

# Design and Implementation of Smart ECG Monitoring System using android App

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**Abstract**— In this paper we design and implement smart ECG system with Smartphone for real-time monitoring, self-diagnosis for chronic heart disease patient before sudden outbreaks or routine checkups. The pulse sensor can sense the heart beat rates of patient and monitor in real time. The healthcare professional can access patient heart rate data wirelessly in real time with their smartphones. This system can be useful especially for senior citizen or heart diseases patient who lives alone or in a lural area where healthcare disability. This purposed idea is to contribute to control heart disease and to act as a expected result in healthcare services to patients in remote areas or in rural areas. This paper presents the development of low cost, low power, portable and time saving ECG monitoring device.

**Keywords:** Electrocardiogram (ECG), Arduino UNO, Android App, Wireless Health Monitoring

## I. INTRODUCTION

In recent years, the cardiovascular diseases have increased due to a very busy lifestyle and environmental health factor. The World Health Organization (WHO) says that over 17 million people die each year from cardiovascular diseases.

The design and implementation of smart ECG system to know the condition of heart of patients or daily routine checkups of heart patients. Most of low and middle income peoples are dying from heart attack or strokes. This death can be minimized to a large extent by early detection of symptoms of cardiovascular diseases. To monitor patients' physiological information are important for further treatment. Nowadays the cardiovascular diseases are increased so for treatment of most patients can benefit from continuous monitoring or daily routine monitoring heartbeat rate condition of heart patient. So remote monitoring also allows to reduce the heart disease. To reduce the heart disease this system is implemented. The cost of this system is very low, low power, portable and time saving ECG monitoring system.

Internet technology is used to transmit data and reports to a mobile device's mobile device in wireless mode. The brief introduction of ECG and hardware is introduced in the next sections with the subsequent implementation of both hardware and software.

## II. ELECTROCARDIOGRAM

ECG is a graph showing electrical activity of heart. ECG graph is trace of heartbeat sensor that contains IR LED and photodetector. The heart beat sensor is tightly holding the figure. The light passes from IR LED to figure out the photo detector will receive the transmitted light from the tissue on the other side. Consequently, the transmitted light intensity varies with pulse of the blood with heart beat rate. This variation of intensity gives the ECG signal.

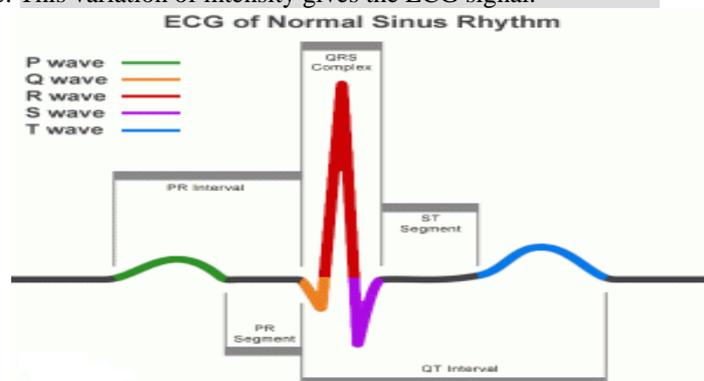


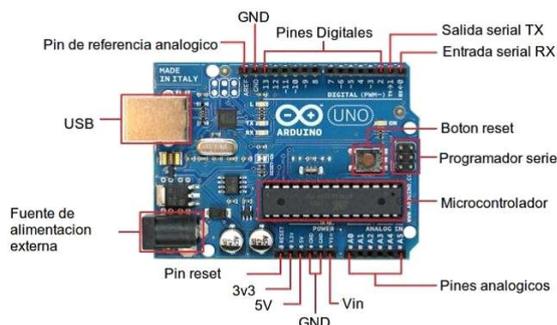
FIG. 1: ECG Wave Form

## III. HARDWARE DEVELOPMENT

### 3.1 Arduino UNO

Arduino is an open electronic platform; The main reason for its success is user friendly hardware and software [3]. Arduino is able to perceive the environment by using various sensors and shields that may be connected to it. Arduino is a massive

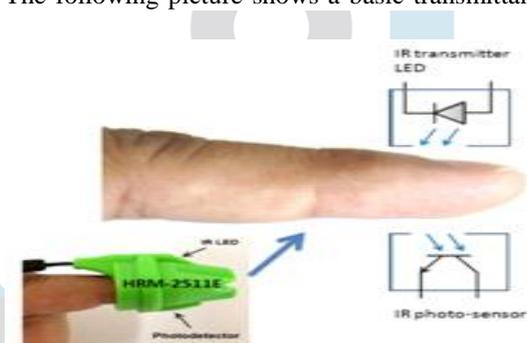
development kit based on the ATMEGA328 microprocessor and contains 13 digital input-output pins, 6 of them with pulse-width modulation (PWM) and 6 analog inputs [4]. Arduino UNO due to specific aspects, i.e. In conjunction with ECG it overruns other projects. Other aspects are: API with a simple programming language, then called Arduino shields that represent enhancement of the Arduino board. The Arduino Uno board with hardware setup is shown in Figure 3.



**FIG. 2: Arduino UNO board**

### 3.2 PULSE SENSOR:

The sensor body is built with flexible silicone rubber material that helps keep the sensor tightly to the finger. Inside the sensor case, an IR LED and a photodetector are placed on two opposite sides and are facing each other. When a fingertip is plugged into the sensor, it is illuminated by the IR light coming from the LED. The photo detector diode receives the transmitted light through the tissue on the other side. More or less light is transmitted depending on the tissue blood volume. Consequently, the transmitted light intensity varies with the pulsing of the blood with heart beat. A plot for this variation against time is referred to as a photoplethysmographic or PPG signal. The following picture shows a basic transmittance PPG probe setup to extract the pulse signal from the finger tip.



**FIG. 3: Pulse Sensor**

## IV. SOFTWARE IMPLEMENTATION

The software part in the present paper is used to determine the ECG values from the sensor and with these values draw ECG (PQRST) waveform. The microcontroller program controls the external devices and measures the input signals from the patient and displays the output. In the present work, the C with Android GUI programming is used for the software development of ECG system. The ECG software mainly consists of following parts

**4.1 Arduino IDE** In present work The Arduino integrated development environment (IDE) is used to interface biomedical parameter ECG sensor. It is a cross-platform application written in Embedded C, and derived from the IDE for the Processing programming language and the wiring projects. It is designed to introduce programming to artists and other newcomers unfamiliar with software development. It includes a code editor with features such as syntax highlighting, brace matching, and automatic indentation, and is also capable of compiling and uploading programs to the board with a single click. Arduino programs are written in Embedded C.

### 4.2 Android

Android is a mobile operating system based on the Linux kernel and currently developed by Google. It is designed primarily for touch screen mobile devices such as smart phones and tablet computers, with specialized user interfaces for home entertainments. App is developed using Visual Basic VB. This app is suitable for displaying the ECG graph.

## V. METHODOLOGY

### 5.1 Proposed System Design

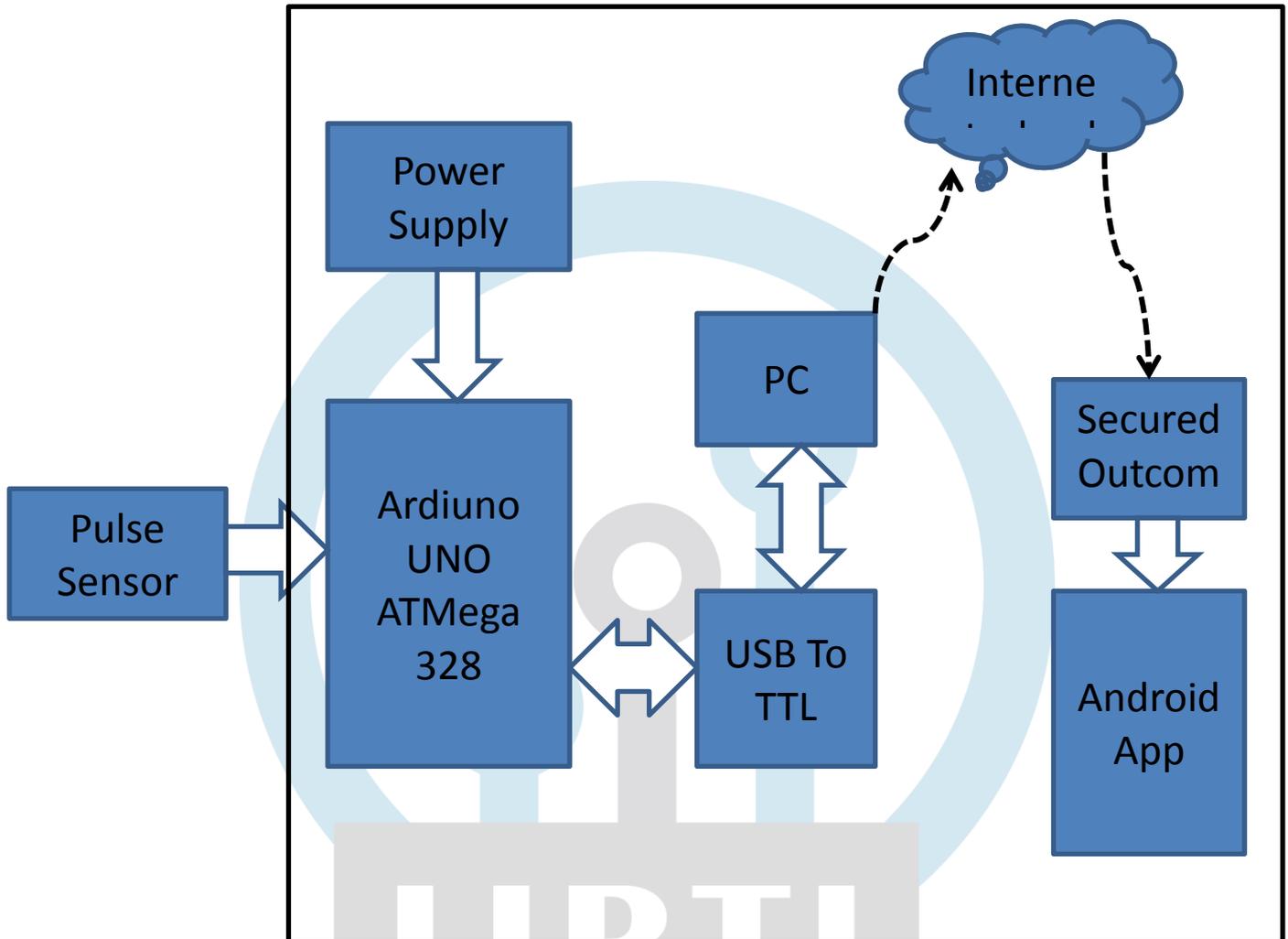
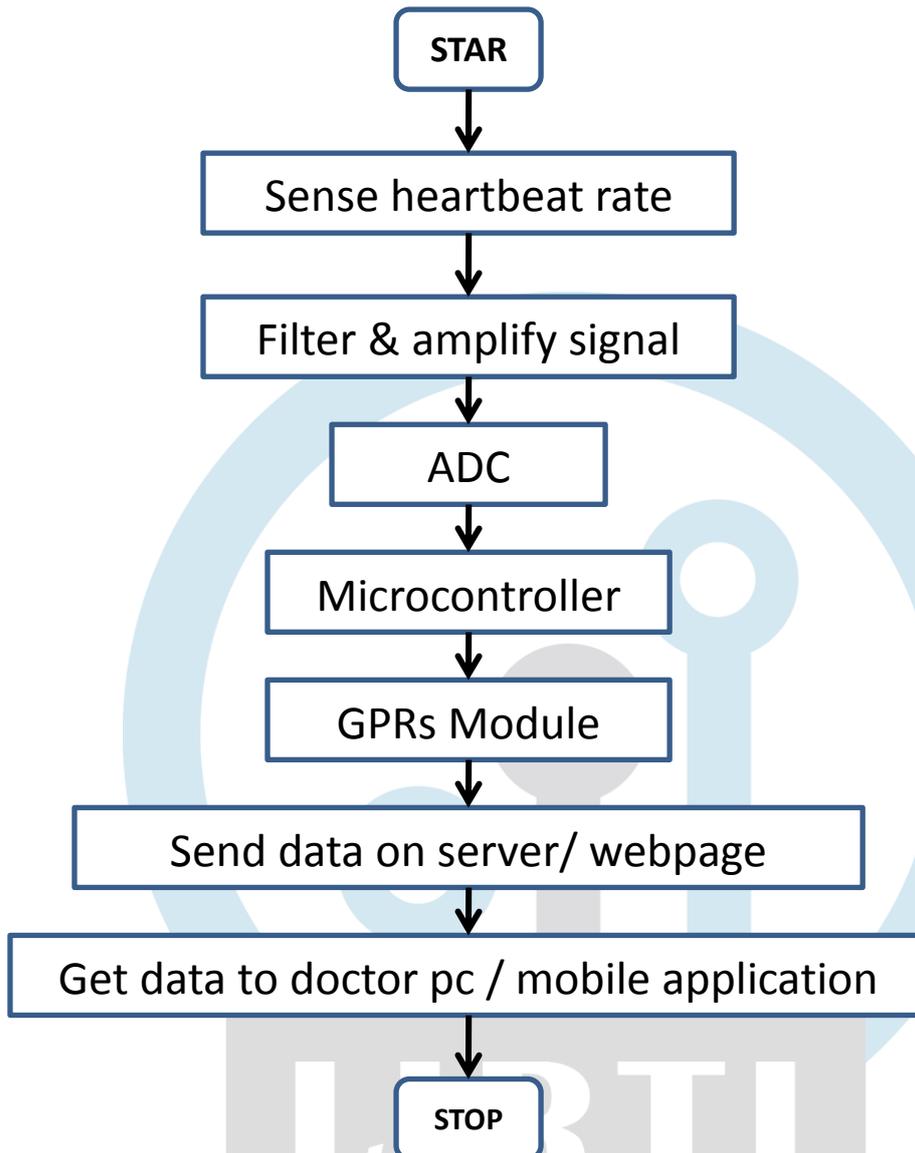


Fig4. Smart ECG system

The proposed system is smart ECG system. The heart beat sensor will sense the pluses generated from heart. The heart beat sensor consists of IR LED and photodetector which holds patient figure. The generated pulse is passing Arduino board. Arduino board receives the pulse generated by heart pulse sensor and coded into digital signal. Then this signal passes over pc. This digital signal passes through internet cloud. We have design a Android app for storing or sending a heart beat pulse to doctor pc or mobile foe monitoring patient condition and giving instruction to patient relatives. The patient information is secured in that system.

## 5.2 Flowchart



## VI .Conclusion

This portable ECG monitoring device is beneficial for patients and act as virtual Doctor for patients. With use of given device patient can avoid visiting Doctor and Patient can check our self on a regular basis. So, patient saves the time. It is very low cost, low power, portable and time saving ECG monitoring device implemented for patients.

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