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# Real Time ECG Monitoring System

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**ABSTRACT:** The frame uses an ECG sensor, an SpO2 sensor and a temperature sensor. These sensors are used to constantly analyze or screen patients and in this way the information is connected to the NodeMcu microcontroller which is then connected to blynk IoT. When a patient's temperature rises, the change in temperature is assessed by doctors using the blynk app. If the blood oxygen level returns to normal, this information is sent to the blynk app. And if the temperature continues to rise, the buzzer will sound and the information will be sent to the blynk app via the NodeMcu microcontroller.

**KEYWORDS:** ECG sensor, SpO2 sensor, Temperature sensor, IoT blinker, Buzzer, NodeMcu microcontroller.

## I. INTRODUCTION

An electrocardiogram (ECG) is a measurement of the heart's electrical activity over time, captured and externally recorded as measured by skin electrodes. The signals indicate the overall rhythm of the heart and weakness in different parts of the heart muscle. This technique is the best way to measure and diagnose abnormal heart rhythms and is commonly used in hospitals around the world. It is also used in sports and military environments for advanced diagnostics of healthy individuals.

In recent years, the research community has been active in the pursuit of "Wireless ECG" technologies, where patients no longer need to be attached to a large stationary device while their ECG signals are monitored. A major driver of this trend is reduced healthcare costs due to remote monitoring where patients can reside in their homes rather than in a hospital bed. Many systems with different goals and approaches have been designed to achieve this performance. Wireless ECG monitoring can be performed using 3, 4, 5 or 10 sensors, providing cardiologists with increasingly detailed information. Data is captured and tracked by wearable circuitry and then transmitted wirelessly to a nearby receiving device. A nearby receiver can be as simple as a basic recording or analysis device, or as complex as a large hospital information system actively collecting real-time wireless data from multiple patients.

## II.OBJECTIVE

One of the main goals of this project is to provide the user or patient with maximum comfort in ECG measurement, especially during long-term use. Wireless technology is the ability to create interactive healthcare using modern technology and telecommunications. A wireless device used for an effective remote monitoring system, using real-time, continuous and accurate information about the patient's heart condition. In this project, we will design a wireless ECG sensor and display its output wirelessly on a computer screen.



### III. LITERATURE SURVEY

It consists of an AD8232 ECG sensor that captures electrocardiograph (ECG) signals. The AD8232 is preferred over other chips, the HM301D is three-channel, while we only need a single-channel ECG, and the ADS1191 does not provide high enough gain to achieve good resolution. The AD8232 has the best output impedance and gain. An EKG is the process of recording the electrical activity of the heart over a period of time using electrodes placed on the body.[1] This research proposes a real-time ECG signal monitoring system in Wireless Sensor Network via Zigbee. The Pan-Tomkins algorithm applied to the real-time abnormal ECG signal monitoring system prevents the risk of cardiac death. It is beneficial for doctors and nurses, they can monitor the patient's ECG signal in real time. A wireless sensor network can communicate over a longer distance than Bluetooth technology and without the limitation of the distance to the server. [2]The wireless ECG monitoring system has a problem with connecting the electrodes to the body, which is adherent to the patient's body, and which needs hydrogel on the electrodes, another problem is with the noise when converting the data to analog to digital format, this conversion is also somewhat noisy data. Some additional circuitry and filtering is needed to remove this noise. Some solutions to the electrode and conversion problem are mentioned in this article. An ECG monitoring system has several advantages when connected to a wireless network. The combination of a built-in and wireless system is more affordable if we are talking about movement while sensing ECG signals from the patient's body. [3]

The ECG module receives three inputs from the human body using 3-lead electrodes. The ECG module (AD8232) has an instrument amplifier and a high-pass filter for operational purposes. After processing the inputs, it produces a single output. It consists of electrodes that are placed on the left arm, right arm and right leg of the patient's body. The ECG module processes the data and produces continuous analog values according to the input that the electrodes give to the Arduino microcontroller.[4]We implemented an ECG monitoring system without supplying additional power to the circuit, so we designed the system to be powered by a USB interface that draws power from a smartphone and supplied to the FPGA board and ECG amplifier.[5]

### IV. EXISTING SYSTEM

- In the current system, patients are connected to large machines.
- It affects their mobility and frequent hospital visits.
- The wireless ECG monitoring system has an electrode-to-body bonding problem that adheres to the patient's body and needs hydrogel on the electrodes. Another problem is noise when converting data to analog to digital format, this conversion also has some data noisy.
- Some extra circuitry and filtering is needed to remove this noise.

#### A. DISADVANTAGES

- Since the system runs on batteries, the batteries can be recharged or changed frequently.
- Electronics must always be with the patient.
- Wireless transmission may be interfered with or may be interfered with by similar frequency sources.
- Attaching the electrode to the wet gel requires a lot of preparation and can cause irritation, allergic reactions, inflammation and bacterial growth.
- Another problem is with monitoring the patient's condition for 24 hours.

### IV. PROPOSED SYSTEM

- The textile electrode was introduced to overcome the limitations of dry and wet electrodes; it requires high pressure for good skin-electrode contact.
- The condition of the patients is continuously monitored and the medical condition of the doctors is checked. Provides maximum comfort to the user or patient during ECG measurement.



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**A. DISADVANTAGES**

- Consumes less time.
- The patient may be able to independently monitor and manage their own health condition.
- The ability of EKG devices to transmit information about the heart has helped reduce the number of victims of cardiovascular disease.
- Doctors can remotely view data and analyze patients' ECG signals.

**V.BLOCK DIAGRAM**

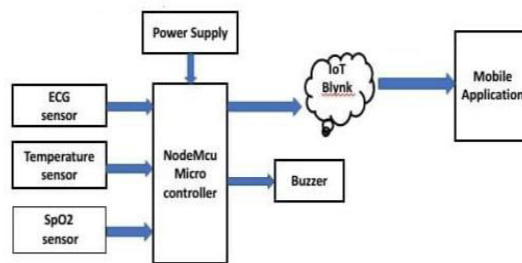


Fig no:1 proposed for block diagram

**A. CIRCUIT DIAGRAM**

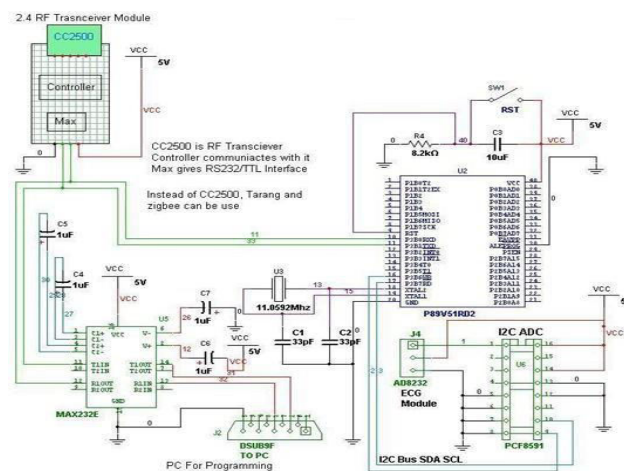


Fig no: 2 circuit diagrams

**VI. HARDWARE REQUIREMENT**

**1. ARDUINO UNO**

Arduino is based on an open source electronics project, i.e. all design specifications, schematics, software are openly available to all users. So Arduino boards can be purchased from vendors as they are commercially available or you can build your own board if you wish i.e. you can download the schematic from the official Arduino website, buy all the components as per the design specification, assemble all the components. and create your own board. Hardware and software

Arduino boards are generally based on microcontrollers from Atmel Corporation, such as microcontrollers based on the 8, 16, or 32-bit AVR architecture. An important feature of Arduino boards are standard connectors. Using these

connectors, we can connect the Arduino board to other devices such as LEDs or add-on modules called Shields. Arduino boards also consist of an on-board voltage regulator and a crystal oscillator. They also consist of a USB to serial adapter that allows the Arduino board to be programmed using a USB connection.



Fig NO: 3 Arduino UNO

## 2. HEART BEAT SENSOR

A basic heart rate sensor consists of a light-emitting diode and a detector such as a photoresistor. The heart's pulses cause changes in blood flow to different areas of the body. The clip is attached to the organ (earlobe or finger) with the detector part on the flesh near the blood, the signal pulses are equivalent to the heartbeat pulses.



Fig no: 4 Heart Beat Sensor

## 3.ECG SENSOR

An electrocardiogram is a graphic produced by an electrocardiograph that records the electrical activity of the heart over time. Analysis of the various waveforms and normal vectors of depolarization and repolarization provides important diagnostic information. An electrocardiogram does not assess the contractility of the heart. However, it can provide a rough indication of increased or decreased contractility.

## 4. TEMPERATURE SENSOR

An LM35 IC from National Semiconductor was used for temperature sensing. It is an integrated circuit sensor that can be used to measure temperature with an electrical output proportional to temperature (in °C). The temperature can be measured with it more accurately than with a thermistor. The sensor circuit is sealed and not subject to oxidation etc. A simple temperature sensor is a device; requires a thermocouple or RTD (resistance temperature detectors) to measure temperature using an electrical signal. A thermocouple is made of two different metals that generate an electrical voltage inversely proportional to the change in temperature. An RTD is a variable resistor, it will change electrical resistance inversely proportional to changes in temperature in a precise and near linear fashion.



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Fig no: 6 Temperature Sensor

### 5. SpO2 SENSOR :

SpO2 is a measure of blood oxygen saturation. The more oxygen in your blood, the higher your SpO2 levels . Since our bodies need oxygen to survive, we can generally say that higher SpO2 levels are good. A device that measures SpO2, movement during sleep, can potentially alert an individual to possible symptoms of sleep apnea. Of course, your SpO2 wearable must be able to monitor your blood oxygen levels while you sleep. SpO2 monitoring during the night usually significantly reduces wearable battery life.



Fig no: 5 SpO2 Sensor

### 6. RELAY:

A simple electromagnetic relay like the one pulled from the car in the first picture is an adaptation of an electromagnet. It consists of a coil of wire surrounding a soft iron core, an iron yoke which provides a low reluctance path for the magnetic flux, movable iron armature and a sets of contacts wo in the relay picture. The armature is suspended from the yoke and mechanically connected to the movable contact or contacts. In this state, one of the two sets of contacts on the relay shown is closed and the other set is open. When an electric current passes through the coil, the resulting magnetic field attracts subsequent movement of the movable contact or contacts either makes or breaks the connection with the fixed contact.



Fig no: 7 Relay

## 7. Power supply

This chapter introduces the operation of power supply circuits built using filters, rectifiers and then voltage regulators. Starting with an AC voltage, a steady DC voltage is obtained by rectifying the AC voltage, then filtering to a DC level, and finally regulating to obtain the desired fixed DC voltage. Regulation is usually obtained from a voltage regulator IC unit that takes the DC voltage and provides a somewhat lower DC voltage that remains the same even as the input DC voltage changes or the output load coupled to the DC voltage changes.



Fig no:8 Power Supply

## 8. BUZZER

A buzzer is a small but powerful component to add sound functionality to our project/system. It is a very small so it can be easily used on Breadboard, Perf Board and even PCB, making it a widely used component in most electronic applications. Sound caused by the internal oscillating circuit present inside. However, the one shown here is the most common as it can be modified with other circuits to easily fit into our application.



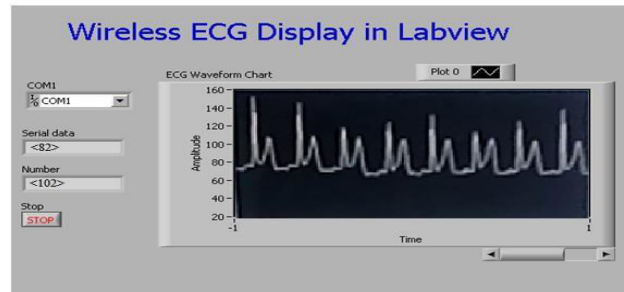
Fig no: 9 Buzzer

## VII. RESULT

The analog signal part has been kept simple to minimize panel space, the raw ECG signal with noise is obtained using disposable electrodes, connected to cables using a few standard terminals. This signal was fed to the filter circuit and then to the wireless module for transmission. Electrodes are used to sense bioelectric potentials caused by muscle and nerve cells. ECG (Electro Cardio Gram) electrodes (Ag-AgCl electrodes) are generally of the direct contact type. They function as transducers converting the flow of ions from the body through the electrolyte into an electron current and subsequently an electrical potential measurable by the front end of the ECG system. Known as bare metal or embedded electrodes, these transducers generally consist of a metal such as silver or stainless steel with a gel electrolyte that contains chloride and other ions.

### OBTAINED RESULT

A wireless ECG sensor that displays its output on a computer is done using Labview. A device that uses effective remote monitoring for continuous and accurate real-time heart status information.



Figno:10 Snapshot of Connections



Fig no:11Kit overall setup

## VIII. CONCLUSION

In this survey, we have tried to design a complete document on heart attack detection by monitoring human heartbeat. The heart rate sensor, which is connected to the microcontroller, senses the person's heart rate and transmits it over the Internet using a Wi-Fi module. The system allows you to set heart rate limits. After setting these limits, a person can start monitoring their heart rate and whenever their heart rate exceeds a certain set point, they can get an alert about high heart rate and also about the possibility of a heart attack. The system also alerts you to a lower heart rate. This research paper focuses on the development of an initial prototype for wireless transmission of ECG signals. It is obvious that the design of such a system will help early detection of abnormal conditions of cardiovascular diseases and prevention of their serious consequences.

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