A

PROJECT REPORT ON

Internet of things based wireless ECG sensor AD8232 And Atmega328p MicroController

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ABSTRACT:

Smart and cost effective healthcare has been in increasing demand to meet the needs of growing human population and medical expenses. It is a known fact that country like India has become heart disease capital of the world. There is a urgent need to develop an effective health monitoring system, that can detect abnormalities of health conditions in time and make diagnoses according to the gleaned data. ECG monitoring is a widely studied and applied approach to diagnose heart diseases. However, existing portable wireless ECG monitoring systems cannot work without a mobile application, which is responsible for data collection and passing on the messages to doctors. Recent advances in mobile technology and cloud computing have inspired numerous designs of cloud-based health care services and devices. Within the cloud system, medical data can be collected and transmitted automatically to medical professionals from anywhere and feedback can be returned to patients through the network. In this paper, we propose a new method for ECG monitoring based on Cypress Wireless Internet Connectivity for Embedded Devices (WICED) Internet of Things (IoT) platform. ECG data are gathered using a wearable monitoring node and are transmitted directly to the IoT cloud using Wi-Fi. Internet of Things utilizes open source protocols like CoAP/HTTP, MQTT, TLS/TCP, DTLS/UDP and OMALWM2M for data communication and device manage.

CHAPTER 1 : INTRODUCTION

By 2020 unprecedented growth in the Internet of Things (IoT) technologies will make it possible to talk about 50billion connected devices through the internet Body-worn sensors are the most among the other devices thatmonitor personal health conditions. There has been a increasing interest in wearable sensors in recent years and anemerging set of new products are commercially available for activity recognition, personal health monitoring, andfitness. For clinical use, long-term patient monitoring and management has also been considered. The two drivingfactors of this technology are the IoT-based data collection and cloud-based analytics. Development of mobileInternet and wireless sensor networks (WSNs)have led to birth of wearable ECG monitoring systems. This gaverise to the idea of building an integrated IoT and cloud based solution for healthcare applications. For instance, smartphone based bio-signal monitoring approach is demonstrated by A systematic review of various mobile healthcareapproaches was carried out by . A mobile cloud-based ECG monitoring service was presenteThese are able to detect ECG signals using a non-intrusive sensor and transmit the signal to the smart phone.

CHAPTER 2: METHODOLOGY

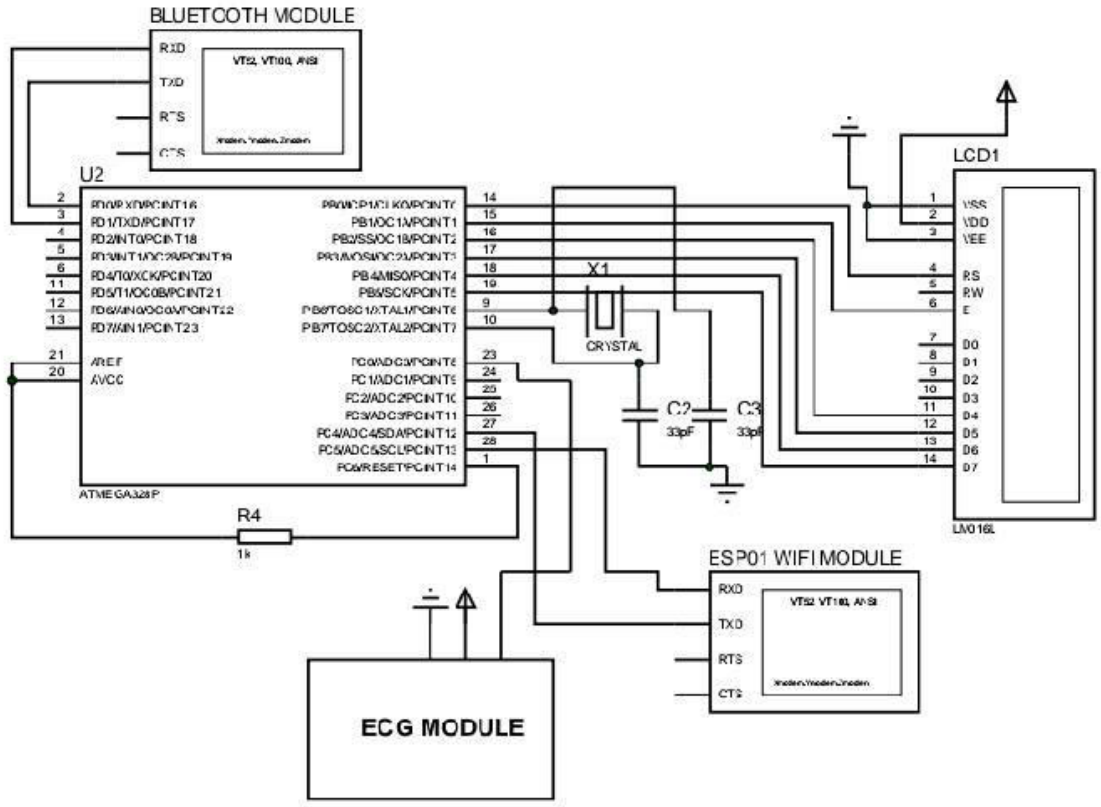

Fig – block diagram of ECG monitoring

CHAPTER 3: SYSTEM DESIGN AND IMPLEMENTATION

The integration of a human heartbeat rate monitoring system using a heart vibration sensor and IoT-based technologies are presented in this study. This sensor detects and records the human heartbeat. The ESP32 controller processes the read data before sending it to the Wi-Fi module for uploading to the Ubidots internet server platform for additional analysis and visualisation. When data is captured, it is processed and saved in real time, with a date and time tag. The input units in the proposed work are the ECG sensor unit, the power supply unit, and the user interface unit. The output unit is the Wi-Fi Module unit. The signals are monitored and controlled by the ESP32 controller unit. The integrated C programming language is used to programme the system. The heartbeat will be detected by the ECG sensor. The sensor's sensed data is sent to an analogue to digital converter (ADC), which converts it to a digital signal. After that, the generated digital signal is sent to the ESP32 controller. The ESP32 controller reacts to the signal based on instructions written in the embedded C programming language [17]. The data is also delivered in real - time basis to the Wi-Fi module and then to the webserver (Ubidots) for more analytics and visualisation. To show the condition of the human heartbeat rate, the analysed data is updated continuously in real-time..It also includes a buzzer and an LED that will activate if the cardiac condition becomes unstable. The central control unit of the system is Arduino. On the input side, there's also a pulse sensor, an ECG sensor, and numerous manual buttons. The output is displayed on the Arduino com port. The Wi-Fi Module allows data to be uploaded to the cloud, and once there, the results may be accessed by logging into the server with a computer or smartphone.

CHAPTER 4 : HARDWARE DESCRIPTION

ATMEGA328 P Microcontroller

The ATmega328 is a single-chip microcontroller created by Atmel in the atmega AVR family (later Microchip Technology acquired Atmel in 2016). It has a modified Harvard architecture 8-bit RISC processor core.

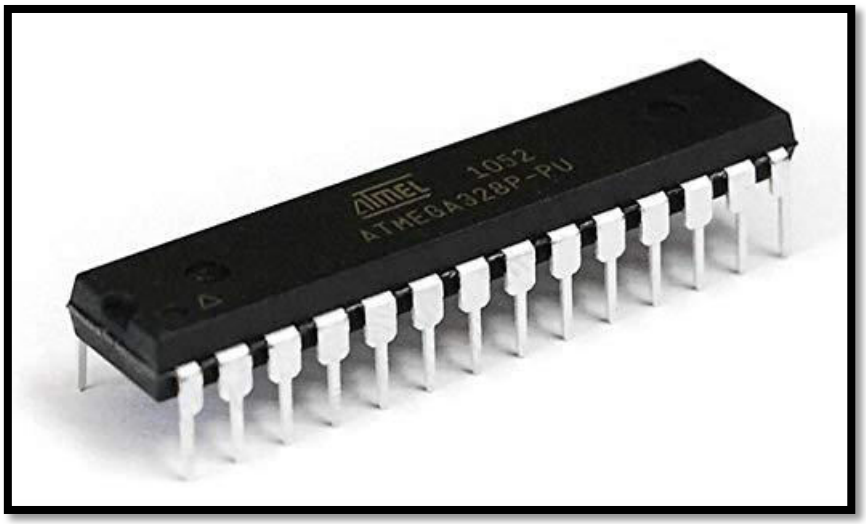

Fig: ATMEGA328 P Microcontroller

The Atmel 8-bit AVR RISC-based microcontroller combines 32 kB ISP flash memory with read-while-write capabilities, 1 kB EEPROM, 2 kB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/Dconverter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. The device achieves throughput approaching 1 MIPS per MHz.

Applications

As of 2013 the ATmega328 is commonly used in many projects and autonomous systems where a simple, low-powered, low-cost micro-controller is needed. Perhaps the most common implementation of this chip is on the popular Arduino development platform, namely the Arduino Uno and Arduino Nano models.

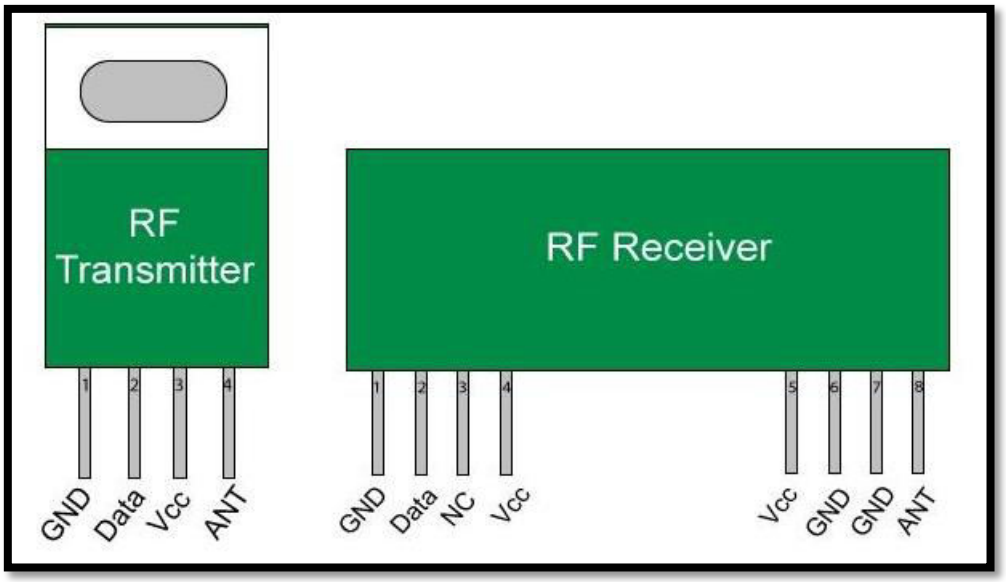

Fig.4.3 RF Transmitter – Receiver Pair

Features of RF Module:

- Receiver frequency 433MHz
- Receiver typical frequency 105Dbm
- Receiver supply current 3.5mA
- Low power consumption
- Receiver operating voltage 5v
- Transmitter frequency range 433.92MHz
- Transmitter supply voltage 3v~6v
- Transmitter output power 4v~12v

Main Factors Affecting RF Module's Performance:

As compared to the other radio-frequency devices, the performance of an RF module will depend on several factors like by increasing the transmitter's power a large communication distance will be gathered. However, which will result in high electrical power drain on the transmitter device, which causes shorter operating life of the battery powered devices. Also by using this devices at higher transmitted power will create interference with other RF devices.

Applications:

- Wireless security systems
- Car alarm systems
- Remote controls
- Sensor reporting
- Automation systems

Features of RF Transmitter and Receiver:

1. Receiver frequency: 433MHz
2. Receiver typical sensitivity: 105Dbm
3. Receiver current supply: 3.5mA
4. Receiver operating voltage: 5V
5. Low power consumption
6. Transmitter frequency range: 433.92MHz
7. Transmitter supply

CHAPTER 5 : SOFTWARE DESCRIPTION

ARDUNIO Compiler IDE:

A program for Arduino may be written in any programming language with compilers that produce binary machine code for the target processor. Atmel provides a development environment for their microcontrollers, AVR Studio and the newer Atmel Studio.

The Arduino project provides the Arduino Integrated Development Environment(IDE), which is a cross platform application written in the programming language Java. It originated from the IDE for the languages processing and wiring. It includes a code editor with features such as text cutting and pasting, searching and replacing text, automatic indenting, brace matching, and syntax highlighting, and provides simple one-click mechanisms to compile and upload programs to an Arduino board. It also contains a message area, a text console, a toolbar with buttons for common functions and a hierarchy of operation menus.

A program written with the IDE forArduino is called a sketch. Sketches are saved on the development computer as text files with the file extension .into. Arduino Software (IDE) pre-1.0 saved sketches with the extension .pde.

The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub main into an executable cyclic executive program with the GNU toolchain, also included with the IDE distribution. The Arduino IDE employs the program *avrdude* to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware.

The open-source nature of the Arduino project has facilitated the publication of many free software libraries that other developers use to augment their projects.

CHAPTER 6 : ADVANTAGES AND KEY CHALLENGES OF ECG MONITORING SYSTEM

Advantages

1.The proposed system provides the solution for some of the main problems faced by the existing Indian grid system, such as wastage of energy, power theft, manual billing system, and transmission line fault.

2.This method will reduce the energy wastage and save a lot of energy for future use.

ECG monitoring systems , are made up of a variety of components, frameworks, and technologies. The variety and heterogeneity of ECG sensor based architectures creates a number of issues, as various academics have pointed out. There are a variety of obstacles that can be encountered, including the following:

- Challenges Associated with the Use of Monitoring Devices.
- Signal quality issues are a problem.
- Difficulties with Durability Monitoring
- Issues with the size of ECG signal data.

CHAPTER 6 : CONCLUSION

Only with AD8232 ECG Sensor and the Atmega328p development kit, we suggested an IoT-based heartbeat monitoring system. Heart ailments have become more prevalent in recent decades, and many individuals have died as a result of these illnesses. As a result, heart illness should not be regarded lightly. Heart disease could be avoided by studying and constantly monitoring the ECG signal early on. The observed ECG signal is examined and analyzed. Early detection, prediction, and management of cardiac disease are all aided by IoT-based statistical frameworks for heart monitoring. This study investigates an IoT-connected low-power wireless sensor interaction technology for long-term cardiac parameter monitoring. Regular usage of the gadget is extremely beneficial for early diagnosis of heart ailments as well as lowering the severity of damage and mortality rates associated with cardiovascular diseases. Additional health monitoring systems, such as temperature measurement, Pulse Rate, Diabetes, and so on, can be constructed utilizing IoT in a similar way to this user - friendly ECG surveillance system, and will significantly help to reduce serious health complications to a certain extent. [3] ECG monitoring systems are constantly being implemented using new technologies including as deep learning, AI, Big Data, and IoT to deliver a cost-effective, completely linked, and sophisticated monitoring system. Empowering technologies provide up a wide variety of possibilities for ECG monitoring system improvement.IoT introduces distant, unconstrained communication and services that make use of data to enable fast, meaningful, and crucial lifestyle decisions. Furthermore, fog computing and cloud processing contribute to greater efficiency and the fulfilment of multiple in-demand extensible application services. Furthermore,

blockchain enables security for numerous transactions across the many elements of the ECG monitoring system's development in a distribute environment.