IOT Based Heart Attack Detection and Alert System

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ABSTRACT

To the existence and influence, health related parameters and issues are of utmost importance to man. Various systems have been developed that are able to capture and monitor changes in health parameters. A real time remote monitoring of heart rate is presented in this paper. This system uses an alert and LCD display that are capable of monitoring the heart rate. A low cost, efficient and flexible heart rate detection and alert system using wireless module has been implemented in this paper. The sensors sense and measure the heart rate and detected signals are sent to control unit for further processing. The processor displays the heart rate on LCD which is then proceeded to alert system. If there is a large difference between the normal and measured heart rates, then an alert will be provided by the system. This system is continuous, real time, safe and accurate in monitoring the heart rates.

Keywords— Alert, Control Unit, Processor, LCD

I. INTRODUCTION

It is estimated that over 20 million deaths all over the world occur due to cardio vascular disorder. Several people are also disabled by cardio vascular disease. The fatal consequence occurs due to delay in providing medical assistance. The severity increases due to deployment of resources for early detection and treatment. In this system, the analog sensors measure the heart rate. An analog to digital converter converts the sensed analog data into corresponding digital data. This digital data is transmitted over a ZigBee module. The heart of patients suffering from fatal heart failures is monitored continuously. The control system accepts and processes the monitored signal. The processed signal is then fed into alert system as an precaution or detection of heart failure to the patients.

This paper aims at reduction in number of deaths due to heart attack and heart related diseases. The design uses low cost effective ZigBee heart rate monitoring and alert system. The system can be used in hospitals and for patients who are under continuous monitoring. The heart attack detection by monitoring the heart rate, helps to inform a person if he is about to have heart attack. The system uses transmitting and receiving parts of which the transmitter is with the patient and the receiver is with doctor or nurse. The system uses smart sensor which converts the heart beat into pulses. When the controller detects heart failure or heart attack, it sends signals to cell phone contained with the doctor.

II. THE EXISTING AND PROPOSED SYSTEMS

In the existing system, heart rate is determined by analyzing the ECG signal measured by microprocessor. The ECG signal is taken from the wrist. In the proposed system, the ECG leads and microcontroller are used to monitor the heart rate. Moreover, the ECG is directly taken from the chest. In the existing system, the sensor fusion algorithm allows the sensors to detect body temperature and water level in the body. In the proposed system, the alert system and LCD display will get activated depending on the heart rate and ECG. This system is portable, flexible, accurate and efficient.

III. BLOCK DIAGRAM DESCRIPTION

A). Transmitter

The transmitting end of the system uses an AVR microcontroller, ECG leads, Power supply, wireless transmitter module, LCD display and multimedia card (MMC). AVR microcontroller is an 8-bit RISC Atmel microcontroller. The heart's electrical activity is represented using ECG lead system. The electrodes are placed on the chest to measure the heart rate. The ECG

lead system can be either unipolar or bipolar. The unipolar lead system uses single conductor lead with an electrode at the tip. The bipolar lead system uses two separate conductors. In this system, ZigBee is used as wireless transmitting module. The MMC is a solid state storage device.
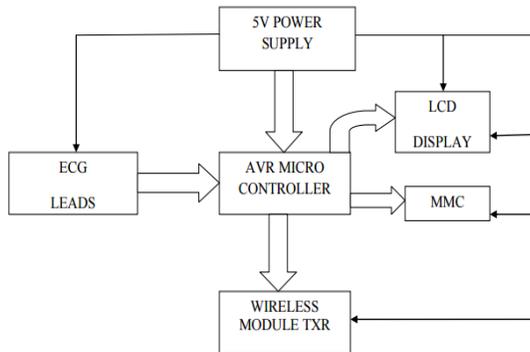

Figure 1: Transmitter

The ECG leads convert heart beat into pulses. Pulses at the rate of heart beat will be generated and are fed into the micro controller. The microcontroller continuously counts the pulses. If any irregularity in the pulse count is detected, the microcontroller transmits signals to the receiver section through wireless transmitter module. The wireless transmitter module acts as an encoder.

B). Receiver

The receiving part of the system uses AVR microcontroller, power supply, buzzer alarm, graphical LCD and wireless receiving module. The graphical LCD display is used to display the heart rate and buzzer is used to provide the alert under critical situations. The wireless receiver module acts as a decoder. It decodes the signal and activated the microcontroller. The microcontroller then provides an alert through the buzzer alarm.
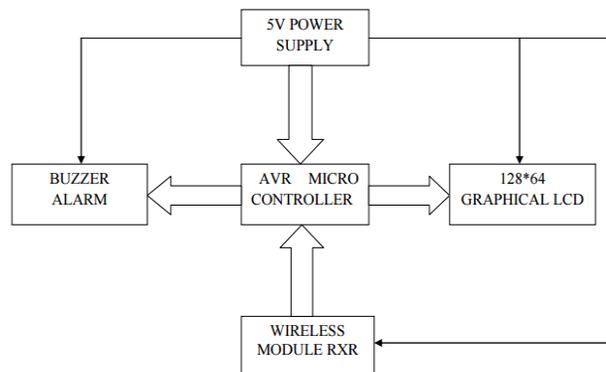

Figure 2: Receiver

IV.   BLOCK DIAGRAM DESCRIPTION

A serious medical emergency in which the blood supply to heart is suddenly blocked leads to heart attack. It is a serious threat in today's world. The death rates due to heart attack are increasing at an alarming rate. Life style, food habits, irregular routine are some of the main causes of heart attack. The heart attack is most likely to occur in elders and senior citizens. Today, most of the senior citizens are living alone or they are left alone in home while others go for their jobs. A system has been proposed to give medical assistance to such people if they suffer from heart attack while they are alone.

Internet of things (IOT) has been used to help the monitoring of heart rates and blood pressure. When the system is placed on the chest, the sensors monitor the heart rates and blood pressure. Using these parameters heart attack occurrence can be detected. When there is a large difference between the recorded heart rate and reference heart rate, an alert message is send to doctor's mobile notifying the person's critical condition.

The heart rate measured by the electrodes will be processed by the microcontroller. The processed data is then send over a mobile phone. The mobile phone user needs to install an application that can read the data from the controller. When the heart rate is in critical level, then the alert message will be send to contacts.

A). Transmission end

The main elements in the transmission end are regulator IC LM 117, ECG leads, AVR microcontroller. The LM117 regulator IC provides a regulated supply voltage of 5V for the working of the circuit. The ECG leads pick up the biopotential activity of the heart. The biopotential is converted into corresponding ECG signal with the help of AD620. This ECH waveform is then fed into the microcontroller. The microcontroller processes the data and the result is stored in MMC. The data from MMC is transferred onto ZigBee for wireless transmission. Switches are used for recording and playback.
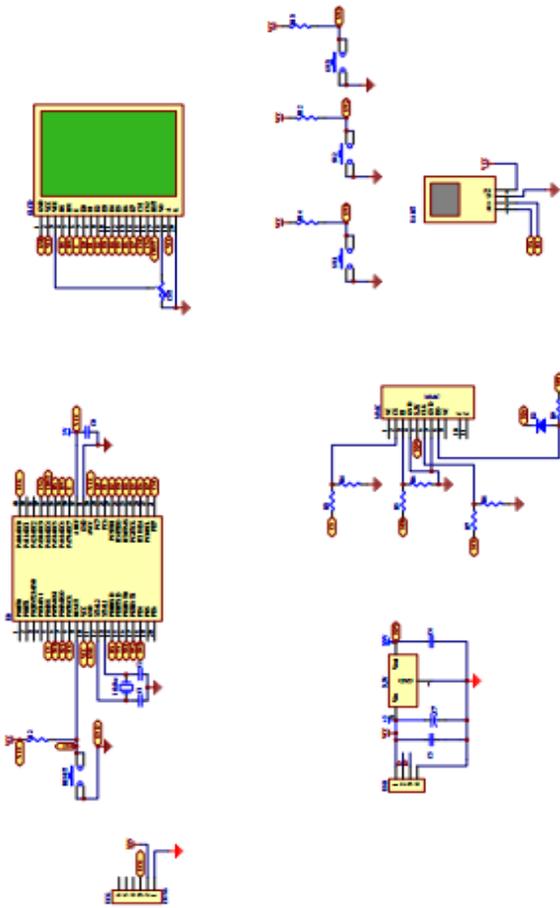
Figure 3: Transmission End

B). Receiving end

      In the receiving end, the wireless receiving module receives the transmitted data. The data which is in digital form is converted back into analog form by the AVR module. The received signal is then compared with the normal ECG levels. If there is a variation in ECG from normal level, alert message or alarm will be produced.
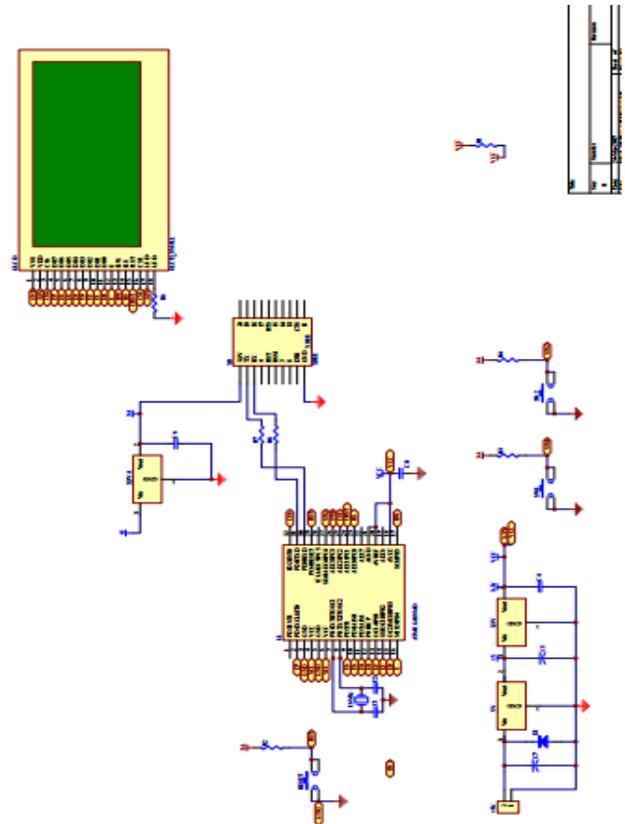

Figure 4: Receiving End

V.   PROJECT OUTCOME

      The LCD display and alert messages are produced whenever the measured ECG levels vary from the normal ECG levels.

Figure 5: LCD Display
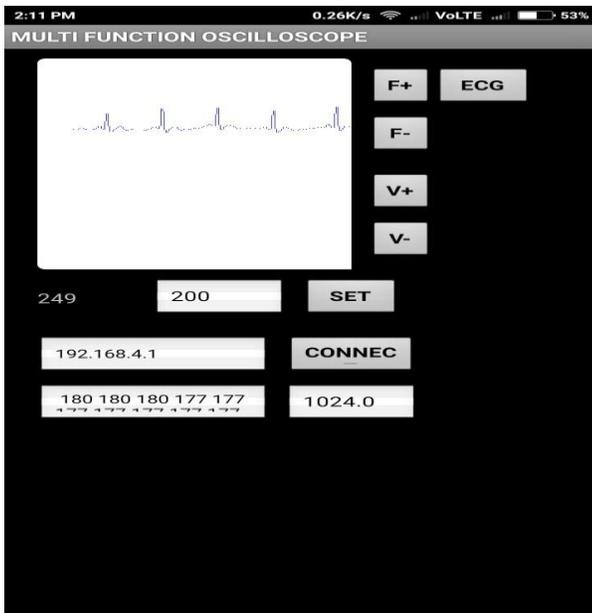
Figure 6: ECG Recording and Display

Figure 7: ECG rate display using mobile application

VI.   CONCLUSION

In this system with the help of IOT heart attack can be detected and life can be saved. This system helps old age people who are more likely to suffer from heart diseases. Apart from heart rate blood pressure can also be measured using this system. Doctors or surrounding people will be notified about the heart attack with the help of alert system.

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