Monitoring and Alerting of Patient Health Remotely

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Abstract- ***This project is significant in various ways because in today's world, everyday many lives are affected because the patients are not timely and properly operated. Also, for real time parameter values are not efficiently measured in clinic as well as in hospitals. Sometimes it becomes difficult for hospitals to frequently check patients' conditions. Also, continuous monitoring of ICU patients is very difficult. To deal with these types of situations, our system is beneficial. Our system is designed to be used in hospitals and homes also for measuring and monitoring various parameters like temperature, ECG and heart rate. The results can be recorded using Arduino and uploaded to cloud using thinker cad Platform. The system will also generate an alert notification in Doctors Twitter account. Our system is useful for monitoring health system of every person through easily attach the device and record it. In which we can analyze patient's condition through their past data, we will recommend medicines if any emergency conditions. In this project the patient health parameters like Temperature, ECG and heart rate can be collected by using the different sensors, and the data could be communicated to Cloud through Arduino, the uploaded data can be sent as an alert to Doctors twitter account, so that doctor can monitor the health condition and suggest medicine in emergency condition as a first aid, which leads to saving the patient's life.***

Indexed Terms- ***Arduino, Microcontroller, ECG, Temperature Sensor, Heart Rate Sensor, Wi-Fi model.***

I. INTRODUCTION

A Remote health monitoring system is an extension of a hospital medical system where a patient's vital body state can be monitored remotely. Traditionally the detection systems were only found in hospitals and were characterized by huge and complex circuitry which required high power consumption. Continuous advances in the semiconductor technology industry have led to sensors and microcontrollers that are smaller in size, faster in operation, low in power consumption and affordable in cost. Many of the systems were introduced in the developed countries where the infrastructure is working perfectly. In most cases, the systems are adapted to work in developing countries. To reduce some of these problems there is need to approach the remote detection from a ground-up approach to suit the basic minimal conditions presently available in developing countries.

i) Single parameter monitoring system:
In this instance, a single parameter is monitored e.g., Electrocardiogram (ECG) reading. From the ECG or heartbeat detection, several readings can be got depending on the algorithm used. An ECG reading can give the heart rate and oxygen saturation.
ii) Multi-parameter monitoring system:
This has multiple parameters being monitored at the same time. An example of such a system can be found in High Dependency Units (HDU), Intensive Care Units (ICU).

Several parameters that are monitored include the ECG, blood pressure, respiration rate. The Multipara meter monitoring system basically proof that a patient is alive or recovering. In developing countries, just after retiring from their daily career routine majority of the elderly age group, move to the rural areas. In developed countries, they may move to assisted living group homes. This is where a remote health monitoring system can come in handy.

II. LITERATURE SURVEY

1. Development and Clinical Evaluation of a Home Healthcare System Measuring in Toilet, Bathtub and Bed without Attachment of Any Biological Sensors
Daily monitoring of health condition at home is important for an effective scheme for early diagnosis,

treatment, and prevention of lifestyle-related diseases such as adiposis, diabetes and cardiovascular diseases. While many commercially available devices for home health care monitoring are widely used, those are cumbersome in terms of self-attachment of biological sensors and cardiovascular diseases. While many commercially available devices for home health care monitoring are widely used, those are cumbersome in terms of self-attachment of biological sensors and self-operation of them. From this viewpoint, we have been developing a non-conscious physiological monitoring system without attachment of any sensors to the human body as well as any operations for the measurement. We developed some devices installed in a toilet, a bath, and a bed and showed their high measurement precision by comparison with simultaneous recordings of ordinary biological sensors directly attached to the body.

2. Intelligent wireless mobile patient monitoring system

Nowadays, Heart-related diseases are on the rise. Cardiac arrest is quoted as the major contributor to the sudden and unexpected death rate in the modern stress filled lifestyle around the globe. A system that warns the person about the onset of the disease earlier automatically will be a boon to the society. This is achievable by deploying advances in wireless technology to the existing patient monitoring system. This paper proposes the development of a module that provides mobility to the doctor and the patient, by adopting a simple and popular technique, detecting the abnormalities in the bio signal of the patient in advance and sending an SMS alert to the doctor through Global System for Mobile (GSM) thereby taking suitable precautionary measures thus reducing the critical level of the patient. Worldwide surveys conducted by World Health Organization (WHO) have confirmed that the heart-related diseases are on the rise.

Many of the carelated problems are attributed to the modern lifestyles, food habits, obesity, smoking, tobacco chewing and lack of physical exercises etc. The post-operative patients can develop complications once they are discharged from the hospital.

3. The real-time monitoring system for in-patient based on ZigBee

The system is made up of two sub-systems: patient physical states data acquisition and communication system based on ZigBee technology, and hospital monitoring and control center. The patient physical states data acquisition and communication system monitors the main physical parameters and movement status continuously. The information from data acquisition system is sent to hospital monitoring center by ZigBee wireless communication module. The monitoring center receives the information from each patient and save them to the database, and then judges the states of the patient by fuzzy reasoning. Most of The data from the patient can be displayed as a graph or numeric on the monitor if it is necessary, and then the doctor can diagnose the patient according to the recorded continuous data. Wireless sensor network is made up of a lot of wireless sensors based on ZigBee technology. The ZigBee technology provides a resolution for transmitting sensors' data by wireless communication ZigBee technology can transmit data with a rate of 250kbps, and then it is enough for the physical.

consumption, low cost, small size, free frequency, etc. To know the physical states of in-patient, the physical parameters need to be monitored real-time.

III. HARDWARE REQUIREMENT

1. Arduino Mega2560

Arduino board is an open-source microcontroller board which is based on Atmega 2560 microcontroller. The growth environment of this board executes the processing or wiring language. These boards have recharged the automation industry with their simple to utilize platform wherever everybody with small otherwise no technical backdrop can start by discovering some necessary skills to program as well as run the Arduino board. These boards are used to extend separate interactive objects otherwise we can connect to software on your PC like MaxMSP, Processing, and Flash. This article discusses an introduction to Arduino mega 2560 board, pin diagram and its specifications.

The microcontroller board like "Arduino Mega" depends on the ATmega2560 microcontroller. It includes digital input/output pins-54, where 16 pins are analog inputs, 14 are used like PWM outputs

hardware serial ports (UARTs) – 4, a crystal oscillator-16 MHz, an ICSP header, a power jack, a USB connection, as well as an RST button. This board mainly includes everything which is essential for supporting the microcontroller. So, the power supply of this board can be done by connecting it to a PC using a USB cable, or battery or an AC-DC adapter. This board can be protected from the unexpected electrical discharge by placing a base plate.

The SCL & SDA pins of Mega 2560 R3 board connects to beside the AREF pin. Additionally, there are two latest pins located near the RST pin. One pin is the IOREF that permit the shields to adjust the voltage offered from the Arduino board. Another pin is not associated & it is kept for upcoming purposes. These boards work with every existing shield although can adjust to latest shields which utilize these extra pins.

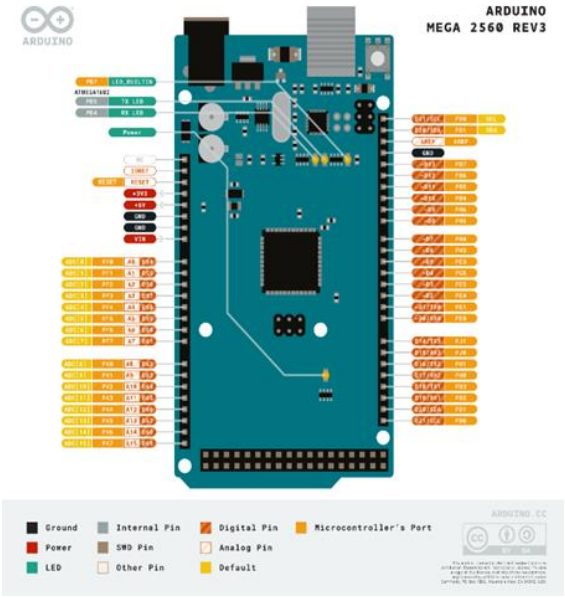

Fig. 1 Block Diagram

The pin configuration of this Arduino mega 2560 board is shown below. Every pin of this board comes by a particular function which is allied with it. All analog pins of this board can be used as digital I/O pins. By using this board, the Arduino mega projected can be designed. These boards offer flexible work memory space is the more & processing power that permits to work with different types of sensors without delay. When we compare with other types of Arduino boards, these boards are physically superior.

2. AD8232 ECG Sensor

Heart diseases are becoming a big issue for the last few decades and many people die because of certain health problems. Therefore, heart disease cannot be taken lightly. By analyzing or monitoring the ECG signal at the initial stage this disease can be prevented. So, we present this project, i.e ECG Monitoring with AD8232 ECG Sensor & Arduino with ECG Graph.

The AD8232 is a neat little chip used to measure the electrical activity of the heart. This electrical activity can be charted as an ECG or Electrocardiogram. Electrocardiography is used to help diagnose various heart conditions.

An ECG is a paper or digital recording of the electrical signals in the heart. It is also called an electrocardiogram or an EKG. The ECG is used to determine heart rate, heart rhythm, and other information regarding the heart's condition. ECGs are used to help diagnose heart arrhythmias, heart attacks, pacemaker function, and heart failure.

Fig.2 Basic ECG Calculation

ECG can be analyzed by studying components of the waveform. These waveform components indicate cardiac electrical activity. The first upward of the ECG tracing is the P wave. It indicates atrial contraction.

The QRS complex begins with Q, a small downward deflection, followed by a larger upwards deflection, a peak (R); and then a downwards S wave. This QRS

complex indicates ventricular depolarization and contraction.

Finally, the T wave, which is normally a smaller upwards waveform, represents ventricular re-polarization.

3. AD8232 ECG Sensor

This sensor is a cost-effective board used to measure the electrical activity of the heart. This electrical activity can be charted as an ECG or Electrocardiogram and output as an analog reading. ECGs can be extremely noisy, the AD8232 Single Lead Heart Rate Monitor acts as an op-amp to help obtain a clear signal from the PR and QT Intervals easily.

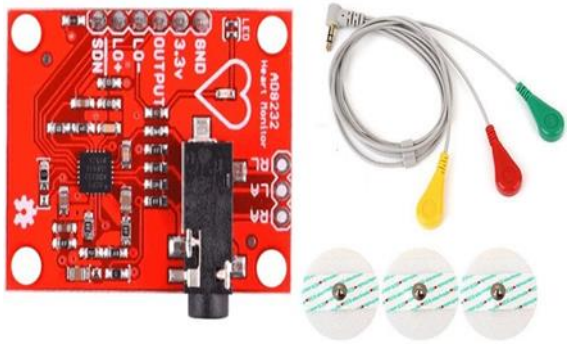

Fig.3 AD8232 ECG Sensor

The AD8232 is an integrated signal conditioning block for ECG and other biopotential measurement applications. It is designed to extract, amplify, and filter small biopotential signals in the presence of noisy conditions, such as those created by motion or remote electrode placement.

IV. SOFTWARE IMPLEMENTATION IN ARDUINO USING MATLAB

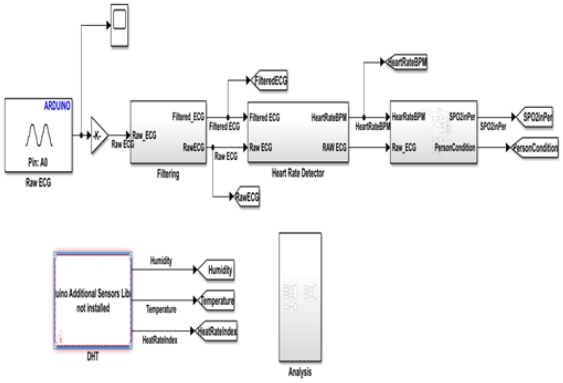

Fig.4 MATLAB Implementation of Health Monitoring System

V. ADVANTAGES

1. Monitoring of Patient Health Remotely.
2. Time to time Health Monitoring.
3. Quick Response from the doctor in the emergency
4. Saving in time to do first aid treatment.

VI. APPLICATIONS

1. Remote Applications
2. Pandemic situation usage

VII. RESULT

The below figure shows the Hardware connection of the Patient health monitoring system with various sensor networks, to monitor the patient's temperature, Heart rate, Pulse and SPO2

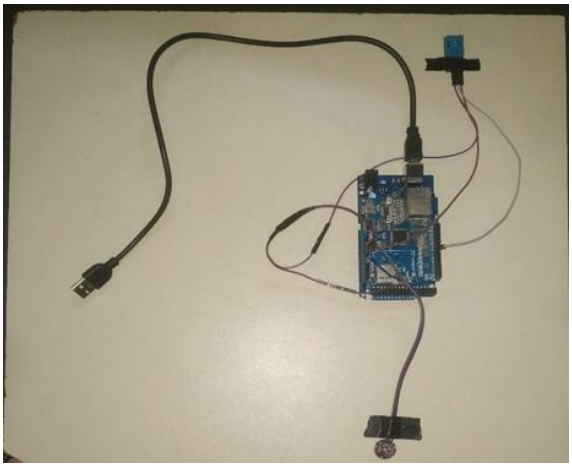

Fig.5 Hard ware connection of Health Monitoring system with Arduino and Sensors

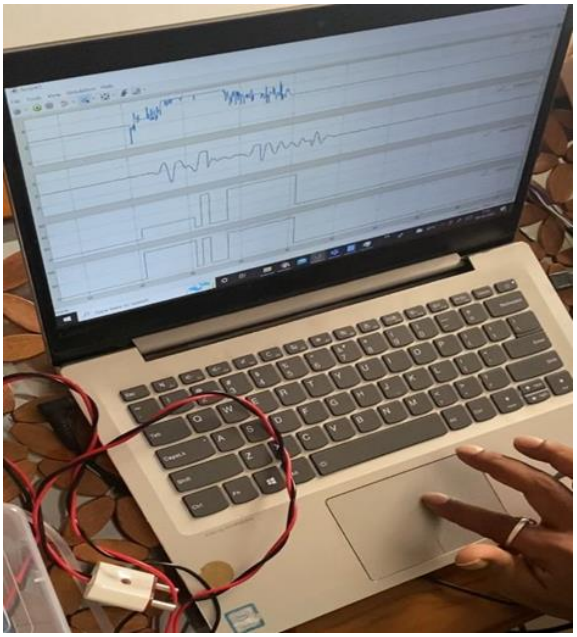

Fig.6 Patient Health Monitor

The above figure indicates the Pulse rate of a Person, Filtering of Pulse rate, Final Pulse rate and Temperature of a person

CONCLUSION

The proposed system of patient health monitoring using Arduino can be highly used in emergency situations as it can be daily monitored, recorded and stored as a database and the same data can be stored in cloud using Arduino and IOT device so that the database can be shared in all the hospitals for the intensive care and treatment.

In this project the Parameters like heart rate, Pulse of a patient, Temperature, and Oxygen levels can be measured using various sensors, but the reliability of the sensors like low, we can use the high reliable sensors to get the exact measurements which will be helpful in analyzing the exact condition of the body.

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