HEALTH CARE AND BIOMEDICAL DEVICES

[1]Asst. Prof. Bishnu Prasad Panda, [2]Asst Prof. Amaresh Choudhury, [3]Lect. Monalisa Gouda,
[4]Lect .Rabindra Das, [5]Lect. Giridharee Pradhan
[1,2,3,4,5] Dept. Of Electrical Engineering
Gandhi School of Engineering, Berhampur

ABSTRACT

This project presents the design and development of a biomedical device aimed at improving heart health monitoring and early detection of cardiovascular conditions. The mechanism can diagnose human health economically within a short period of time. The mechanism or device will detect Blood Pressure, Heart Rate, Pulse Rate and ECG etc. The device would be installed in rural area and people can use it to check there check heart rate, blood pressure or pulse rate and be aware of their health condition without being dependent on cardiology tests. The device will operate on the norms of AI and would give an instant analysis in their mobile set, whether the user is safe from any diseases or he needs to go for a quick check up. This project aims to provide precaution in advance to people in rural areas.

1. INTRODUCTION

The heart diseases are one of the foremost reasons for unexpected deaths. Thus, various medical devices have been developed by the engineers to diagnose and scrutinize various diseases. The Healthcare has become one of the most substantial issues for both Individuals and government due to brisk growth in human population and medical expenditure. Many factors such as Age, fitness activity, cholesterol level, diabetes, cardio vascular diseases, body size, body position etc. may influence the heart rate of an individual. In this way, how to recognize human sicknesses in a convenient and exact way with ease has been given careful consideration. Because of the predominance in the detection of the heart linked sicknesses, ECG wave observing and analysis has been commonly utilized in the clinics, hospitals and pathology labs. The Electrocardiogram is physiological signal ensuing from the body surface. Electrocardiograph is a device used to evaluate and monitor the ECG signal. Electrodes placed noninvasively on the body surface are being used to obtain information about the electrical activity produced by the heart. In most of the medical institutions, Electrocardiogram is observed using bulky and fixed instruments. This sort of hardware normally utilizes twelve electrodes to gather Electrocardiogram Records because of their great execution and accuracy in less time. However the equipment isn't compact, which implies that patients' movements are constrained at the time of data gathering. As these devices are costly and cumbersome for home utilization, patient need to visit the hospital on regular basis, which will increase the load on clinics and hospitals. In this manner, a minimal effort convenient ECG detecting framework is exceptionally required. In this study, using Internet-of- things (IoT) cloud, the architecture of ECG monitoring system is put forward. In perspective of this design, we plan and execute an adaptable ECG checking framework. The ECG data, which is gathered from the human body, will be sent directly to the smart phone, utilizing Bluetooth module HC 05.

II. PROBLEM IDENTIFICATION

Now, people face many types of consequences regarding the Cardiology analysis. If someone goes to the diagnostic center to measure the ECG, Heart Rate and pulse Rate then he/she has to face many types of problems like,

- Tests are done via biochemical method
- Results might be delayed Unnecessary spending of money
- Need to consult a professional to read the report
- Time consuming
- Accuracy
- Dependency on others

SOLUTION DEVELOPED

We are planning to develop a predictive analysis mechanism for overall health monitoring. The mechanism can diagnose human health economically within a short period of time. The mechanism or device will detect Blood Pressure, Heart Rate, Pulse Rate and ECG etc. The device would be installed in rural area and people can use it to check there check heart rate, blood Pressure or pulse rate and be aware of their health condition without being dependent on cardiology tests. The device will operate on the norms of AI and would give an instant analysis in their mobile set, whether the user is safe from any diseases or he needs to go for a quick check up.

III. DESCRIBE IDEA

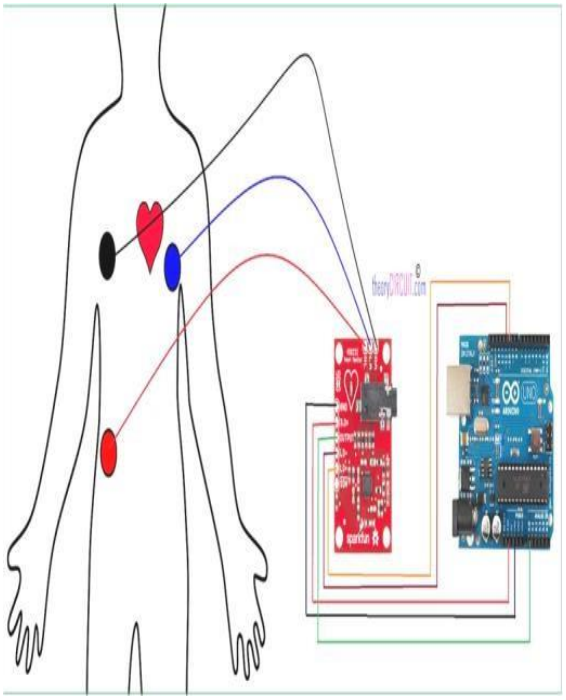
The idea and solution is described through a figure as below
To build a portable, low-cost, real-time heart monitoring system that measures both electrocardiogram (ECG) signals and heart/pulse rate, and transmits the data wirelessly to a Smartphone or computer using Bluetooth.

IV. COMPONENT REQUIRED

- AD8232 ECG Sensor – Captures ECG signals from the body.
- Pulse Rate Sensor (e.g., MAX30100 or a fingertip pulse sensor) – Measures the pulse or heart rate (BPM).
- Arduino Uno – Microcontroller for data acquisition and control.
- HC-05 Bluetooth Module – Enables wireless communication with Smartphone or PC.
- Power Supply – Typically 5V (can be USB or battery pack).

When we use AD8232 sensor, it costs around Rs. 1000, pulse rate sensor costs around Rs. 400, blood pressure monitoring device costs Rs. 1400, Bluetooth module HC05 costs Rs. 600, Arduino UNO costs Rs. 650, connecting wires costs Rs. 150, electrode cost Rs. 250, but in our device one can find all Cardiology test at Rs. 5000 Approximately. thus it is very cost effective.

- AD8232 ECG Sensor – Arduino UNO Connection
- AD8232 pin Arduino UNO pin
- Pulse Rate Sensor – Arduino UNO
- Bluetooth Module HC 05 – Arduino UNO



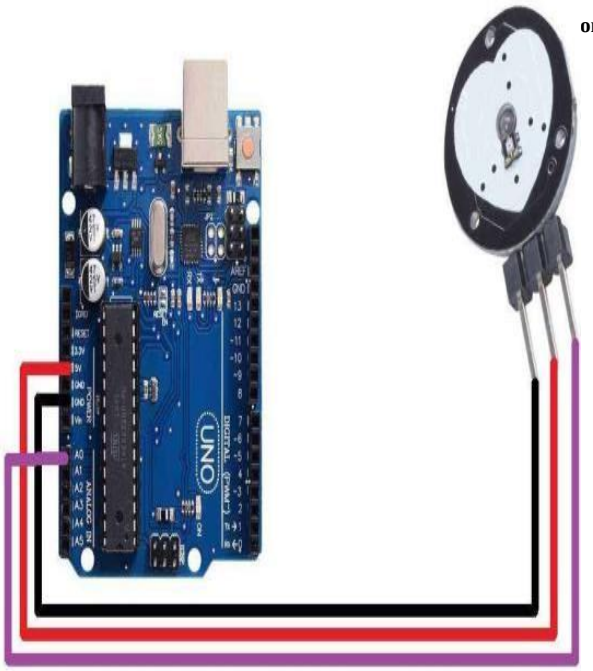
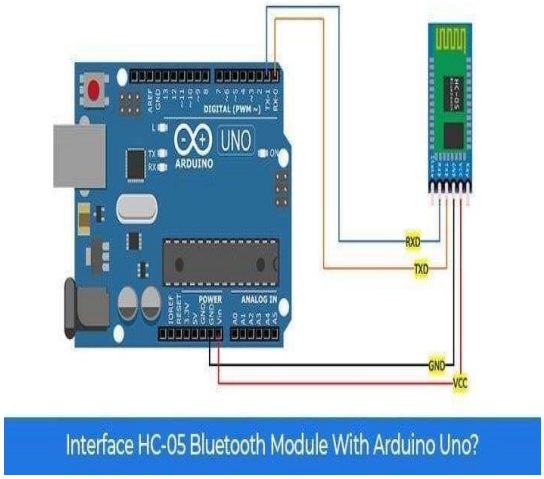
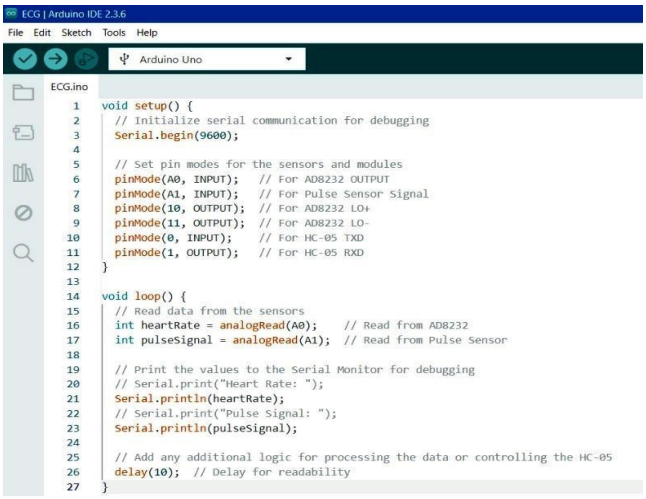


Figure 4.2 Bluetooth Module HC 05– Arduino UNO



V. PROGRAM



```
void setup() {
  // Initialize serial communication for debugging
  Serial.begin(9600);

  // Set pin modes for the sensors and modules
  pinMode(A0, INPUT);   // For AD8232 OUTPUT
  pinMode(A1, INPUT);   // For Pulse Sensor Signal
  pinMode(10, OUTPUT);  // For AD8232 LO+
  pinMode(11, OUTPUT);  // For AD8232 LO-
  pinMode(0, INPUT);    // For HC-05 TXD
  pinMode(1, OUTPUT);   // For HC-05 RXD
}

void loop() {
  // Read data from the sensors
  int heartRate = analogRead(A0);    // Read from AD8232
  int pulseSignal = analogRead(A1);  // Read from Pulse Sensor

  // Print the values to the Serial Monitor for debugging
  // Serial.print("Heart Rate: ");
  Serial.println(heartRate);
  // Serial.print("Pulse Signal: ");
  Serial.println(pulseSignal);

  // Add any additional logic for processing the data or controlling the HC-05
  delay(10);  // Delay for readability
}
```

Figure 5.1 Program for 3-lead monitoring cable and attach each lead to the patient's anterior chest wall

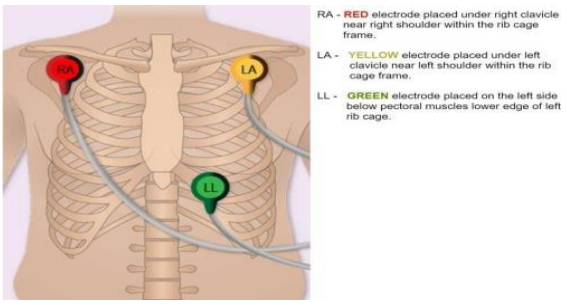


Figure 5.2 3-lead monitoring cable and attach each lead to the patient's

5.1 PROCEDURE FOR ECG

- Prepare areas on skin- a razor may be required to remove hair.
- Minimize the duration of exposure- patients can wear clothing once the ECG leads are attached.
- Select the 3-lead monitoring cable and attach each lead to the patient's anterior chest wall as shown below:-

Figure 5.3 ECG report

5.2 ECONOMIC SUSTAINABILITY

The production cost of our product is quite low and it has low maintenance cost, hence it is economically very sustainable.
Our product will use reusable plastic and sensors and will not contribute to pollution. The longevity is long enough which adds to its environmental sustainability.

VI. CONCLUSION

The heart monitoring system developed using the Arduino UNO, Bluetooth module HC-05, AD8232 ECG sensor, and a pulse rate sensor effectively demonstrates a low-cost, portable, and real-time solution for basic cardiac health monitoring. The AD8232 sensor provides accurate ECG signals, while the pulse sensor monitors heart rate, offering a comprehensive overview of cardiovascular activity. With wireless data transmission via the HC-05 module, the system enables remote monitoring on mobile devices or computers, enhancing user convenience and enabling early detection of potential heart anomalies. This project highlights the potential of integrating biomedical sensors with microcontroller platforms to build accessible health monitoring tools suitable for personal use, telemedicine, and educational purposes

REFERENCES

[1] James L. Wayman in Biometrics-Now and Then: "The Development of Biometrics Over the Last 40 Years". New York Times article:

[2] James L.Wayman, "Fundamentals of Biometric Authentication Technologies". National Biometric Test Center.

[3] Joseph Atick, From "The Science and Technology of Biometrics and Managing Human Identity".