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Wireless Health Care Monitoring

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Abstract— This paper deals with design and developed for remote patient monitoring in healthcare field. The primary function of this system is to constantly monitor patient's physiological parameters such as pulse rate, breathing rate, blood pressure rate and patient's body movement, and display the same information to the doctor. In hospitals, where patient's physiological parameters are needed to be constantly monitored, is usually done by a doctor or other paramedical staff for maintaining a record of it. It is a tedious method. In this proposed system transmitting module continuously reads patient's pulse rate or heart beat rate, breathing rate, patient body movement and blood pressure rate through a pulse sensor, airflow sensor, accelerometer and sphygmomanometer .The sensors are used sense the information and Microcontroller is used to receive the data from the sensor. Using a Zigbee transmitter the retrieval information be send to corresponding receiver locate at the computer. The Zigbee receiver receives the data from transmitter and finally displays record to doctors via web browser. Provide notification message about the emergency to the physicians through GSM module. The main aim is to reduce the cost for monitoring patient health using different types of sensor.

Keywords— Accelerometer, Airflow Sensor, Blood Pressure Sensor, Pulse Sensor, GSM, Zigbee.

I. INTRODUCTION

This paper describes about to build a wireless healthcare monitoring system using GSM Technology and Zigbee. Remote monitoring is seen as an effective method of providing immediate care as it allows for continuous as well as emergency transmission of patient information to the doctor or healthcare providers. Remote patient monitoring will not only redefine hospital care but also work, home, and recreational activities. These new technologies enable us to monitor patients on a regular basis, replacing the need to frequently visit the local doctor for a recurring illness.

the treatment and diagnosis to the large crowd effectively. Summarization and aggregation of the data is very difficult and burden. So there may be possible that output contains some errors or redundancy. Finally then introduce the ITC (information technology & communication) in order to reduces the distance and time gap between the patient and health service provider or physician. IT technologies such as Wi-Fi, 3G and WSN provide a way for remote monitoring of the patients. Healthcare services can improve the living of patient, physical handicapped, elders, and chronically ill persons. So without frequently visit to the doctor, anyone can get proper treatment and improve his/her health conditions. In recent years, many e-Health systems developed and they are providing the remote monitoring of the patient. In the health management system designed a integrated patient monitoring device with low cost and this way of technology is mainly used to continuously monitor the patient health condition, for effectively and accurately measuring the patient physiological parameter such as blood pressure, temperature, and pulse rate of the patient, movement .This system send the health information of patient to the microcontroller then send to the PC via Zigbee communicating device. PC stores this data onto the local database. If there is any emergency, it displays an alert message on the screen and send a notification message to the doctor by using GSM technology. This new system provides the full management of the medical staff and other medical resources. The doctor, nurses and administrator can view the patient profile that contains family history, patient history etc. Based on the different privileges, the doctor, nurses or other medical staff can add, delete, and modify the patient profile. The administrator can update doctors and nurses profile in central server.

II. MOTIVATION

In past years, at remote rural areas the peoples die, due to lack of treatments and lack of availability of health monitoring devices and doctors, most of the

countries in the world facing this type of problems. There are numbers of the system which can provide remote health care services but there have some limitation such as very costly, lack of patient data security and highly communicational and computational overhead. According to the World Health Organization, the probability of dying between 15 and 60 years of age in male/female (per 1000 population) in India is nearly 250/169. In present years, the chronic diseases and the civilization diseases are introduced in the world, due to the changes in the environment. In order to avoid existing problem, the proposed system introduced integrated health monitoring devices with low cost and take an advantages to continuously monitor patient physiological parameters.

III. Problem Dtefinition And Limitation

Today's healthcare systems in most countries are struggling with increased number of patients and increased costs of patient care per patient. This situation is aggravated by the current trends of unhealthy lifestyle habits, including stress and physical inactivity, which increasingly leads to chronic illnesses such as obesity, diabetes and heart disease, even in younger population. For such cases, early treatment, including physical exercise, could prevent negative outcomes as population ages. Such a treatment would be more likely to succeed if the healthcare system had access to facilities for continuous monitoring of the individual's physical fitness level, because it would allow monitoring compliance and providing feedback. Such facilities would ideally consist of simple, inexpensive and readily available equipment.

IV.Literature Survey

The health tracker 2000, that can monitors user's vital signs such as heart rate or pulse, blood pressure and respiration rate could be implemented using pressure sensors [1]. The integrated patient monitoring combining with electronic patient records, the main challenges to increasing robustness of "e-health" application to a level at which clinically useful. The disadvantages of electronic patient record are extremely time consuming and costly to overcome this problem, using novelty detection task that allows a direct comparison without integrated, automatics methods [2]. The aim is to show how radio frequency identification, multi-agent and internet of things technologies can be used to improve people access to quality and affordable healthcare services, to reduce medical errors, to improve patient safety and to optimize the healthcare processes. The current widespread deployment of cell phones, laptops, Wi-Fi, Bluetooth, Personal digital assistants (PDAs) and radio frequency microcontroller is shown in Figure 2; the heart logo in pulse sensor makes contact with skin and small LED shines at backside of pulse sensor. Generally Pulse sensor can be placed on the fingertip or earlobe of the human body. The critical data send to the mobile health care unit using GSM communication. Pulse sensor communicated with the microcontroller which is arduino Un identification (RFID) technologies penetrate the healthcare environment [3]. Vital data rates and the amount of the data accumulation in a variety of smart health care use cases are discussed. Finally they developed patch type wearable vital monitoring device that multiple numbers of vital sensors, a high performance processor and a dual mode Bluetooth transceiver are integrated [4]. the microcontroller based continuous non invasive cuff less blood pressure measurement system with an alarm circuit for health care monitoring system. Accuracy of the system is found in acceptance range by comparing the results with the existing conventional systems. If the BP reading, heart rate or body temperature exceeds the standard range for any patient, the system is able to notify using an alarming circuit. The whole system is controlled by microcontroller ATMEGA8L. The overall system is reliable, accurate, portable, trust worthy, user friendly and cost effective [5].

V.Architecture

In this architecture, four different sensors are used for monitoring the patient healthcare such as pulse sensor, Accelerometer sensor, Respiration sensor, Blood pressure sensor which can directly communicate with microprocessor is shown in Figure 1. Here Arduino Uno acts as microprocessor in healthcare monitoring, which is used to control multiple devices such as communication devices and sensor devices. RS232 is used for serial communication which is connected to the devices.

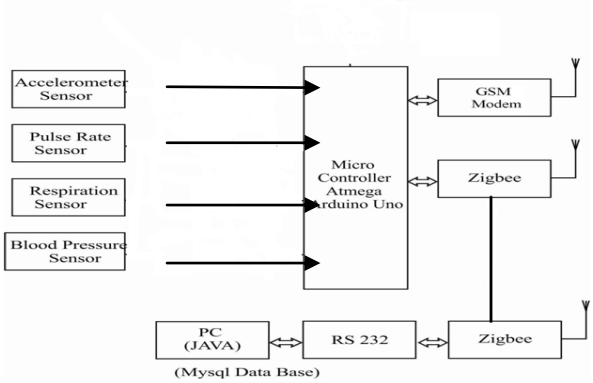

Fig. 1 System Architecture

A. Pulse Sensor

Pulse sensor is used to monitor the regular heart beat of the patient's, which is used to find whether the patient's heart rate is normal or abnormal. The pulse sensor with three male connector is used to communicate with

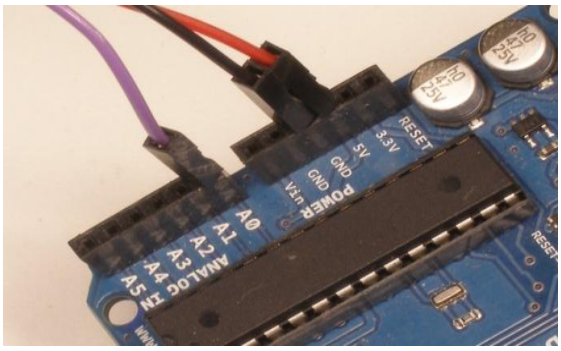

Fig. 2 Pulse Sensor Connected with Arduino

B. Accelometers

An accelerometer is a device that measures the vibration, or acceleration of motion of a structure is shown in Figure 3. The force caused by vibration or a change in motion (acceleration) causes the mass to "squeeze" the piezoelectric material which produces an electrical charge that is proportional to the force exerted upon it. Since the charge is proportional to the force, and the mass is a constant, then the charge is also proportional to the acceleration. There are two types of piezoelectric accelerometers (vibration sensors). The first type is a "high impedance" charge output accelerometer. In this type of accelerometer the piezoelectric crystal produces an electrical charge which is connected directly to the measurement instruments. The charge output requires special accommodations and instrumentation most commonly found in research facilities. This type of accelerometer is also used in high temperature applications (>120C) where low impedance models cannot be used. Tri axial accelerometers measure the vibration in three axes X, Y and Z. They have three crystals positioned so that each one reacts to vibration in a different axis. The output has three signals, each representing the vibration for one of the three axes. The ACC301 has lightweight titanium construction and 10 mV/g output with a dynamic range of +/-500 g's over a range of 3 to 10 kHz.

The second type of accelerometer is a low impedance output accelerometer. A low impedance accelerometer has a charge accelerometer as its front end but has a tiny built-in micro-circuit and FET transistor that converts that charge into a low impedance voltage that can easily interface with standard instrumentation. This type of accelerometer is commonly used in industry. An accelerometer power supply like the ACC-PS1, provides the proper power to the microcircuit 18 to 24 V @ 2 mA constant current and removes the DC bias level, they typically produces a zero based output signal up to +/- 5V depending upon the mV/g rating of the accelerometer. All OMEGA(R) accelerometers are this low impedance type.

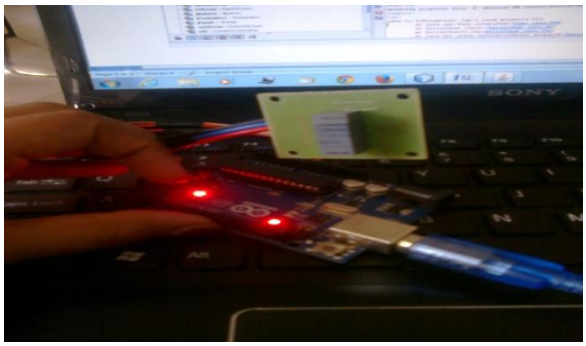

Fig. 3 Accelerometer

Accelerometers can be used to measure vibration on cars, machines, buildings, process control systems and safety installations. They can also be used to measure seismic activity, inclination, machine vibration, dynamic distance and speed with or without the influence of gravity. Applications for accelerometers that measure gravity, wherein an accelerometer is specifically configured for use in gravimeter, are called gravimeters.

C.Respiration

In humans, the respiratory system consists of the airways, the lungs, and the respiratory muscles that mediate the movement of air into and out of the body. Within the alveolar system of the lungs, molecules of oxygen and carbon dioxide are passively exchanged, by diffusion, between the gaseous environment and the blood. Thus, the respiratory system facilitates oxygenation of the blood with a concomitant removal of carbon dioxide and other gaseous metabolic wastes from the circulation. The system also helps to maintain the acid-base balance of the body through the efficient removal of carbon dioxide from the blood.

D .Blood Pressure Sensor

Blood pressure is the pressure of the blood in the arteries as it is pumped around the body by the heart. When your heart beats, it contracts and pushes blood through the arteries to the rest of your body. This force creates pressure on the arteries. Blood pressure is recorded as two numbers—the systolic pressure (as the heart beats) over the diastolic pressure (as the heart relaxes between beats).Blood Pressure sensor is shown in Figure 4.

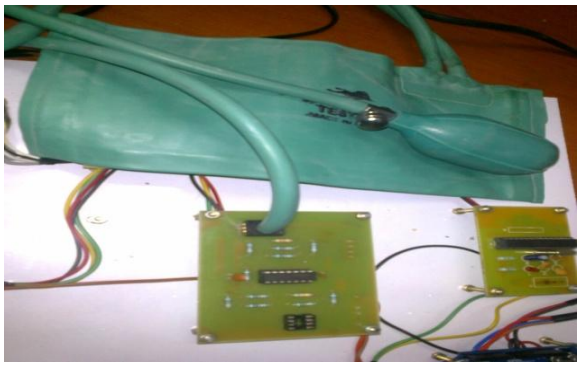

Fig. 4 Blood pressure Sensor

High blood pressure (hypertension) can lead to serious problems like heart attack, stroke or kidney disease. High blood pressure usually does not have any symptoms, so you need to have your blood pressure checked regularly.

Table 1
Classification of Blood Pressure for Adults (18 years and older)

Category	*Systolic(mm Hg)*	*Diastolic (mm Hg)*
Hypotension	*< 90*	*< 60*
Desired	*90–119*	*60–79*
Pre hypertension	*120–139*	*80–89*
Stage1 Hypertension	*140–159*	*90–99*
Stage 2 Hypertension	*160–179*	*100–109*
Hypertensive Crisis	*≥ 180*	*≥ 110*

Monitoring blood pressure at home is important for many people, especially if you have high blood pressure. Blood pressure does not stay the same all the time. It changes to meet your body's needs. It is affected by various factors including body position, breathing or emotional state, exercise and sleep. It is best to measure blood pressure when you are relaxed and sitting or lying down.

E .Patient Pulse Report

Pulse sensor is used to monitor the heart beat of the Patient, which is used to find whether the patient heart rate is normal or abnormal. If the heart rate is normal then the patient health condition is good otherwise, the patient health condition is critical then sends a notification message to the physician. Heart logo can be beated based upon the pulse rate is shown in Figure 5.

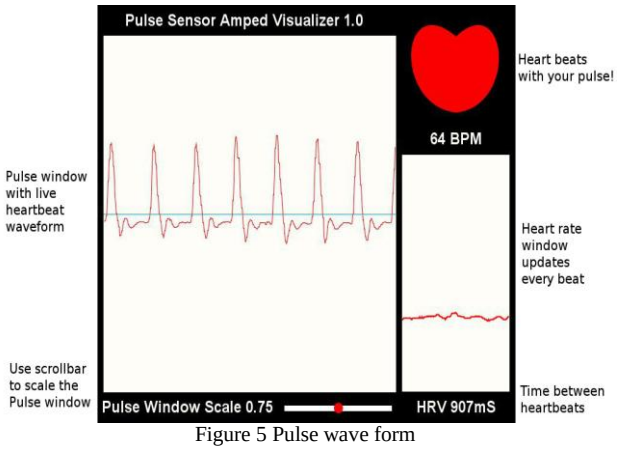

Figure 5 Pulse wave form

F .Measurement of Accelerometer

Accelerometer sensor is used to measure the patient body movement whether the patient in straight or reverse or left or right. This sensor can be placed on the chest portion of the patient. Accelerometer sensor is very helpful for the heart patient especially for bypass surgery patient. Create a java user interface form for monitor the patient dynamic body movement while set com port connection. Then position can be displayed in the form is shown in Figure 6.

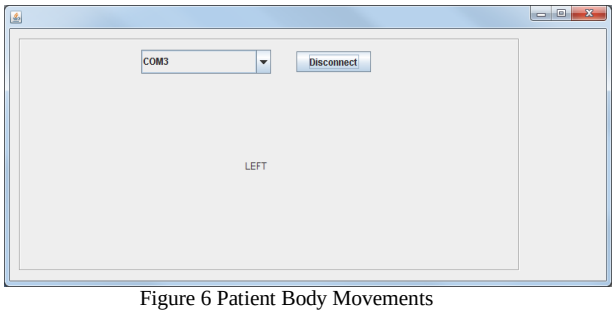

Figure 6 Patient Body Movements

G .Patient Health Monitor

The graphical user interface is designed by using java for displaying the sensor values of that place is shown in Figure 7. We designed a login form for patient with unique ID and Name based on this we will create a database and store the patient health information. Every half an hour we will generate the patient's record in web pages

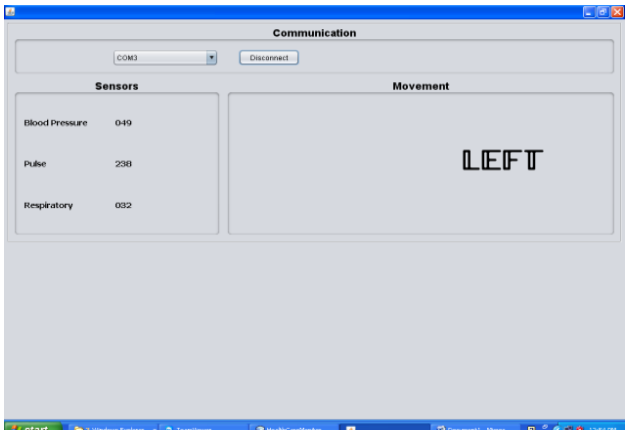

Figure 7 Patient Health Condition

H .Patient Record

Webpage is created for displaying the patient's health information through doctor's login. Only authorized users can login into the webpage. The doctor's can access the patient's information from anywhere in the world by just logging in into the account. In this project data are displayed by using WAMP for windows Apache (an HTTP Server), MySQL for stored information in database and PHP language for server side communication. After login into webpage, user can see the patient's health records are shown in Figure 8.

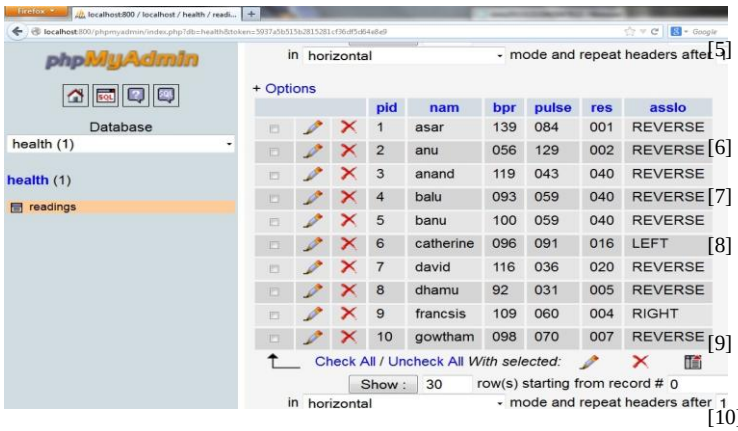

Figure 8 Patient Health Record in Database

VI. Conclusions

We conclude that healthcare monitoring is done by using wireless sensor devices and report all the sensor data to the physician. During the healthcare monitoring if any patient health condition is critical, then send an emergency notification message to the physician by using GSM technology. Using four sensors related to healthcare monitoring such as pulse sensor, Accelerometer, breathing sensor and blood Pressure sensor which is controlled by microcontroller and fetched data from sensors. Remaining work will be planned to use Zigbee for send data from sensor devices to PC and we will use GSM technology for send emergency notification messages to the physician mobile.

VII. Remaining Work

Remaining work includes fetching the abnormal condition data from the patients database based on the data emergency message will be send to the physician using GSM technology.

Acknowledgment

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