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AFFORDABLE ECG TRACKING DEVICE FOR PATIENTS UTILIZING MOBILE PHONES

Yogeesh TR[1]

[1]HOD, Electronics and Communication Department, Vidyavardhaka Polytechnic, Mysuru, Karnataka, India

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ABSTRACT

This paper incorporates various sensors and an Arduino board to develop and deploy a Smart ECG Monitoring System. ECG monitoring is increasingly integrated into daily life, allowing for the analysis of ECG features such as the patient's heartbeats, heart conditions, and heart diseases. The system detects the patient's ECG signals through a three-lead electrode setup, which AD amplifies these signals for processing by the Arduino. This setup measures the heart's electrical activity, known as ECG. In this project, an Arduino and a Bluetooth module are utilized to gather and transmit the ECG data to a mobile application. Currently, portable ECG devices are expensive, making it difficult for individuals to use them at home for emergencies, and this new technology offers a more affordable alternative.

Keywords: Electrocardiogram, ECG signal, FIR Filters, High- pass Filter, Low-pass Filter, Arduino-uno, temperature sensor.

1. INTRODUCTION

In numerous instances, patients need to be constantly watched, requiring extended stays in hospitals, which can be costly today. The conventional monitoring systems involve attaching sensors to bedside machines, essentially keeping the patient bedridden. However, in our fast-paced world and the rise in sudden cardiac events, there's a need for a monitoring system that can keep track of patients from a distance. Not all patients show symptoms of atrial fibrillation arrhythmia, yet a doctor might spot an irregular heartbeat during a regular ECG test. Therefore, it's essential to continuously monitor patients' heartbeats in their daily lives to catch any arrhythmias early.

Early detection can significantly improve patient outcomes. The focus of this research is on designing and developing a system for detecting atrial fibrillation (atrial fibrillation) and processing alarms. To create an effective model for predicting atrial fibrillation, a Long Short-Term Memory model is used. This model doesn't need preprocessing but can identify underlying patterns in various ECG signals and learn their relationships through deep learning. The ECG data is collected and monitored in real-time by the system.

The choice of an Android smartphone as a portable monitoring device was made due to its advanced features and open-source nature. The reliability and delay of this system have been tested in real-world scenarios. The ECG Remote Monitoring System, which also includes monitoring of heartbeats and body temperature, has been outlined. This system is made up of three main components: a hardware module for data collection, a Bluetooth module for data transmission, and a display module for data presentation. Through Wi-Fi, the collected clinical data is sent to a database server. The system's performance has been evaluated on various patients, and the proposed modifications have been found to be beneficial for healthcare professionals.

2. METHODOLOGY

This review, we really try to make an Arduino-based implanted ECG framework, explicitly for the finding of heart-related issues using an equipment tool compartment for rustic Bangladeshi clinical offices. For this recommended framework, we should use an equipment tool stash that can quantify electrocardiogram (ECG) everyday medical issue. This computerized signal is moved to a getting gadget for signal handling, and we should utilize an EKG safeguard to change over it into a type of twofold information that can be utilized. We simply assemble the ECG information and apply different ECG information sifting calculations on it (like: Low-pass channel, High-pass channel, FIR channel). The heart master will next use this crude information and the sign showing bend to suggest prescription.

Framework Model: This venture satisfy the mean to diminish the gamble of contamination in medical services laborers fundamentally. Lessening the increasing is likewise anticipated interest for PPE (staff assurance gear) units and different necessities. The wellbeing can be checked and illness analyzed by any specialist at any distance. An IoT based wellbeing observing framework was created. The framework screens internal heat level, beat rate and saline level, which are likewise showed on a LCD.

These ECG sensor values are then shipped off a clinical server and to patient family members utilizing remote correspondence. These information are gotten in an approved personals advanced mobile phone with IoT stage. With

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the qualities got the specialist then, at that point, analyze the sickness by checking the seriousness and the condition of soundness of the patient is known.

1. Equipment particular
2. Connecting between Arduino with Microcontroller and WiFi Module of the PC
3. Perusing sequential information from the sensor port
4. Putting away those information into a Constant information document
5. Observing ECG and Temperature sensor utilizing IoT

3. MODELING AND ANALYSIS

HC-05 module is a simple to utilize Bluetooth SPP (Sequential Port Convention) module, intended for straightforward remote sequential association arrangement. The HC-05 Bluetooth Module can be utilized in an Expert or Slave design, making it an extraordinary answer for remote correspondence.

This sequential port Bluetooth module is completely qualified Bluetooth V2.0+EDR (Upgraded Information Rate) 3Mbps Adjustment with complete 2.4GHz radio handset and baseband. Installed frameworks are regulators with on chip control. They comprise of microcontrollers, info and result gadgets, recollections and so forth, on chip and they can be utilized for a particular application.

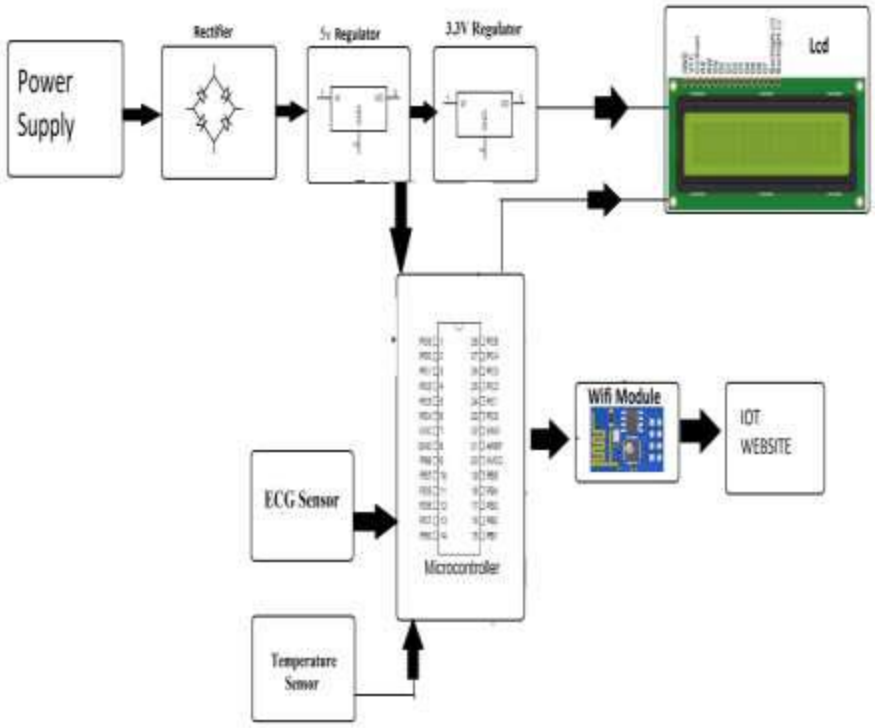

Figure 1: Real-time ECG Monitoring system

Equipment particular: The Atmel center consolidates a rich guidance set with 32 universally useful working registers. Every one of the 32 registers are straightforwardly associated with the Math Rationale Unit (ALU), permitting two free registers to be gotten to in a solitary guidance executed in one clock cycle. The coming about engineering is more code effective while accomplishing throughputs up to multiple times quicker than customary CISC microcontrollers.

1. Arduino Viable Board (Ex; atmel 311)
2. Safeguard EKG-ECG (Ex. AD8232 Sensor)
3. Bluetooth Module (Ex. HC-05)

Safeguard EKG-ECG sensor has 6 interfacing pins. The inventory voltage of this sensor is 3.3V. 3 ECG terminal cushions are required for the sensor to take estimations in the human body. These cushions are associated with the sensor by means of the sterao jack. Furthermore, it contains one drove so the drove will squint at the hour of heart beat. Since the abundancy levels of biomedical signs are at uV levels, intensification is required. Subsequently, one more benefit of this sensor is that it contains the speaker and channel circuit.

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In the result, it conveys the ECG message to the ARDUINO stage as simple structure NRF24L01 modules created by NORDIC organization are utilized for remote correspondence. 2Mbit correspondence speed on air and simplex correspondence are liked. SPI correspondence convention is given between this module and ARDUINO for information transmission A little PC planned in a solitary chip is known as a solitary chip microcomputer. A solitary chip microcomputer ordinarily incorporates a microchip

Smash, ROM, clock, hinder and fringe regulator in a solitary chip. This single chip microcomputer is additionally called as microcontroller; These Microcontrollers are utilized for assortment of utilizations where it replaces the PC. The use of this microcomputer for a particular application, where the microcontrollers as a piece of use, is called inserted framework

Arduino Complier with KEIL C Programming to ECG: The C programming language is a broadly useful, programming language that gives code proficiency, components of organized programming, and a rich arrangement of administrators. C is definitely not a major language and isn't intended for any one specific area of application. Its over-simplification joined with its shortfall of limitations, makes C a helpful and viable programming answer for a wide assortment of programming errands. Numerous applications can be addressed more effectively and proficiently with C than with other more particular dialects.

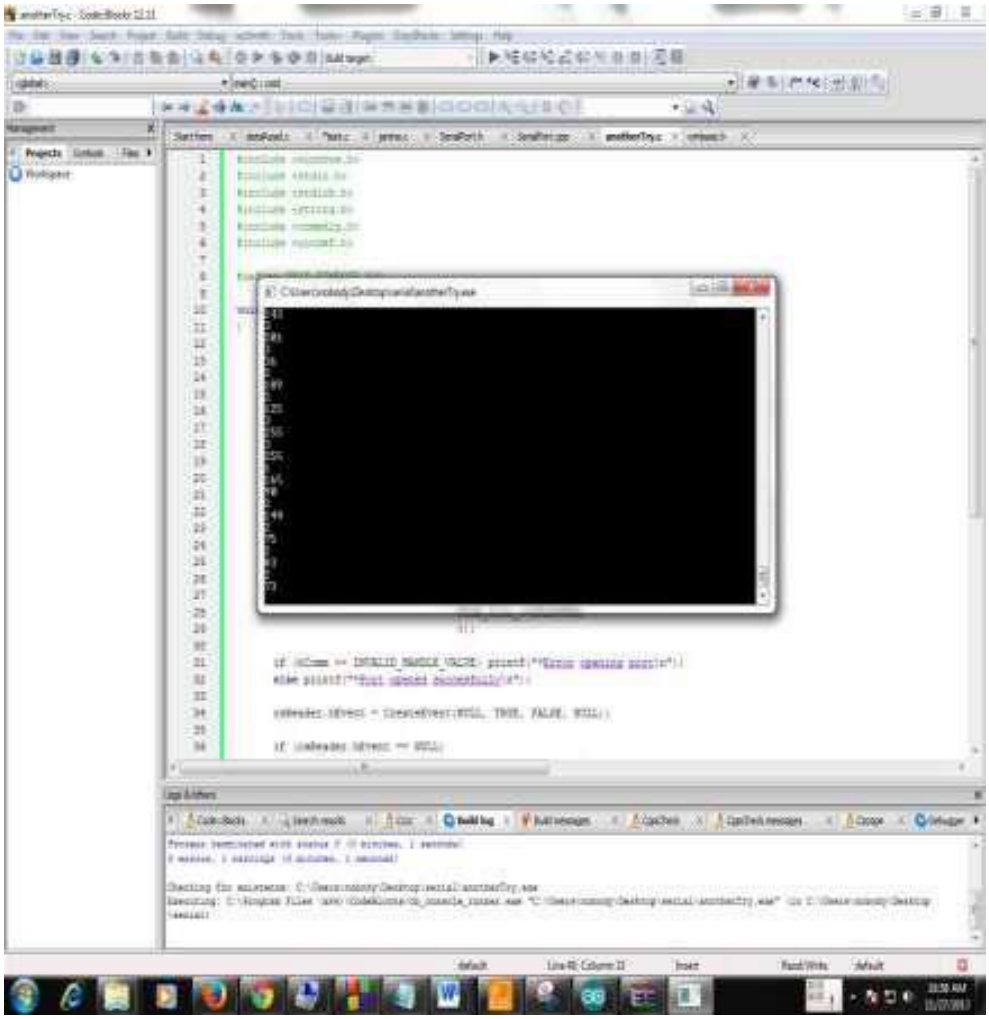

Figure 2: Keil C Software for real-time ECG visualization

Perusing and Putting away Information from sensor Port: Perusing and Putting away Information from sensor Port: This permits exceptionally quick beginning up joined with low power utilization. In Broadened Reserve mode, both the principal oscillator and the non-concurrent clock keep on running. Atmel offers the QTouch® library for installing capacitive touch buttons, sliders and wheels usefulness into AVR microcontrollers.

2.1 Putting away those information into an Ongoing information document:

Put away information might contain Standard meander, Electrical cable obstruction and muscle commotion. To take out those clamor we apply various channels including High pass channel, FIR channel, Low-pass channel and QRS recognition calculations. Utilizing of those channels positively make the ECG information more commonsense and utilitarian,

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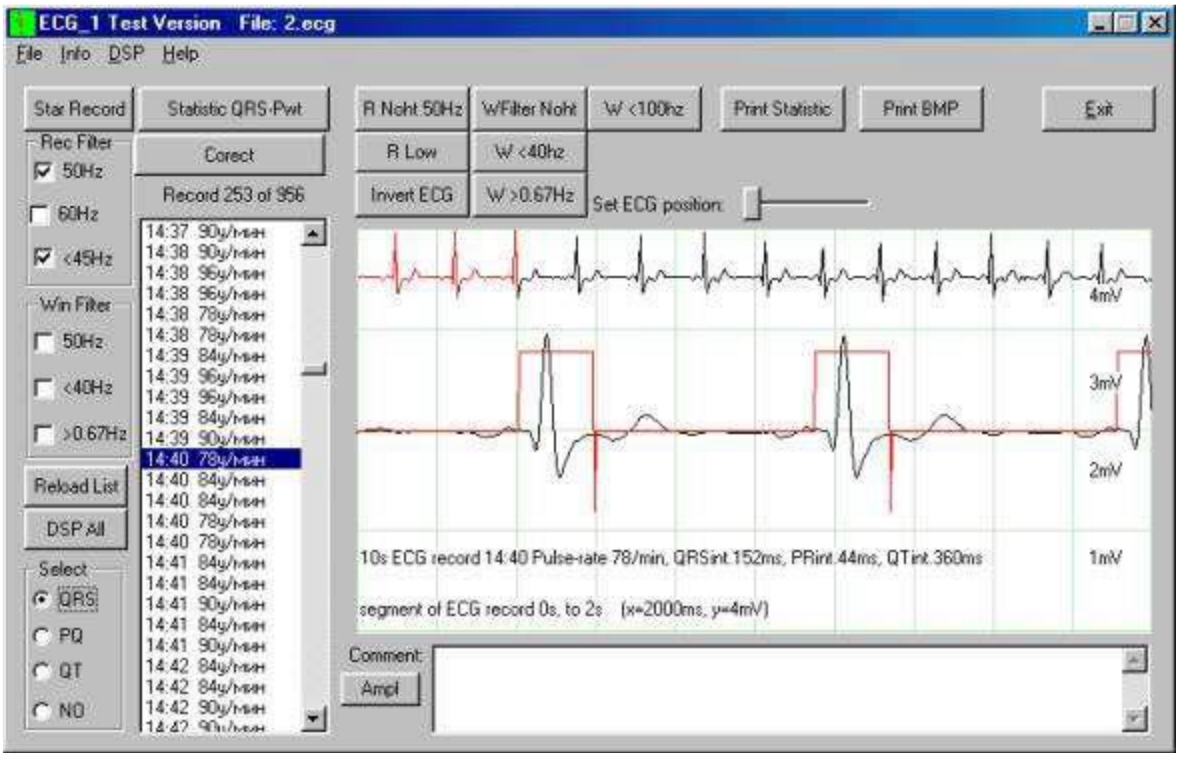

Figure 3: Reading and storing ECG data using C programming

Figure 4: Temperature sensor

5v Regulator: We are utilizing straight managed power supply having 5V result which will be helpful for driving different parts in the circuit like microcontroller.

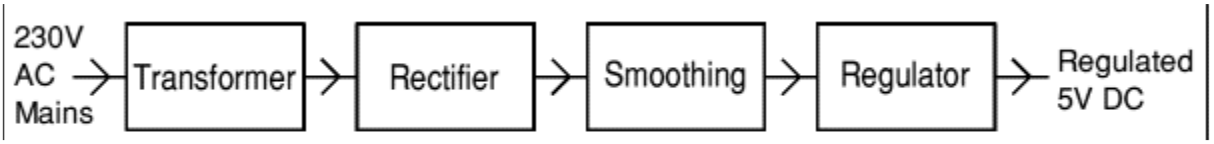

Figure 5: 5v Regulator

A module ought not be embedded or eliminated from a live circuit. The ground terminal of the power supply should be secluded appropriately with the goal that no voltage is actuated in it. The module ought to be disconnected from different circuits, so that stray voltages are not prompted, which could cause a flashing show.

Transformer: Transformers convert AC power starting with one voltage then onto the next with little loss of force. Transformers work just with AC and this is one reason why mains power is AC. Move forward transformers increment voltage, step-down transformers lessen voltage. Most power supplies use a stage down transformer to diminish the hazardously high mains voltage (230V in UK) to a more secure low voltage

The transmitter area incorporates an IR sensor, which sends constant IR beams to be gotten by an IR collector module. An IR yield terminal of the beneficiary fluctuates relying on its getting of IR beams. Since this variety can't be examined in that capacity, thusly this result can be taken care of to a comparator circuit. Here a functional intensifier (operation amp) of LM 339 is utilized as comparator circuit.

ELECTROMECHANICAL REGULATORS:

In electromechanical controllers, voltage guideline is handily achieved by looping the detecting wire to make an electromagnet. The attractive field delivered by the current draws in a moving ferrous center kept down under spring pressure or gravitational force. As voltage increments, so does the current, fortifying the attractive field created by the loop and pulling the center towards the field.

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4. RESULTS AND DISCUSSION

The principal objective of this undertaking is to assemble data from the human body to be utilized by the Arduino EKG-ECG safeguard to gauge the ECG wave. We have tried this innovation on a few people to survey the ECG information of the human body at different ages. In light of the review, we have gotten the outcomes recorded underneath.

ECG information has been displayed to show commotion and standard float. We found a negligible likeness to the certifiable ECG chart. By the by, we saw significant contrasts in the wake of applying those channels to similar ECG information, as displayed in figure 9. Knowing the patients' heart wellbeing status has become more reliable thanks to the created's major areas of strength for result to certifiable ECG information.

Figure 6: ECG graph and temperature monitoring.

On the off chance that we can find the quantity of blunders, it tends to be a huge method for separating and store the pulse information of human body. We attempted to channel those ECG information involving various channels for eliminating the clamor structure the ECG information. Further examination can add to the improvement of this cycle and make it more exact.

5. CONCLUSION

The task created and carried out an Arduino based ECG checking framework. The framework perspectives are fostering a minimal expense compact ECG checking framework to dissect the heart states of the patient. This undertaking proposes a viable respiratory failure recognition framework that assists with decreasing passings brought about by coronary failures as the primary driver of passings from coronary failures is because of postpone in appropriate treatment.

The little and compact ECG estimating gadget is effectively carried out. Along these lines, it is feasible to screen ECG signals while doing day to day exercises of unfortunate individuals. Furthermore, because of its little size, it works autonomously from different stages (cell phone, PC, web).

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