tolerant network. Data loggers are widely used devices for continuous monitoring of data such as temperature, humidity etc. But most of the times these devices need to be set up in areas offering no GSM or GPRS connection and high risk to human life. Thus we have clubbed these two aspects together to retrieve logged data from those connection arid or risky areas. The idea is to send a mobile robot to retrieve the information from the logger wirelessly. As the robot cannot be controlled in a remote location, (without GPRS or GSM connectivity), a line follower is used to retrieve the information. The robot will halt whenever it detects a node which is ready to transmit its data. The data is stored on a SD card on the robot which can later be downloaded to a computer via RS232 serial link using hyper Terminal.

Design Of 0.5V Low Power Low Pass Filter For Biomedical Signal Processing

Student Group

SANKET BALE (10ECE042)
GANDHAR KAMAT (10ECE054)
SAURABH NAIK (10ECE058)
TEJAS RAUT DESSAI (10ECE065)

Adviser Name: Vasantha M.H.

Abstract

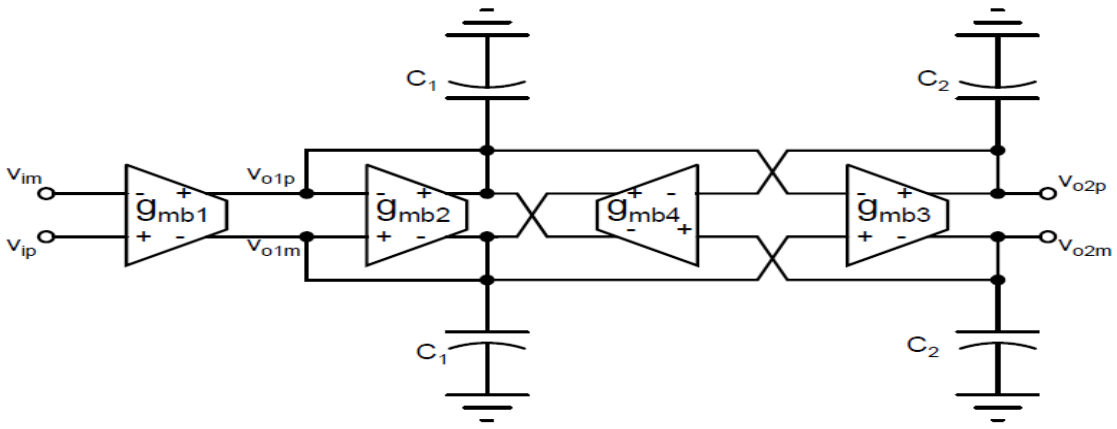
Biomedical engineering requires electronic systems for interfacing with biological systems that need to be power efficient, fast and reliable with no room for error. It also involves working with very low frequencies, mostly under a few hundred hertz. Most of the signals especially in the human body such as pulse, EEG, ECG etc. fall in this range.

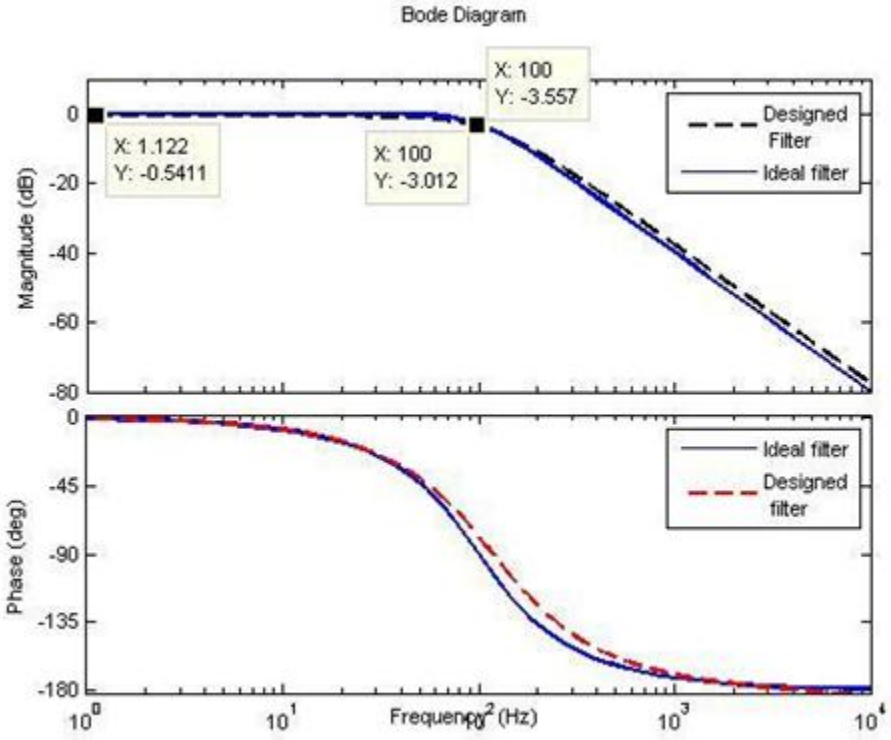
Filters being an essential front end component of signal processing, power efficient filters for biomedical devices is a need of the hour. Low cutoff frequencies call for active filters with large time constants. Also power efficient system implies devices can be made portable which is of paramount importance when we deal with biomedical devices that are fitted within the human body and rely on batteries for their power supply, for example a pacemaker.

After evaluating several filter implementation options we designed a 2nd order butterworth filter following the Transconductor-Capacitor (Gm-C) topology. We have successfully implemented a 225nW CMOS linear Gm-C 2nd order Butterworth filter operating at 0.5 volts in weak inversion for cut off frequency of 100Hz for low voltage applications.

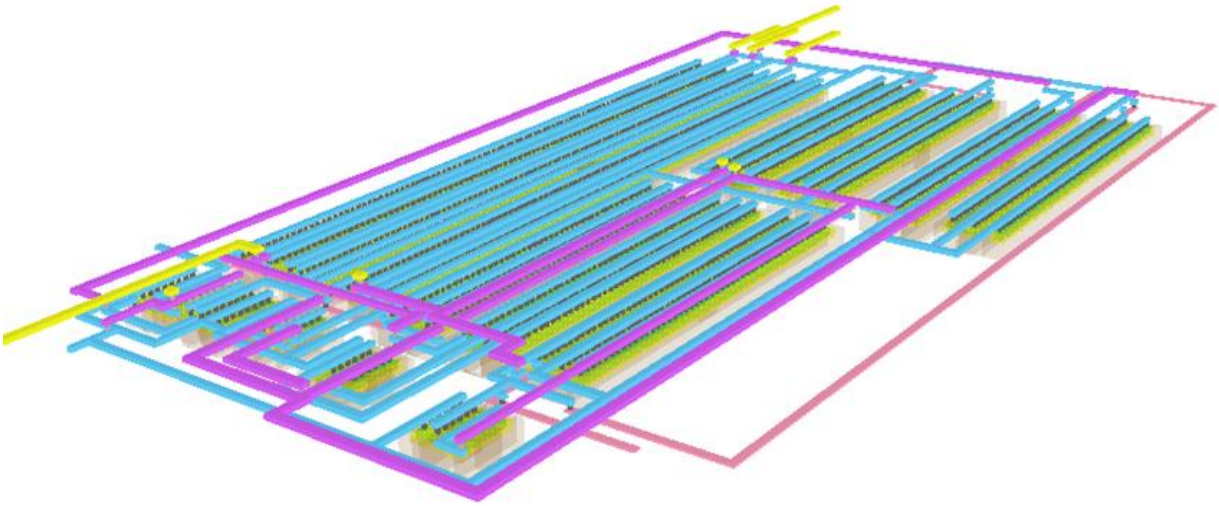
The circuit has been simulated in *LtSpice* and layout has been implemented and tested in *Electric VLSI Design System.*

Architecture/Simulations Graphs





Layout in Electric



Parameters of the designed 2nd order Butterworth low pass filter

Bandwidth[Hz]	100
Order	2
Technology	180nm
Topology	Gm-C
Supply Voltage[V]	0.5
Power dissipated [nW]	225
Quality Factor(butterworth)	0.707
Output Amp. @ 1% THD [mV]	121 p-p
Dynamic range @1% THD[dB]	74.62
FOM [fJ]	0.055

Title: SIGNAL PROCESSING APPLICATION TO FINANCIAL DATA

Student Group: Aaruni Chawla (10ECE034)

Amonkar Gourish (10ECE039)

B. Venkat Suhas (10ECE044)

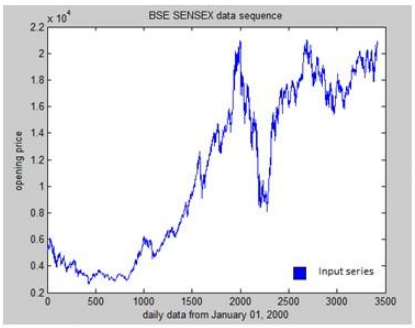
Usha (10ECE073)

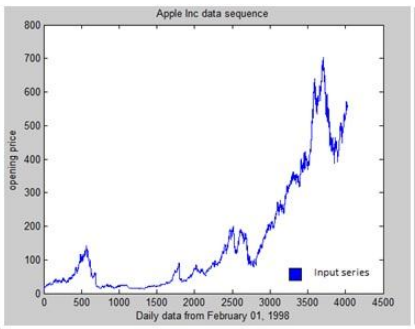
Project Mentors: Dr. Lalit K. Jiwani

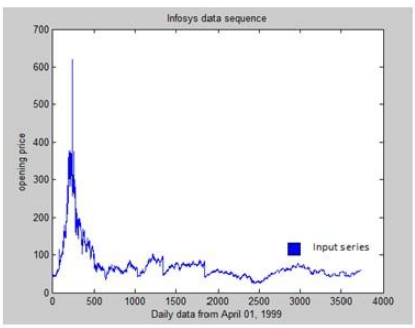
Dr. Ajaya Kumar Panda

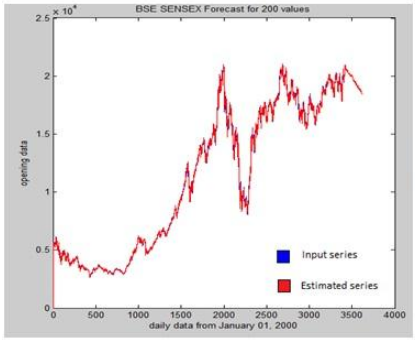
Abstract:

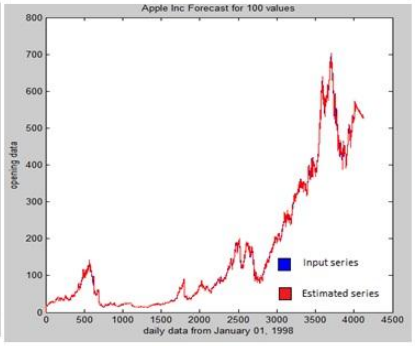
Financial market generates large quantities of high-frequency data which must be analyzed to perform trading decisions. The market is hit by all the events occurring across the globe but reacts only to significant and substantive news. Hence, we attempt to study financial market data by having a pre-processing stage to clean and present the raw price information as a homogeneous regularly spaced time series. This is essential so that there is no transfer of spurious features to the following analysis stage. The time series is further analyzed using various prediction models based on dependency between the input data such as Forward Prediction Model, Backward Prediction Model and Autoregressive Moving Average Model and Time Series Prediction using descriptive statistics. Various estimations are carried out using different threshold values of the properties of the data set. The optimum model generates minimum error and maximum SNR and is used to carry out forecast of future values of the data. Optimum models for long term forecasts and short term forecasts are different.

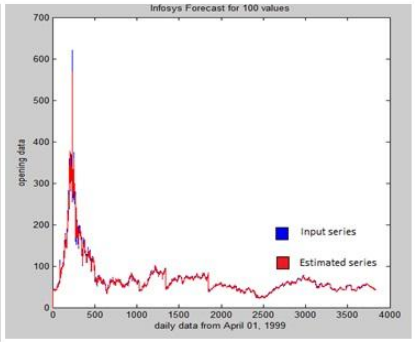

BSE SENSEX data sequence
x 10^4
opening price
daily data from January 01, 2000
Input series


Apple Inc data sequence
opening price
Daily data from February 01, 1998
Input series


Infosys data sequence
opening price
Daily data from April 01, 1999
Input series


BSE SENSEX Forecast for 200 values
x 10^4
opening data
daily data from January 01, 2000
Input series
Estimated series


Apple Inc Forecast for 100 values
opening data
daily data from January 01, 1998
Input series
Estimated series


Infosys Forecast for 100 values
opening data
daily data from April 01, 1999
Input series
Estimated series

Tri-copter an Unmanned Aerial Vehicle

Student Group

Akhil Gupta: (Roll No: 10ECE036)

Phadte Aniket Vinod: (Roll No: 10ECE061)

Pranav Peethambaran: (Roll No: 10ECE063)

Faculty Adviser: Vasantha M.H.

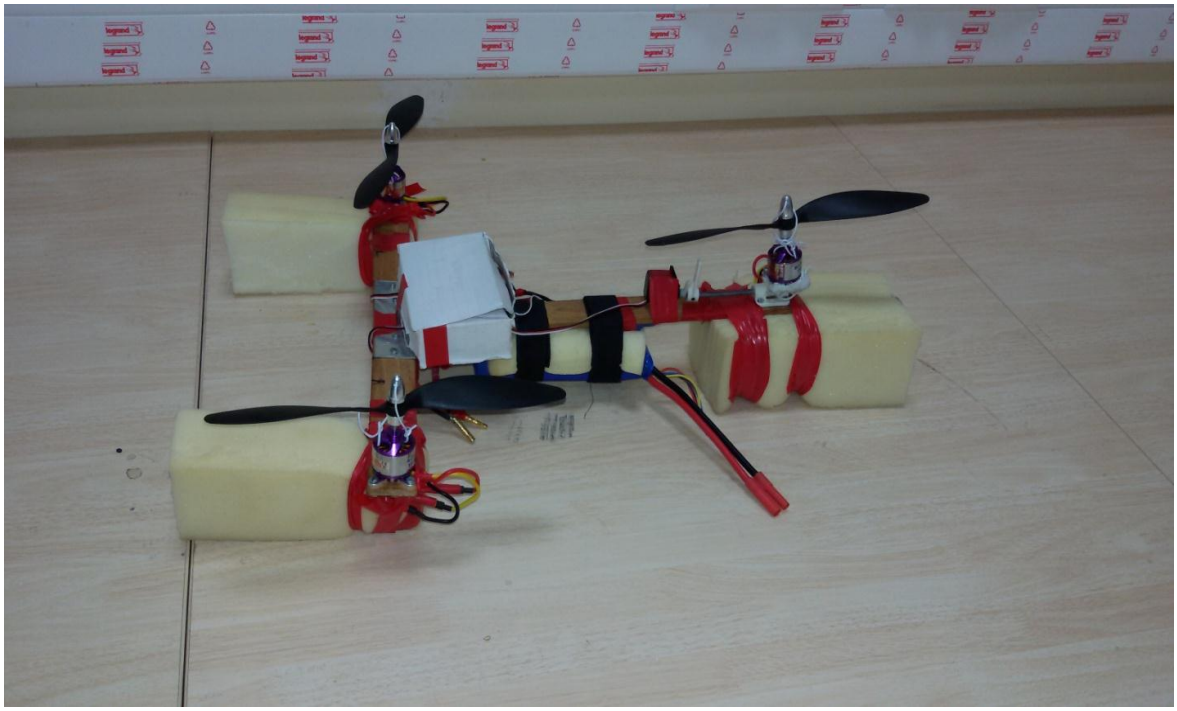
ABSTRACT

To develop an automated tri-copter on which various sensors modules can be airborne according to the applications. The flight of the tri-copter is controlled using the laptop in which a serial terminal is configured according to the transceiver specifications. The input signals will be sent via 2.4 GHz serial link UART RF module. The sensors will help to get the data which will be processed by the microcontroller & sent to the laptop via 2.4 GHz serial link UART RF module.

The IMU Unit consists of four sensors i.e. accelerometer, gyroscope, barometer and magnetometer. The flight and the stability of the tri-copter is controlled by the gyroscope and accelerometer present in the flight controller board. The gyroscope (attached with the inbuilt temperature sensor) is also used to get the temperature of the surrounding environment. The accelerometer is used to get the change in angle i.e. roll, pitch and yaw.

The 2.4 GHz serial link RF module has the range of maximum of 100m. it can support baud-rate of 9600bps, 19200bps, 38400bps and 57600bps.

Snap shots of Designed Tri-copter



Video Encoding Using Inter Frame Prediction Method

Student Group: B. Naga Manoj (10ECE043)
G. Vinay Kumar (10ECE049)
J. Krishna Kanth Rao (10ECE051)
S. Sriharsha (10ECE072)

Supervisor (s): Dr. Lalit .K. Jiwani

ABSTRACT: There is an explosive demand on the multimedia content worldwide. The amount of data generated in terms of speech, audio, images and video is growing. In this scenario video data volume is highest in terms of use on internet and other media. The raw video data is considered to be highly redundant. This demands for large storage and also requires large bandwidth for transmission. This growth on video data necessitates the need of efficient compression algorithms for video encoding. The main objective of any video coding mechanism is to develop efficient algorithms for compressing videos in such a way, that they occupy least amount of memory without much trade-off in quality. This will bring about efficiency in resource management, both in terms of using storage as well as bandwidth.

The process of compression is broadly divided into two types depending on type of redundancies it removes. In the intra-frame method, a redundancy in a given frame is removed and in inter-frame method, the redundancy in adjacent frames is removed. In this project work our emphasis is on developing an inter-frame compression scheme. In this method, a frame is expressed in terms of one or more neighbouring frames. There are number of methods available in the literature and are mostly exploiting the motion in the adjacent frames. This motion is described on a block by block basis. The motion estimation is one of the important methods for inter – image redundancy removal. The state of art video compression methods like MPEG-4 and H.264 uses this block based approach.

There are various models of motion based encoding of the video data. In this work we want to exploit long term dependency for motion estimation. This has the potential of providing required compression efficiency to support the demand of future multimedia applications. As a first phase we would be implementing an existing standard compression technique and then come up with an improved inter prediction system by developing new algorithms and coding techniques.

REFERENCES:

1. Digital Image Processing, 2/E; by Rafael C. Gonzalez and Richard E. Woods.
2. H.264 and MPEG-4 Video Compression: Video Coding for Next-generation Multimedia by Iain E. Richardson.

Video Encoding by Intra-Prediction

Student group: Reuben Carvalho (10ECE045)
Kenneth D'souza (10ECE047)
Rohan Singh (10ECE071)

Supervisor (s): Dr. Lalit K. Jiwani

ABSTRACT: In the digitally driven world of today, the amount of information available has increased exponentially. Such growth brings about a natural demand for resources. However, the memory resources are limited and need is increasing as new applications are increasingly used by users. Therefore, we require our data to occupy the minimum possible space. The main objective of a compression scheme is to develop a compression method in such a way, that they occupy less amount of memory. This increased compression efficiency helps in resource management, in terms of using storage, communications and processing.

Main aim of any video compression is the process of eliminating redundancy in videos such that, size of the video file/data decreases, without showing any noticeable change in quality. This redundancy is due to similarity in a frame of video or across the frames. The compression process can be lossy or lossless. In lossless video compression, the video has same characteristics after compression, and only the data stream's statistical redundancy may be removed (by encoding). By lossy video compression, some of the characteristics of the video are removed permanently and new artifacts may be introduced. Main aim is to provide compression without noticeable change in video quality.

The process of compression is broadly divided into two categories: 1) inter-frame (between each frame) and 2) intra-frame (within each frame). Our aim in this project is to work on intra-frame compression method. In developing an intra-frame compression method, the spatial redundancy is removed. One of the directions of work will be exploring the directional properties of the images. The aim of the project is to first implement a encoding/decoding mechanism in software.

Present standards use coding and prediction to compress an image. This may be done by transform (wavelet, direct cosine) coding. In non-adaptive prediction coders, a fixed set of prediction coefficients are used across the entire image. In adaptive coders, one updates the correlation coefficients and hence the prediction coefficients are based on local samples. Our aim is to create an appropriate system for our needs.

REFERENCES:

1. Digital Image Processing, 2/E; by Rafael C. Gonzalez and Richard E. Woods.
2. H.264 and MPEG-4 Video Compression: Video Coding for Next-generation Multimedia by Iain E. Richardson

Wireless Home Automation System

Synopsis:

Home automation, home control, smart or digital home are just different names for comfort, convenience, security and power saving. These systems are of increasing importance these days. Even though such systems are very expensive in general, they can also be very economical if one designs and construct them for very specific needs. There are many ways to control a smart home system, including wireless communication over internet. This project will help in creating a new generation of smart homes in which user can control the home appliances such as Refrigerator, Air Conditioner, Fans, and Bulbs etc. whenever they want and from wherever they are with the aid of Internet. This can be extended to mobile apps also in the open source platforms like Android. The apps can be used to create a user interface using which one will be able to control home appliances via their Smartphone.

There are 3 major modules which are required to build this system, that are: Client Server, Radio Frequency Transceiver and Microcontroller. This system can be accessed by internet by using Personal Computer or Smartphone. This project consist of two parts Hardware and Software. Hardware refers to the development of the device itself including circuit construction, printed circuit board etching and soldering process. Software part refers to the designing algorithms, coding and compilation. It also includes development of user interface.

Team Members:

- Aman Kumar Sharma (10ECE037)
- Aman Niranjan (10ECE038)
- Anuraag Tandel (10ECE040)
- Pramod Kumar Tiwari (10ECE062)

Supervisor's Name:

- Mrs. Varada Potnis Kulkarni

References:

- http://www.eee-lab.com/microcontroller/avr-microcontroller/196-an-example-of-ethernet-based-control-system-with-avr-micro-controller.
- http://library.utem.edu.my/index2.php?option=com_docman&task=doc_view&gid=4706&Itemid=208.
- Armando Roy Delgado, Rich Picking and Vic Grout , **"Remote-Controlled Home Automation Systems with Different Network Technologies" ,** Centre for Applied Internet Research (CAIR), University of Wales, NEWI, Wrexham, UK.
- R.Piyare, M.Tazil, Department of Electrical & Electronics Engineering Fiji National University. **"Bluetooth Based Home Automation System using Cell Phone" ,** IEEE 15th International Symposium on Consumer Electronics, 2011 .

PATIENT MONITORING AND EMERGENCY ALERT SYSTEM

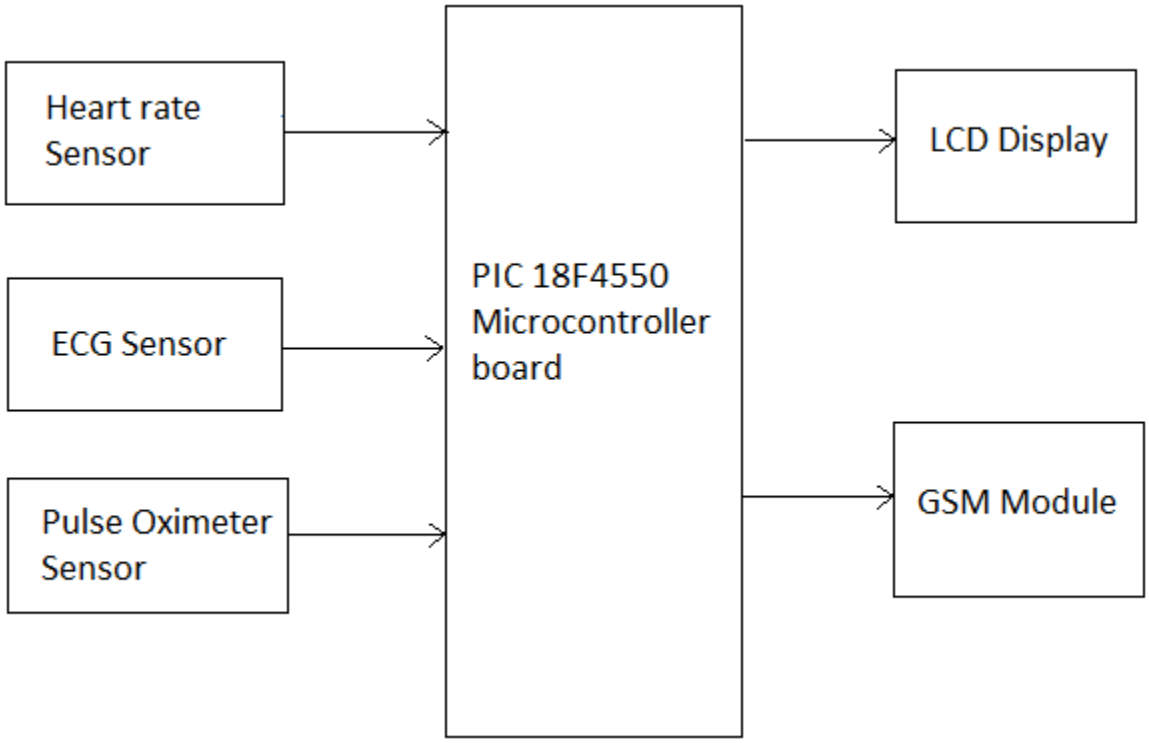
Student Group : JYOTI SHARMA (10ECE053)
EESHA K. TARCAR (10ECE055)

Name of the Advisor : Vasantha M.H.

Abstract

Patients in hospital Intensive Care Units (ICUs) have to be monitored constantly to ensure their safety. The supervising doctor has to visit the monitoring station, usually in the patient's room, to get readings of the patient's vital signs. At other times, the doctor usually has no information of the patient's progress, and must be paged by a human in case of emergencies. A far better system would be one that keeps the patient's information available to the doctor at all times, typically through the use of a handheld device. The doctor can then check on his/her patient's progress in real time. Should an emergency arise, the doctor can be paged directly by the monitoring system itself. The aim of this project is to set up such an infrastructure for monitoring patients in hospital ICUs.

BLOCK DIAGRAM



Heart beat monitor:

The patient's heart beat rate is monitored using piezo sensor (heart rate sensor) which can sense the patient's pulse rate. This method of tracking the heart rate is more efficient than the traditional method which derives the same from ECG graph.

Electrocardiogram:

The basic objective of ECG is to deduce the electrical and mechanical condition of the heart by making non-invasive body surface potential measurements. A three lead ECG (ECG sensors) monitoring system is used in this project with voltages measured from two sensors kept at various parts of the body. These voltages are signal conditioned and given to the PC through a PIC. The three leads used are silver electrode.

Pulse oximeter:

The patient's oxygen saturation is monitored using photoelectric sensor which can sense the patient's amount of oxygen in blood.

LCD Display:

Liquid Crystal Display which is commonly known as LCD is an Alphanumeric Display it means that it can display Alphabets, Numbers as well as special symbols thus LCD is a user friendly Display device which can be used for displaying various messages unlike seven segment display which can display only numbers and some of the alphabets. The only disadvantage of LCD over seven segment is that seven segment is robust display and be visualized from a longer distance as compared to LCD

GSM Module:

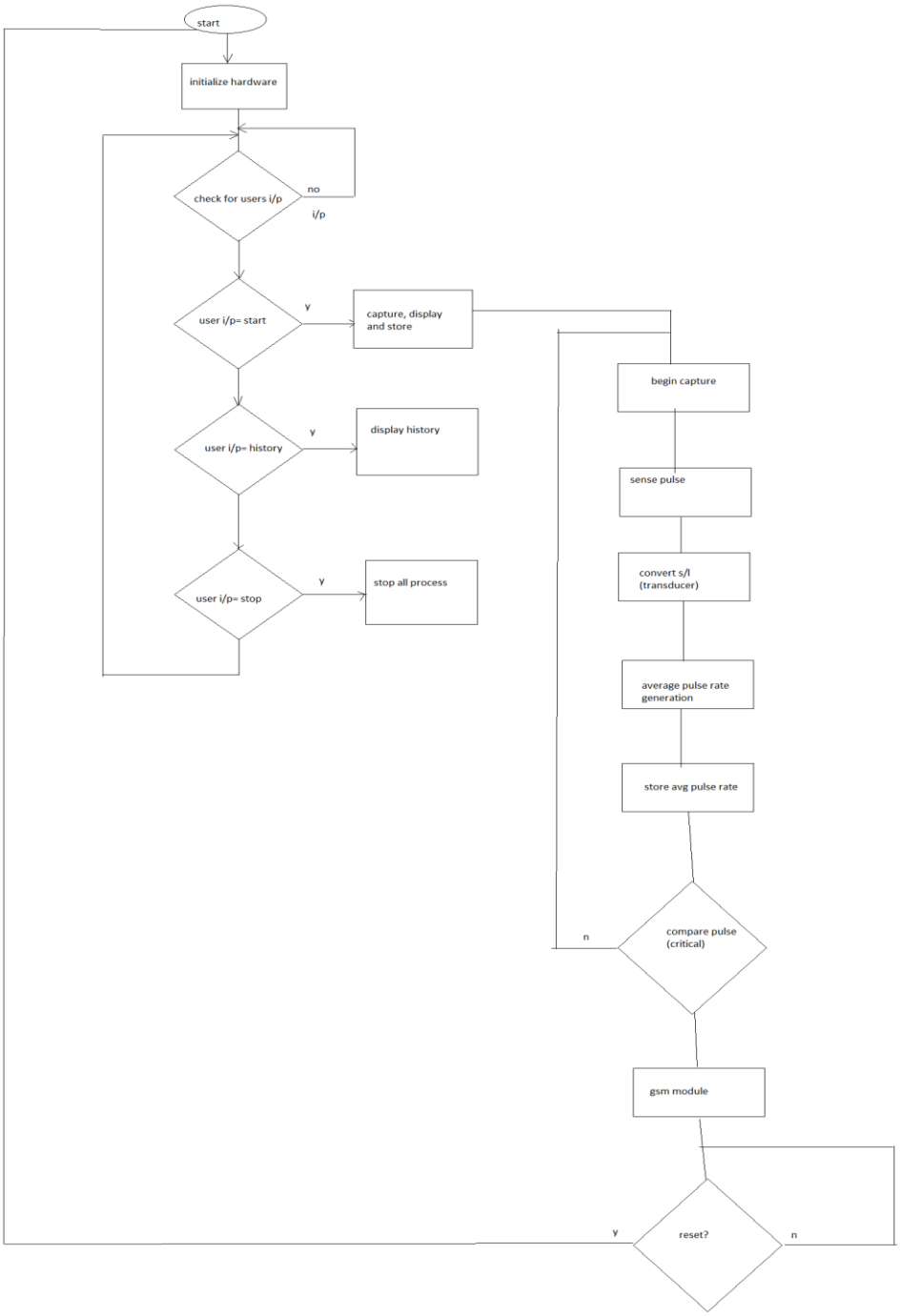
GSM interface is the additional feature provided for this system. It is used as a enhancement. In this the present readings taken through the sensors are given to the GSM modem for further manipulations and calculations.

GSM (Global System for Mobile Communications: originally from *Group Special Mobile*) is the world's most popular standard for mobile telephony systems. The GSM Association estimates that 80% of the global mobile market uses the standard. GSM is used by over 1.5 billion people across more than 212 countries and territories. This ubiquity means that subscribers can use their phones throughout the world, enabled by international roaming arrangements between mobile network operators. GSM differs from its predecessor technologies in that both signaling and speech channels are digital, and thus GSM is considered a *second generation* (2G) mobile phone system. This also facilitates the wide-spread implementation of data communication applications into the system.

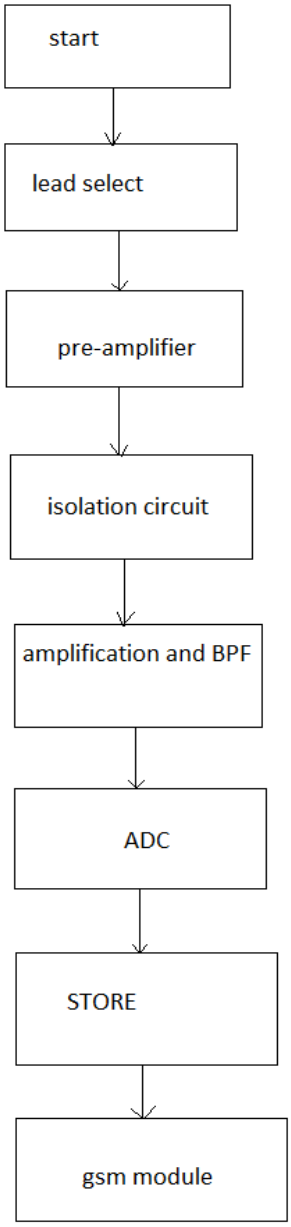
The GSM standard has been an advantage to both consumers, who may benefit from the ability to roam and switch carriers without replacing phones, and also to network operators, who can choose equipment from many GSM equipment vendors. GSM also pioneered low-cost implementation of the short message service (SMS), also called text messaging, which has since been supported on other mobile phone standards as well. The standard includes a worldwide emergency telephone number feature

CIRCUIT FLOWCHARTS

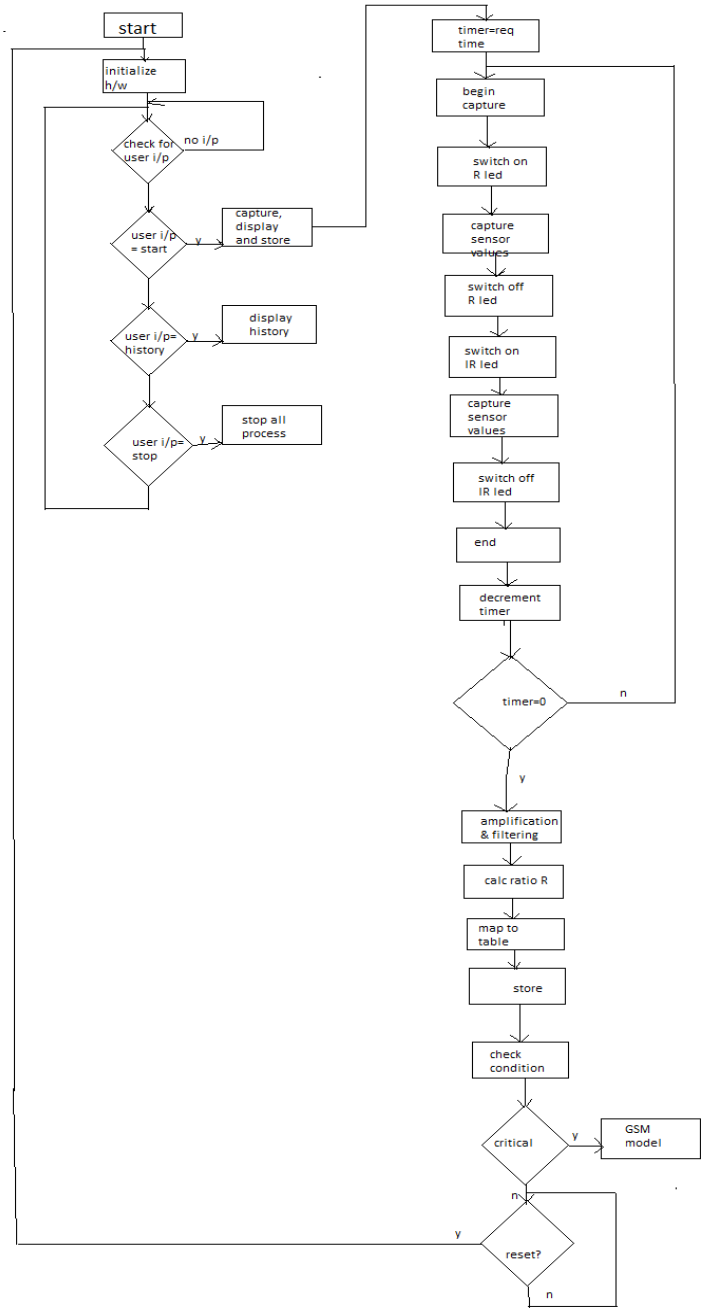
1) HEART RATE



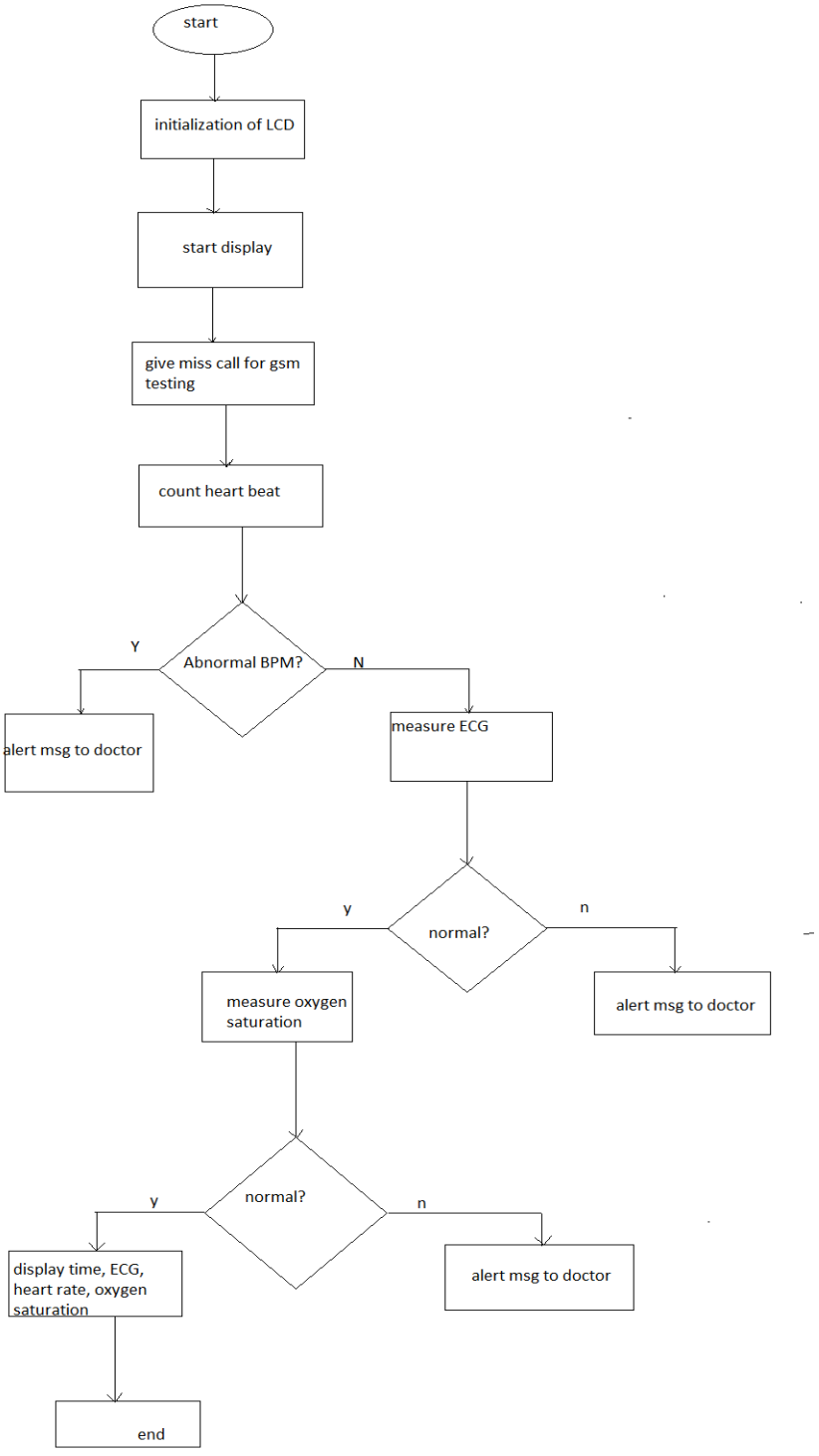
2) ECG


start
lead select
pre-amplifier
isolation circuit
amplification and BPF
ADC
STORE
gsm module

3) Pulse oximetry



4) Main circuit flow chart



References

1) R.S.Khandpur, 'Handbook of Bio-Medical Instrumentation'.
2) John G. Webster, 'Medical Instrumentation Application and Design' 3rd edition

Websites

http://www.ti.com/tool/tida-00011
http://field4.co.uk/physmes/project.htm
http://electronicsforu.com/electronicsforu/circuitarchives/view_article.asp?sno=805&article_type=1&id=704&tt=unhot

Performance Analysis of Underwater Wireless Communication Networks

Submitted by:-

1. RAGINI CHALUVADI - 10ECE046
2.CHINTHAK JETHWA - 10ECE052
3.P.PRADEEP CHANDRA - 10ECE060

Supervisor:

Mrs.Varada Potnis Kulkarni

Performance Analysis of Underwater Wireless Communication Networks

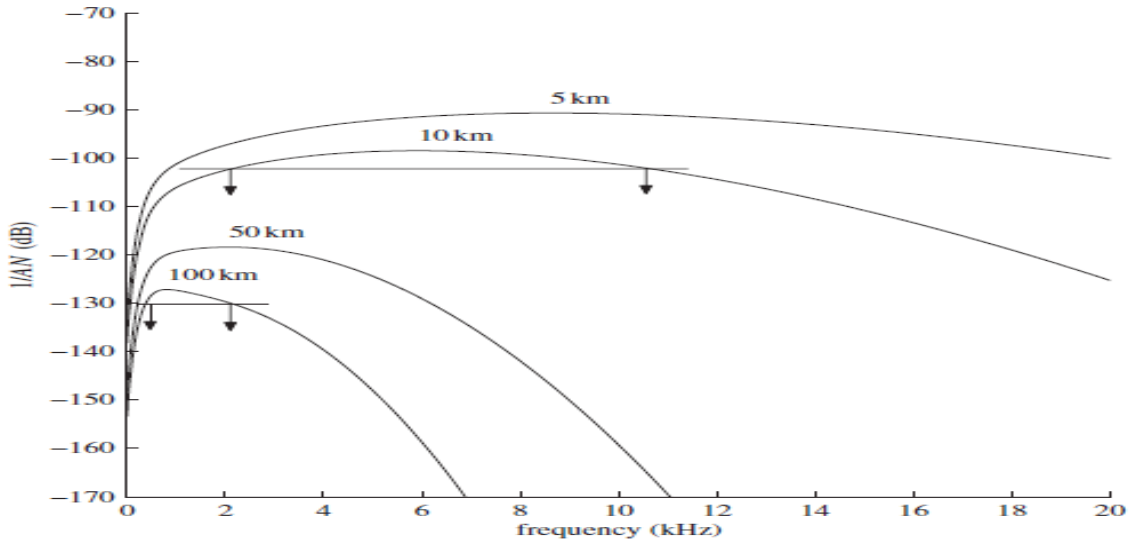
- Underwater wireless communication uses acoustic technology
- Radio signals attenuate very rapidly within few meters in water.

Constraints of acoustic communication

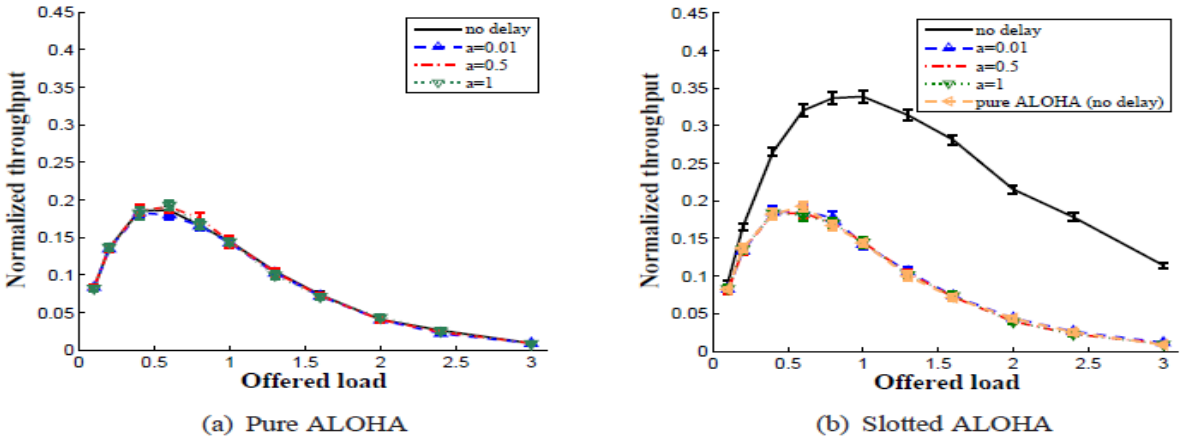
Acoustic communications are constrained by:

Distance-dependent bandwidth

Low speed of sound (Propagation latencies are five-orders of magnitude greater than RF)



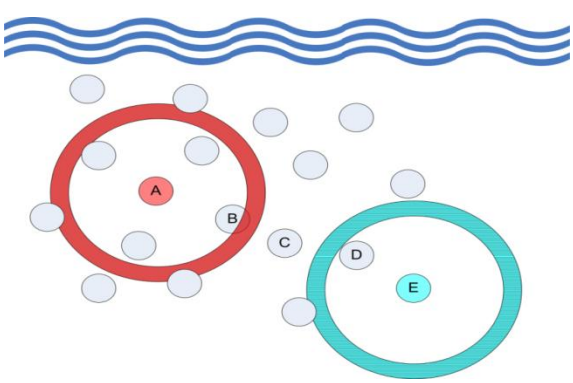
- **Slotted-Aloha degrades to pure Aloha under high latency environment.**



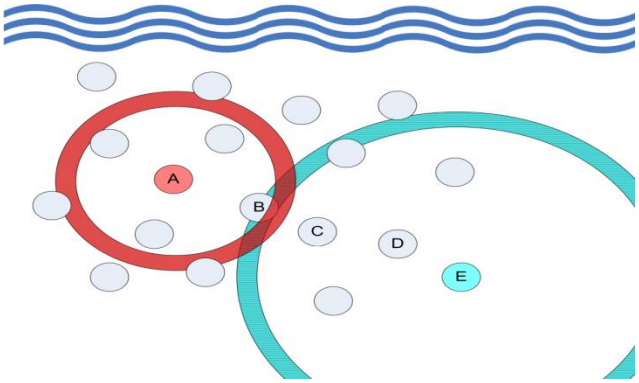
(a) Pure ALOHA (b) Slotted ALOHA

Propagation Delay Tolerant Aloha protocol (PDT-Aloha):

- Implementation of CSMA in underwater is costly.
- Space-time uncertainty:
- Large propagation delay of acoustic media makes it essential to consider the locations of a receiver.



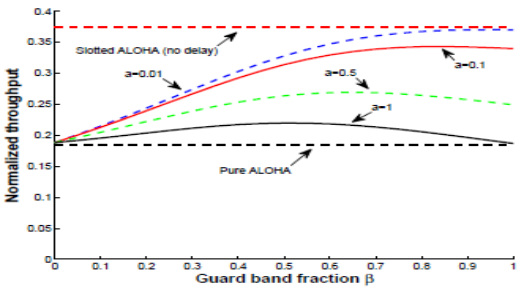
Same transmission time; no collision at B



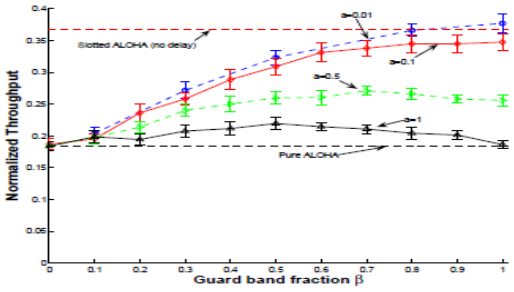
Different transmission times but collision at B

PDT-Aloha :the protocol

- PDT-Aloha is Slotted-Aloha with extra guard time.
- Space-time uncertainty can be handled by the addition of extra time beyond the transmission time in time slots.
- The slot duration, is increased from T to T +β · τmax, where β represents the fraction of maximum propagation delay (τmax)



(a) Analytical result



(b) Simulation result

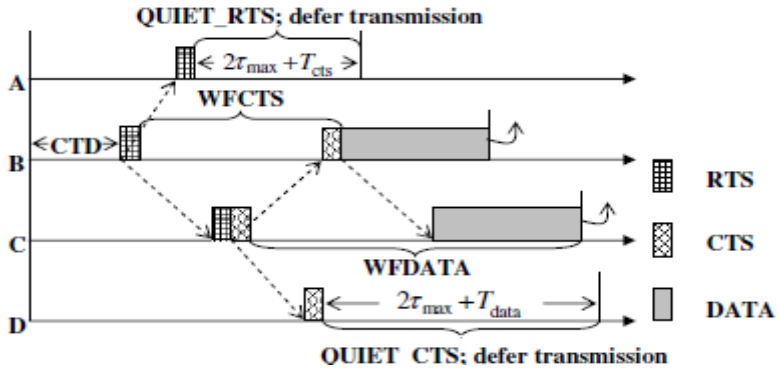
- Throughput capacity of PDT-ALOHA improves by 17–100% compared to slotted ALOHA, depending on network propagation delay
- Cons:

PDT-ALOHA is not feasible for ad-hoc networks where every node can be a potential receiver.

MACA-U :

- MACA-U has five distinct states, namely, IDLE, CONTEND (CTD), WFCTS, WFDATA and QUIET.

- Timing diagram for MACA-U



MACA-U' state transition rules:

i) In WFCTS state

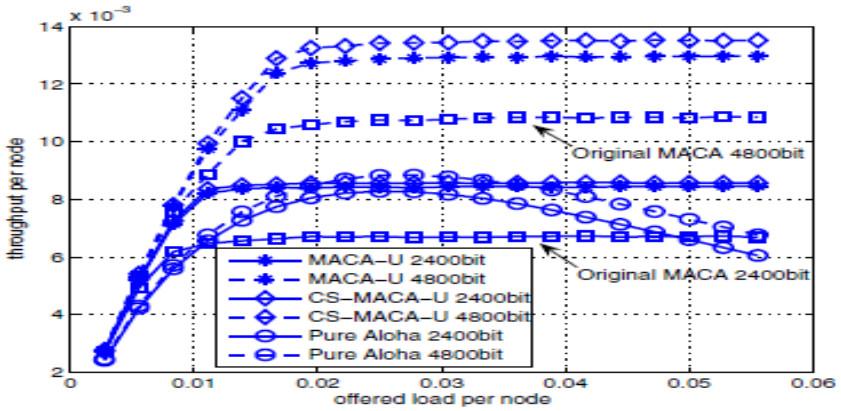
- source node disregards any RTS or xRTS packet
- the persistent waiting strategy is abandoned when it overhears an xCTS; the source node goes to QUIET state.

ii) In WFDATA state

Receiver node disregards any RTS, CTS, xRTS and xCTS

iii) In QUIET state, a node remains in QUIET state for an extended period when it overhears xRTS or xCTS.

- Simulations and results :



Throughput comparison for MACA-U ,Pure Aloha ,MACA

- Pros :
- MACA-U maintains its stable throughput as the offered load increases, at the expense of small control packets
- Cons:
- No ACK used

Roadmap:

- ACK is added to MACA-U
- Throughput is observed on

  (i)adding ack

  (ii)retransmission

References:

1. John Heidmann, Milica Stojanovic and Michele Zorzi. 2012 Underwater sensor networks: applications, advantages and challenges . *Phil. Trans. R. Soc. A* 2012 **370**, 158-175. (doi:10.1098/rsta.2011.0214)
2. Ahn, J., Syed, A., Krishnamachari, B. & Heidemann, J. 2011 Design and analysis of a propagation delay tolerant ALOHA protocol for underwater networks. Ad Hoc Netw. J. 9, 752–766. (doi:10.1016/j.adhoc.2010.09.007)
3. Xie, J.-H. Cui, Exploring random access and handshaking techniques in large-scale underwater wireless acoustic sensor networks, in: Proceedings of the MTS/IEEE OCEANS Conference, Boston, Massachusetts, 2006, pp. 1–6.

OPTICAL CHARACTER RECOGNITION AND TEXT TO SPEECH

Student Group:

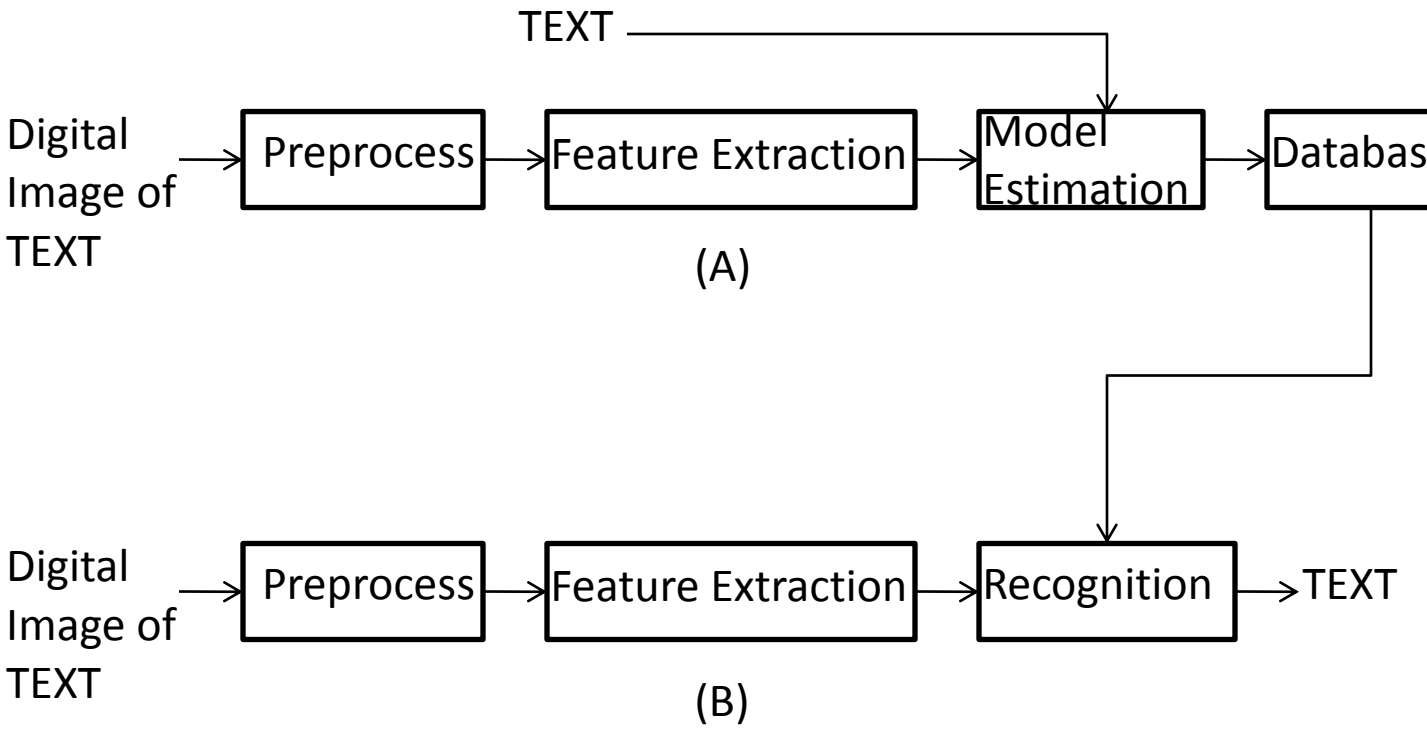
- Jay Dharmameher[10ECE048]
- Shekhar Manjhi[10ECE068]
- Tejas Shetty[10ECE069]
- Jacob Dominic[10ECE050]

Adviser Name: Dr. Veerakumar T.

Abstract

OCR (Optical Character Recognition) also called Optical Character Reader is a system that provides a full alphanumeric recognition of printed or handwritten characters at electronic speed by simply scanning the form. Forms containing characters images can be scanned through scanner and then recognition engine of the OCR system interpret the images and turn images of handwritten or printed characters into ASCII data (machine-readable characters).Therefore, OCR allows users to quickly automate data capture from forms, eliminate keystrokes to reduce data entry costs and still maintain the high level of accuracy required in forms processing applications. Here we are using MATLAB to implement the OCR tool.

A text to speech [TTS] system is a system that can convert a given text into speech signals. The aim of an ideal TTS system is to be able to process any text that a human can read. A TTS system consists of mainly two parts: Text processing part and speech synthesis part. Here the output of an OCR is used as an input for this system. We are implementing the TTS system using ARM microcontroller, which is programmed to obtain the final output.



A General OCR system, (A) Training phase, (B) Tracking phase