Faculty of Information Technology

Real-time Remote Health Monitoring System
Level 1 Final Report

IN 1900

Group No: 18 (IT)

CyberHitz

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Date of Submission: 08/12/2017

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1. Introduction

Real-time Remote Health Monitoring System are useful due to the possibility of timely and efficient healthcare services. These systems are based on wearable sensors & advanced wireless technologies. The continuous growth in technology has remarkably enhanced the scope of real-time remote health monitoring systems which is developed considering the cost, ease of application, accuracy, and data security. The system is conceptualized to provide an interface between the doctor and the patients for two-way communication. The main purpose of this study is to facilitate the remote cardiac patients in getting latest healthcare services which might not be possible otherwise due to low doctor-to-patient ratio

- In today's healthcare practice, Doctors have a need to monitor more than one medical parameter from patients. We need device that it should allow doctors to view the measured parameters over long period of time for analysis.

- If doctors can get these parameters wirelessly, it is very useful for both patients and doctor.

- Our Project is Real-time Wireless Health Monitor System. This system based on long distant wireless technology.

- It displays the result of these to the doctor through LCD display and Mobile app using GPRS Technology.

2. Literature Survey

Many patient monitoring systems have been proposed by many researchers to monitor the patient at the bedside and at a central monitoring system. We have used some features in those projects and modified them to suit with our aims and objectives to give the users, the best performance.

- **Low Cost and Portable Patient Monitoring System for E-Health Services in Bangladesh This Paper Propose an Efficient Low Cost & Portable**

  Patient's health monitoring system. a raspberry pi based system is developed for collecting sensed data from sensor (sensors like temperature, blood pressure, oximeter etc. are used) this signals from patients will be sending to doctor for remotely analyzing the patients' health report.

  A web based application has been developed for both patients and doctors through which they can even communicate with each other. This system can be more useful for the peoples from rural areas.

- **Mobile Telemedicine System for Home Care and Patient Monitoring**

  This paper describes the implementation of a telemedicine system for patient monitoring using mobile telephony, using this application any patient can be monitored with rs232 interface. the system proved to be quick and reliable. therefore, it represents an applicable solution to tele-homecare. additionally, the high costs involving the conventional internment and the frequent problems in patient transporting do necessary a different way of providing good medical care. this system is based on client server application in which server stores data collected from client, role of client is to collect proper data from patient & transfer it to server.

3. Aim and Objectives

3.1 Project Aim:

- To develop an automated health monitoring system.

3.2 Objectives:

- To Develop a Platform that has the capability to
    - Collect Heart Rate, Blood Pressure, Respiration Rate, Saline Level and Body Temperature data
    - Enable the device to display the parameters
    - To send warning messages to doctor and other paramedical staff in case of abnormal conditions.

4. Proposed Solution

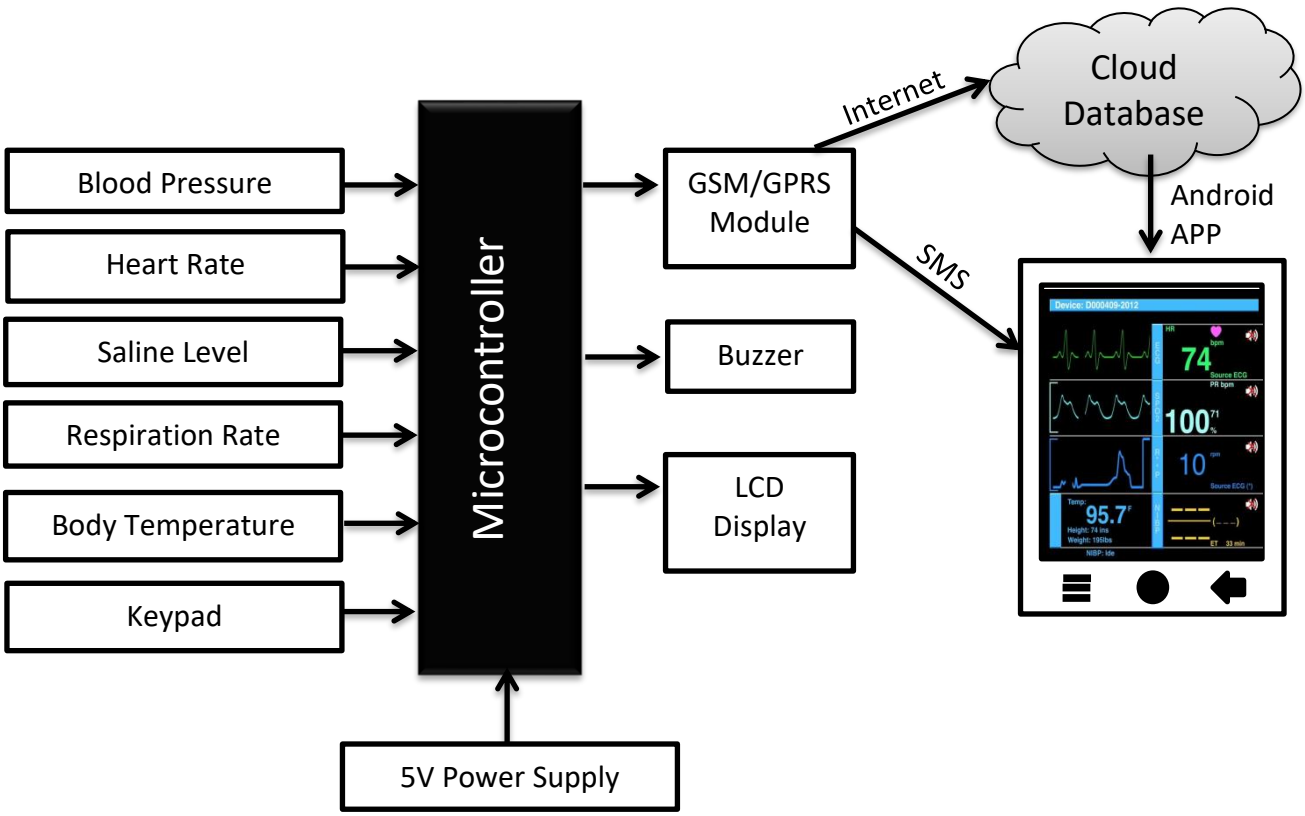

Figure 4.1: *System Diagram*

- In the hospital, patient's Body Temperature, Heart Beat rate and other parameters must need to be monitored constantly. This is usually done by doctor or other paramedical staff.
- They observe that data from patients constantly and maintain a record of it in papers. That is not Environment Friendly.

- Today there is no device to monitor on-time patient's parameters wirelessly.

- We give solution for this problem. This device Collect Heart Rate, Blood Pressure, Respiration Rate, Saline Level and Body Temperature data from sensors.

- It displays the result of these to the doctor through LCD display and Mobile app using GPRS Technology.

- We use buzzer to generate warning signal, If the parameters cross the safe limit.

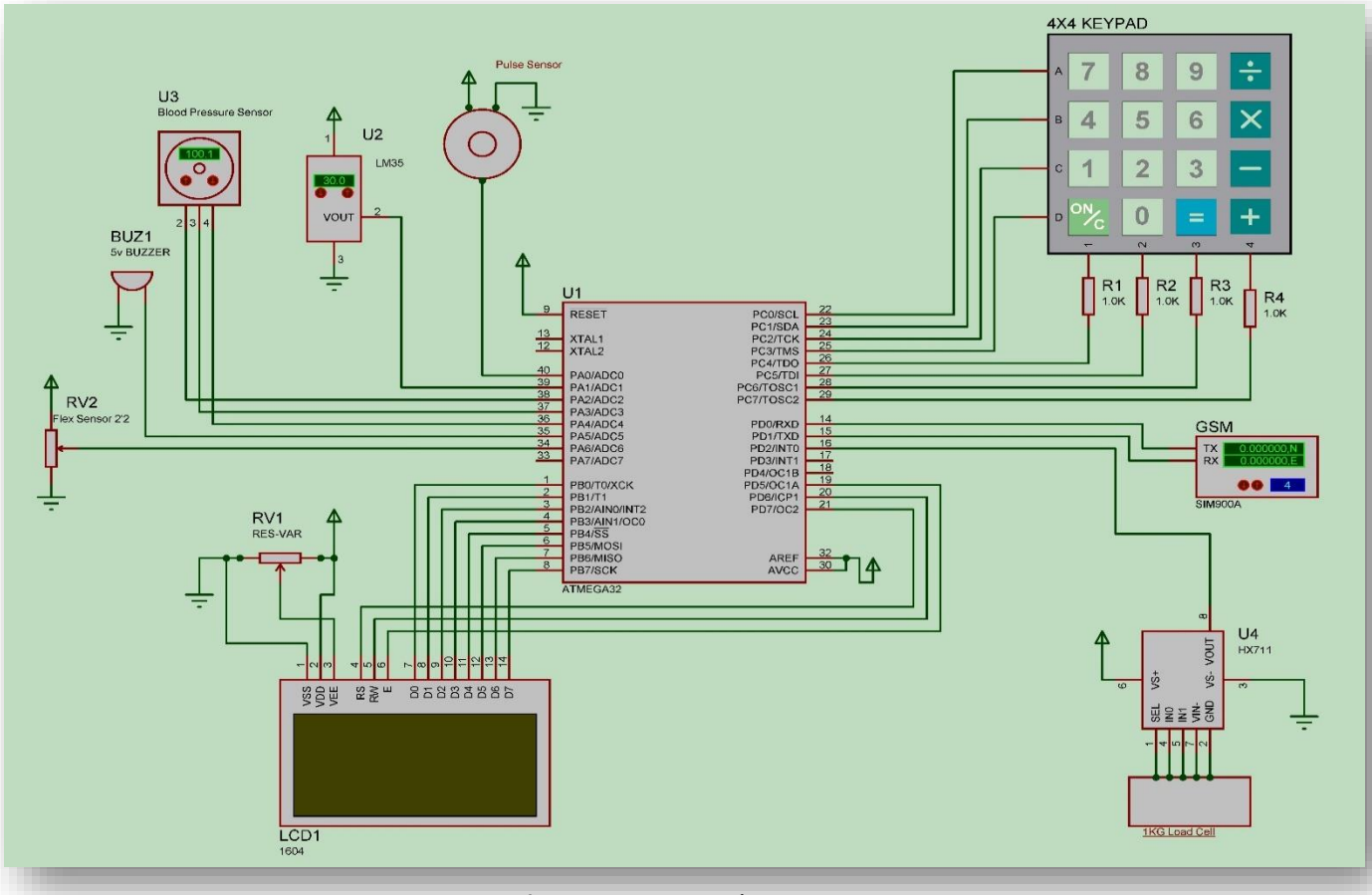

Figure 4.2: *Circuit diagram*

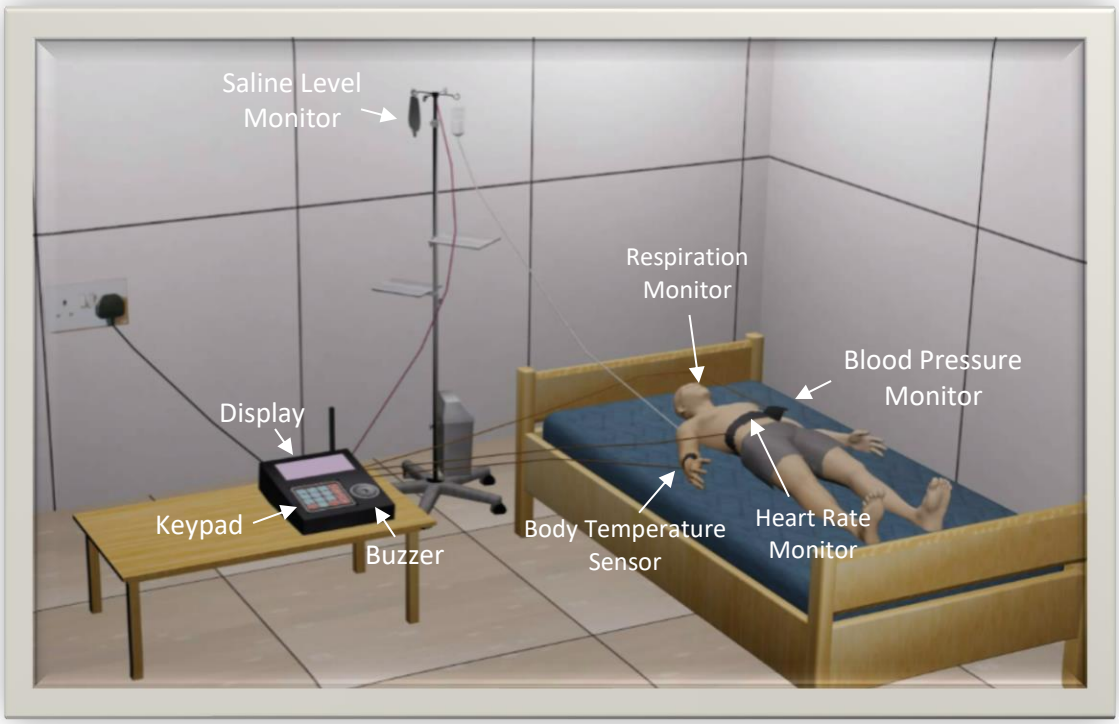

Figure 3.7: *3D design of the Project*

5. Testing and Implementation

. In testing and implementation stage the 1st problem we faced is choosing a suitable microcontroller for the proposed project. We had discussions among the group, with seniors, with the supervisors and finally decided to use ATmega32 microcontroller as it is regularly used and hardly getting burnout.

After choosing the microcontroller we have developed Heart Rate, Body temperature part, Respiration Part, Saline level monitor, LCD Display, Buzzer, GSM Module Part, Online Database and Android Application. We got Heart Rate, Body temperature part, Respiration Part, Saline level monitor as inputs and display it on LCD Display. If there are any abnormal condition in those parameters, we send SMS. Then all parameters got from patient are transmit to Mobile Application.

***Figure 5.1**: Testing Process*

***Figure 5.2**: Testing Keypad*

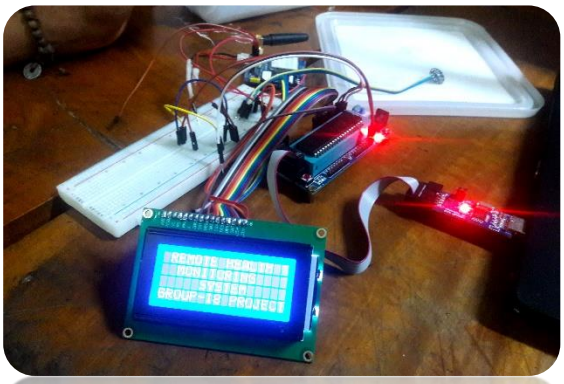

***Figure 5.3**: Testing LCD Display*

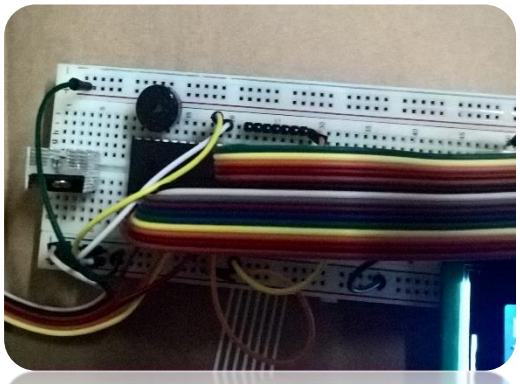

***Figure 5.4**: Testing Buzzer*

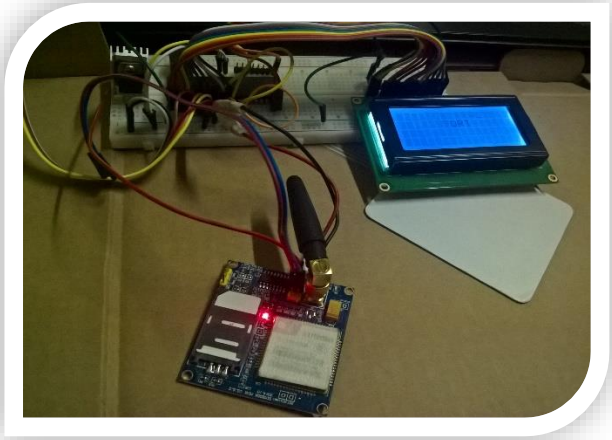

***Figure 5.6**: Testing GSM Module*

***Figure 5.7**: Testing Heart Rate Sensor and Temperature Sensor*

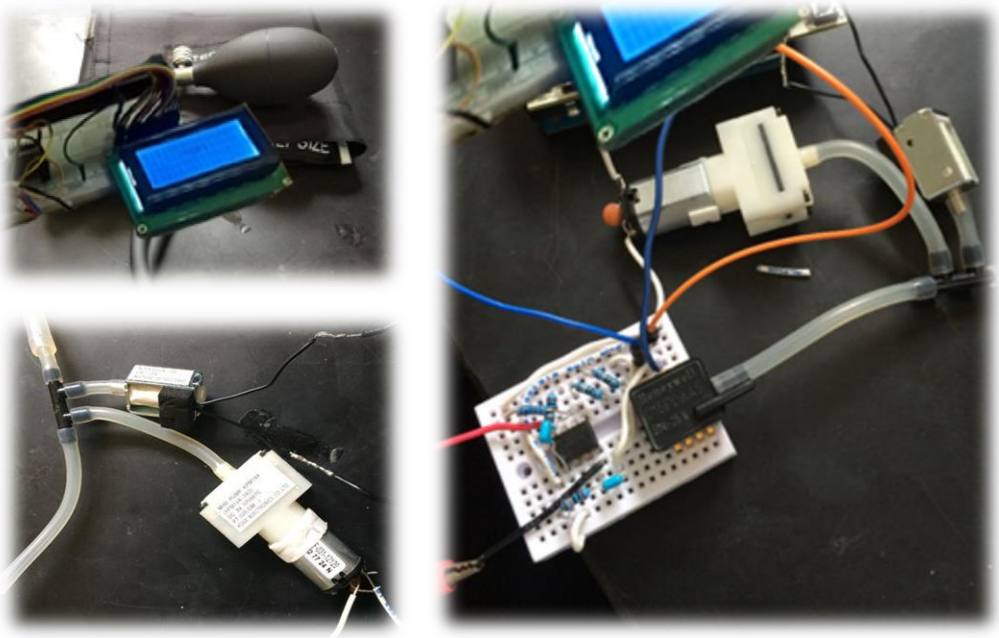

***Figure 5.8**: Testing Blood Pressure Sensor*

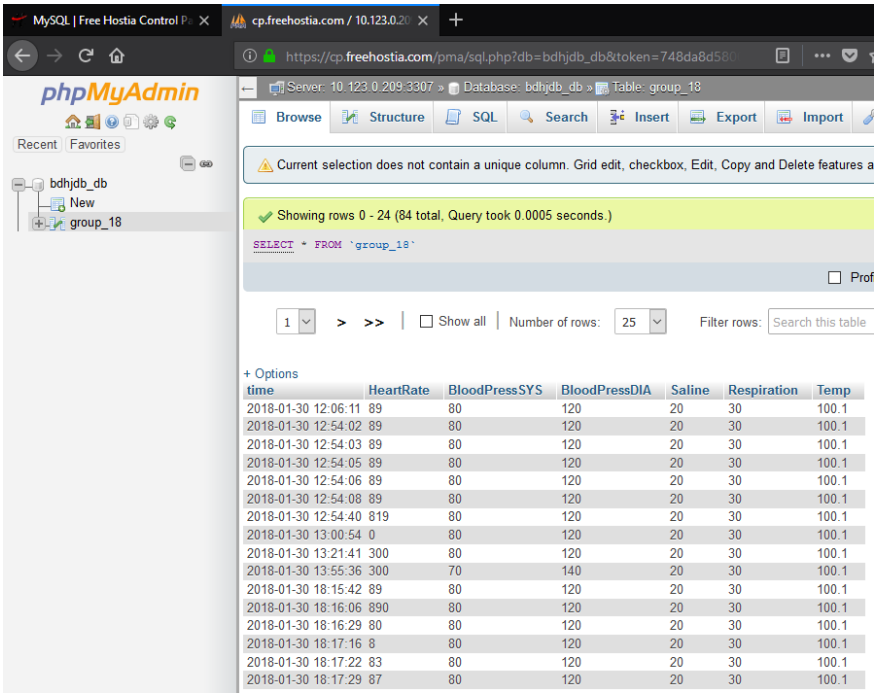

***Figure 5.9**: Web Server*

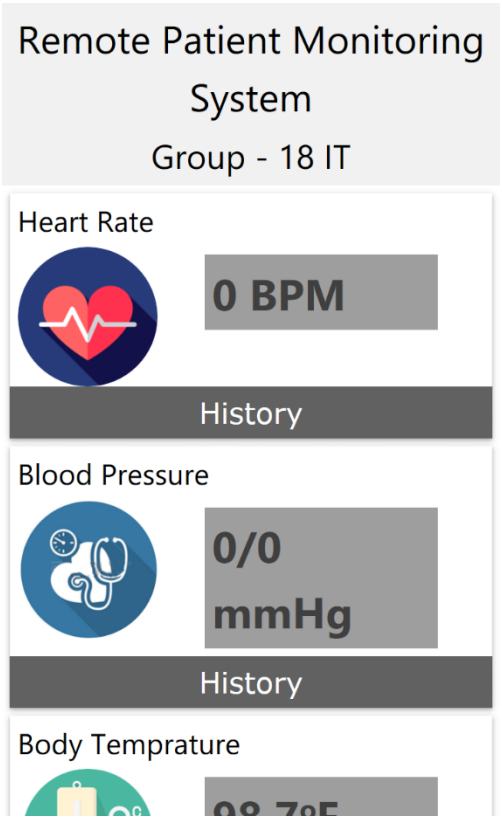

***Figure 5.10**: Android Application*

6. Individuals Contribution to the Project-

1. Student name: B. M. C. Rathnayaka 164112H

- Designing Structure
- Design Communication System with GSM/GPRS Module
- Design Android App

6.1.1 GSM Module

Mobile phone based health monitoring allows caregivers a better way to monitor their patients and the cost is also less compared to staying in hospitals. We Collect Patient's Heart Rate, Blood Pressure, Respiration Rate, Saline Level and Body Temperature data from sensors are sent to the Microcontroller. The Microcontroller then transmits the data to the user in the form of SMS and GPRS. Here we are using the GSM modem to transmit the information. From the transmitter, the recordings of patient health parameters are sent to Mobile Application through GPRS. And also send SMS in Emergency cases to the care taker or the expert or a doctor which have been given as the recipient.

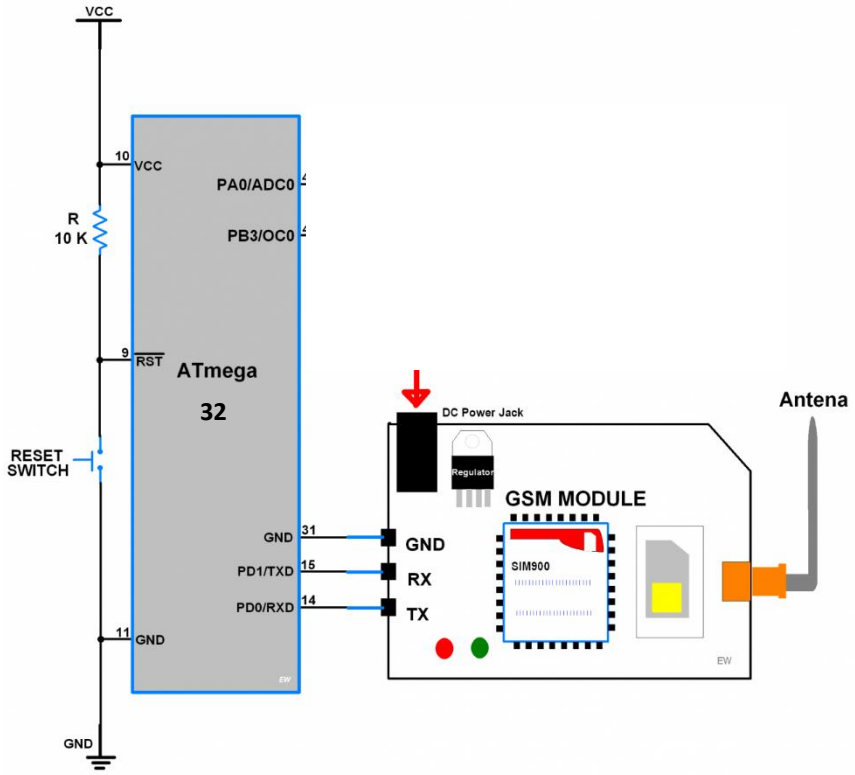

***Figure 6.1** : GPRS Module*

6.1.2 Mobile Application

We also develop a mobile platform that has the capability to collect sensor data from sensors, process the data, analyze the data and trigger the warning messages to doctors, relatives etc. The system will provide the capability to visualize the signal in doctor's mobile. The system also considering the involvement of the doctors for assigning the risk levels of the patients. The doctor will get the warning message in his mobile. The involvement of the doctors will help this system to be more accurate and acceptable for health monitoring. This system also proposes developing dynamic algorithms for reduced power consumption during real time continuous monitoring of the patients.

The system can collect the sensor data to monitor the basic vital parameters such as Patient's Heart Rate, Blood Pressure, Respiration Rate, Saline Level and Body Temperature data from sensors. The collected data buffered temporarily in the Microcontroller itself. The data can be analyzed in the microcontroller itself to find the warning level. If the result is above a threshold a warning message should be send to the doctor and caregivers. The warning message and the stored data will be transmitted to the Database. If the doctor needs to see the patient's parameters in his or her phone, the system will also provide a provision to view the patient's sensor parameters in his or her smart phone. So, no matter where the user is she or he can view the needed data in their mobile. System Architecture is shown in the Figure 6.2

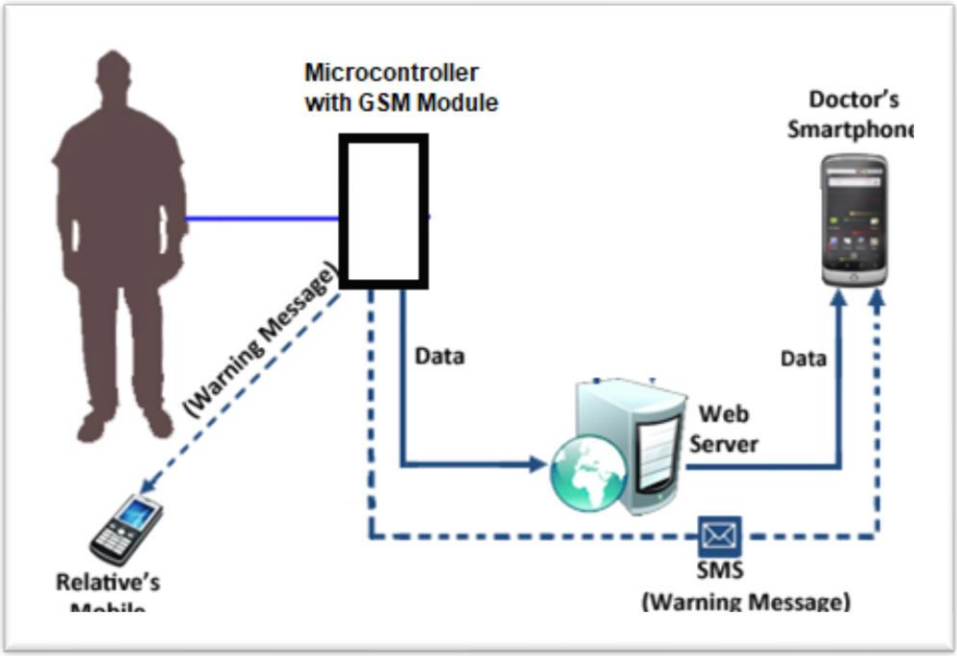

***Figure 6.2**: Mobile Application System*

Apart from the healthcare application there are other functionalities and applications that run in smart phone that consume more energy. For high risk patients the reception of the data from the sensor is more frequent than the low risk patients. For the low risk patients, the data will be transmitted data to the central database server when the memory gets full or during the reception of a warning level. For a high-risk patient, the Energy consumption will change based on the energy required to transmit the data to the central database server and the amount of energy required to transmit the warning message.

2.Student name: Jeyaranjan Kisojan 164070B

- Design Body Temperature Part
- Design Keypad Input Part with Emergency Call System

6.2.1 Body Temperature

Temperature sensors in the medical field have been used from time immemorial to measure the body temperature and monitor the medical condition of patients. With a temperature sensor attached to the body of the patients, measurement of absolute temperature of the patient will be accurate, and the system allows for continuous monitoring of a patient's differential change in temperature. We use MAX30205 Human Body Temperature Sensor. This sensor has 0.1^{o}C Accuracy.

6.2.1 PATIENT CALLING SYSTEM:

The patient calling system we use keypad for get input, when patient pressed Emergency button display on the screen and Send SMS to the doctor.

3.Student name: Jeyarajah Tharsegan 164135F

- Design Saline Part with Load Cell
- Design Display Output

6.3.1 SALINE MONITORING SYSTEM:

For saline monitoring we use weight sensor. The code is written to give an audio alert and send SMS, when saline level falls below the safe level.

6.3.2 LCD Display

We collect patient's data from sensors. Then It displays the result through LCD display. We display respiration Rate, Blood Pressure, Heart Rate and Body Temperature.

4.Student name: P. M. K. T. Tharuka 164136J

- Design Heart Rate System
- Design Blood Pressure System

6.4.1 HEART BEAT MONITOR:

As your heart beats, it pumps your blood round your body so that your muscles can get all the energy and oxygen they need. To do this, your heart pushes your blood through a network of blood vessels called arteries. As the blood travels through the arteries it pushes against the sides of these blood vessels and the strength of this pushing is called your blood pressure.

Every pulse the blood pressure goes high. By this method we can get pulse rate.

6.4.2 Blood Pressure

As your heart beats, it pumps your blood round your body so that your muscles can get all the energy and oxygen they need. To do this, your heart pushes your blood through a network of blood vessels called arteries. As the blood travels through the arteries it pushes against the sides of these blood vessels and the strength of this pushing is called your blood pressure.

As your heart squeezes and pushes your blood through your arteries, your blood pressure goes up. As your heart relaxes, your blood pressure goes down. So, with each heartbeat, your blood pressure will rise to a maximum level and then fall to a minimum level.

When you have your blood pressure taken, the result is given as two numbers - the maximum and minimum levels. This is shown as one number over another, for example:

110/80mmHg

You would hear this reading said as "110 over 80".The first or top number is the highest level your blood pressure reaches when your heart is squeezing. This is called your **systolic** blood pressure level. The second or bottom number is the lowest level of your blood pressure when your heart is relaxing. This is called your **diastolic** pressure.

This system allows easy monitoring of blood pressure in a hospital. Today's blood pressure system must meet the demands of measuring, storing and transmitting blood pressure, pulse and other medical data. To meet these demands

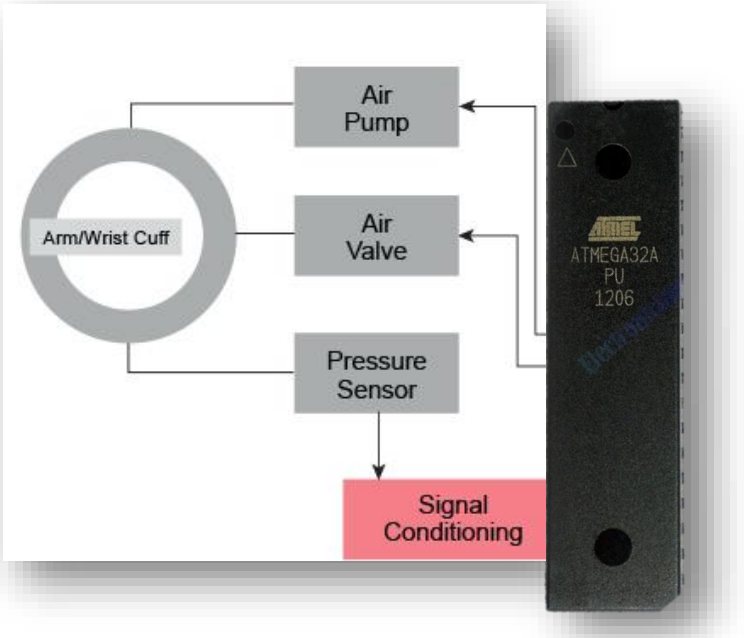

***Figure 6.5**: Blood Pressure System*

5.Student name: H. M. M. Akram 164201F

- Design Respiration Part
- Design MYSQL Database
- Design Buzzer System

6.5.1 MEASUREMENT OF RESPIRATORY RATE:

Thermistor is used for the measurement of respiratory temperature. This thermistor is a passive transducer and its resistance depends on the beat being applied on it. We have arranged the sensor in the potential divider circuit. This sensor exhibits a large change in resistance with a change in body temperature. The respiratory rate is determined by holding the sensor near the nose. The temperature sensor part is attached to the patient whose temperature has to be measured, which changes the values and thus the corresponding change in the temperature is displayed on the monitor graphically. Also, all temperature measurements are updated in the patient's database. Here in our project we use LM-35 temperature sensor.

6.5.2 Buzzer

We use buzzer to generate warning signals, If the parameters cross the safe limit.

7. Further works

In our project we created Patient monitor system for Hospitals. Our project has capability of display patient's bio medical information in mobile application.

Today we didn't use device like this. This project is very useful for medical sector. By using this concept, we can develop this as Commercial product in further.

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