Ambulatory Health Monitoring system using IoT

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ABSTRACT - In our everyday life, we have a special focus on health. This project aims at developing an ambulatory health monitoring system that is used to examine the heart rate, body temperature and blood pressure based on a microcontroller. It has the benefit of adaptability over existing hospital systems. The microcontroller analyses pulse rate signals in real-time and bind data from various sensors, primarily temperature, blood pressure, and ECG signal, to transmit data through radio frequency via the Wi-Fi module, Bluetooth making it to transfer the data to users and doctors so that they can examine the patients up-to-date. The hardware and software are geared toward a single-chip microcontroller-based device, which reduces the overall size.

Keywords - *Health monitoring system, IoT, Microcontroller, Pulse sensor, Temperature sensor, ThingSpeak.*

I. INTRODUCTION

In recent years, wireless technology has increased in popularity to meet the needs of various industries. In these recent years, IOT improved the most region uncommonly computerization and automation. Biomedical is one of the later trends to supply better well-being care. In a conventional method, doctors play an imperative part in health check-up. This activity usually requires a portion of your time for registration, preparation, and then check-up. Furthermore, reports are produced afterwards. Working people prefer to ignore or delay checkups as a result of the lengthy procedure. Consequently, health issues are also increasing day by day. Patient health monitoring through the Internet of Things (IOT) may be a breakthrough in enabling patients to be monitored outside of conventional clinical settings (e.g., at home), potentially increasing access to treatment and lowering healthcare transportation costs.. This may altogether progress an individual's quality of life. It allows patients to keep their autonomy, avoid problems, and save money. This framework encourages these objectives by conveying care right to the domestic. Besides, patients and their family individuals feel consolation knowing that they are being checked and will be supported in case an issue Emerges

1.2 Main Features of Health Monitoring System

1. Remote monitoring of Health through website.

2. Connected and efficient in any area of the world

3. Lower cost and higher efficiency

4. Digital Monitoring made easy and accessible

II. MODULES OF HEALTH MONITORING SYSTEM

1. Wireless communication WIFI module (ESP8266)

2. Smart ECG technique: Manually controlled

3. Easily temperature measuring using temperature sensor

4. Smart Pulse Sensor: Pulse measuring system

2.1 Smart Working of WIFI Module (ESP8266):

This device will help to connect the data, to send the values to the thing speak and with that help, we can view our data in Thingspeak.

2.2 Smart Working of ECG Sensor

Typically a sort of a sensor in which we collect the heart rate of the patient with the assistance of 3 pads which are given with ECG. One is connected on the left arm, the second one is connected on the right arm and the final one is associated on the proper side underneath the close stomach. That given information is shown on the GLCD by taking that we send that in Thingspeak.

2.3 Smart Working of Temperature Sensor

With the assistance of a temperature sensor, we take the estimation of the temperature of the patient physically. We are going to send that information into thing speak to show that information in GLCD

2.4 Smart Working of Pulse sensors

This is type of sensor which is used to collect the pulse value of the patient to measure the value heartbeat. It provides us with the value of BPM (beats per minute) and

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it will display the value in GLCD.

III. COMPONENTS DESCRIPTION

3.1 Arduino

Arduino is an open-source electronics prototyping platform that combines hardware and software. The Arduino Uno is a microcontroller based on the AVR Atmega328 microcontroller. It can be connected to a computer via USB cable in order to transfer code to the controller IDE which is compatible with all operating systems, including Windows, Mac OS X, and Linux. In IDE, programming languages such as C and C++ are used.

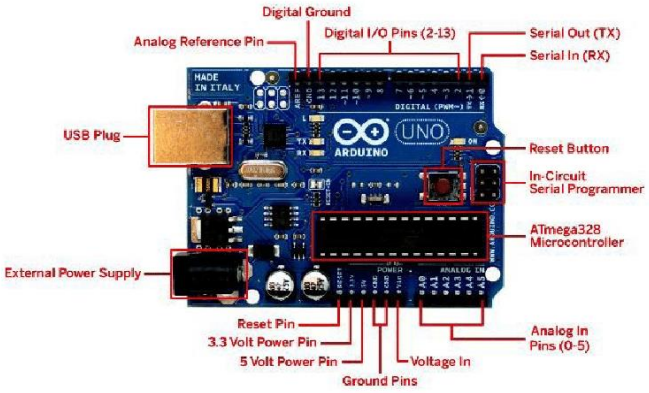

Fig 1. Arduino Board

3.2 Pulse sensor

When a finger is placed on the pulse sensor, it produces an analogue output of heartbeat. When it first turns on, the top-side LED will begin blinking with each heartbeat. The output pin of the sensor is connected to a controller to display the sensor output. The sensor's operation is dependent on the control of light by blood flow through nerves at each heart-beat. It effectively combines a basic optical heart rate sensor with amplification and noise cancellation circuitry to provide accurate pulse readings quickly and easily.

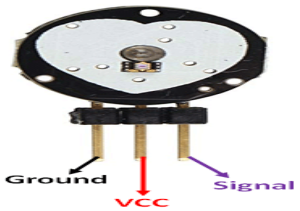

Fig 2. Pulse sensor pin description

3.3 Graphical Liquid Crystal Display

The term "GLCD" refers to electronic display equipment that is used to show the results of electrical equipment or devices. It has an automatic power-on reset and uses very little power to operate. It is powered by 5 volts of electricity. Graphics, as well as characters and Numeric values, can be shown in GLCD. These LCDs are prominently displayed or are used for animation and graphic design. It can handle 128*64 pixels.

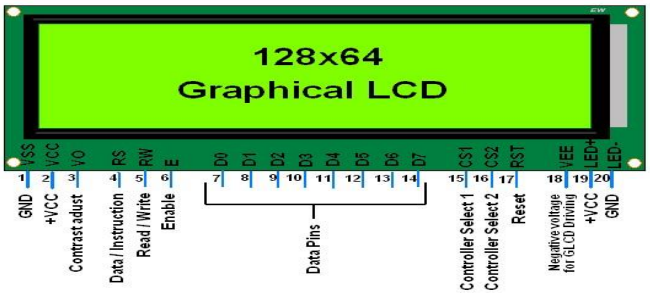

Fig 3. GLCD Pin description

3.4 Wi-Fi Module (ESP8266)

The ESP8266 module is a low-cost wifi module with TCP and IP stacks as well as a microcontroller. It uses the I2C serial communication protocol to communicate. It also features Analog to Digital conversion and Pulse Width Modulation. It has a 64-kilobyte boot ROM, 64-kilobyte instruction RAM, and 96-kilobyte data RAM. The ESP8266 module is a wireless transceiver that can be used in endpoint IOT applications. The microcontroller needs to use a series of AT commands to communicate with the ESP8266 board.

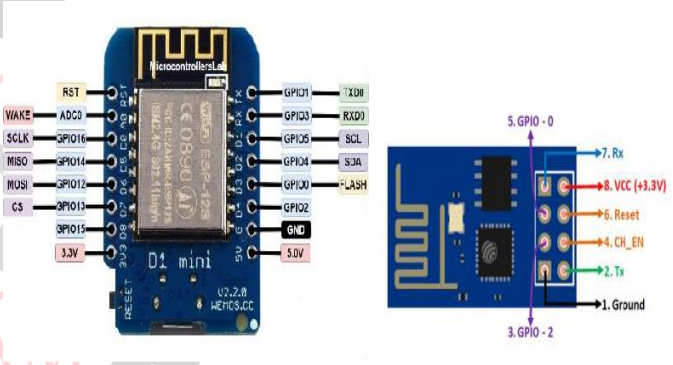

Fig 4. ESP8266 Pin description

3.6 Temperature Sensor

The LM35 series of precision integrated-circuit temperature devices have a linearly proportional output voltage to the temperature in degrees Celsius. We don't need to deduct a significant constant voltage from the output of the LM35 unit to obtain convenient Centigrade scaling, unlike linear temperature sensors tuned in Kelvin. The LM35 Linear Temperature Sensor module can be used to measure the temperature of the surrounding air. Temperature sensitivity is 10 milli-volts per degree Celsius.

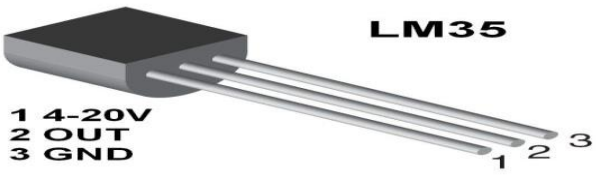

Fig 5. LM35 Pin Description

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Table 1.Specifications of components

Module	Item	Specification
Arduino	Operating voltage, input voltage digital pins, Flash memory	5V,7-12V, 14, 32 KB
Temperature sensor	Recommended Temperature range, power, output imp-dence,	-55C to 150C,4-3.0V, 0.1W for 1mA load
Pulse sensor	Operating voltage, current consumption	+5V or +3.3V, 4mA
Wifi module	Protocol, Power ,boud rate ,range	802.11 b/g/n protocol, 3.3V, 9600BPS, Up to 10m
LCD	Power, display construction	5V, 128*64

IV. IMPLEMENTATION AND SETUP

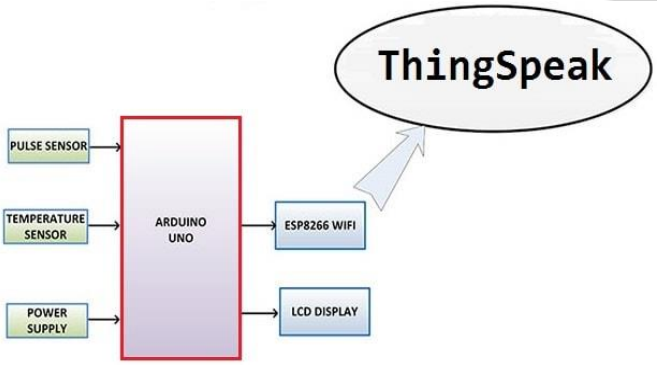

Fig 6. Block Diagram of proposed model

The sensors for health tracking are used to collect health-related data, or data acquisition. A controller can be used to communicate and transfer data over the internet wirelessly. At the server, all data is stored and aggregated. Health-related information can be displayed on a webpage in an easily readable format for friends, i.e. data management.

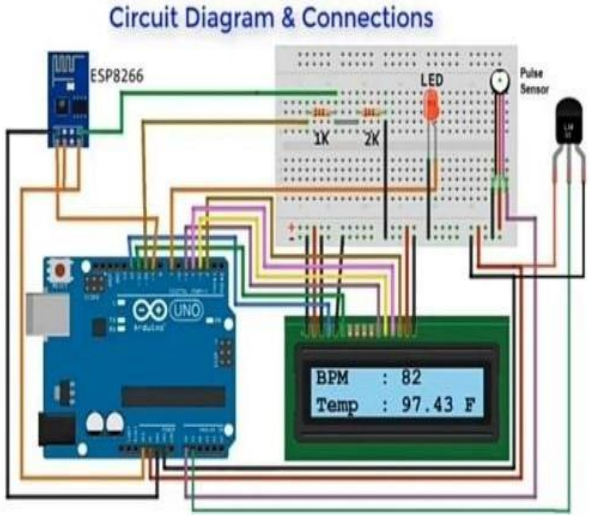

Fig 7. Circuit Connection

All the components with specifications mentioned in table-1 are assembled and connected as shown in fig 1.

4.1 Interfacing ECG Sensor with Arduino Uno:-

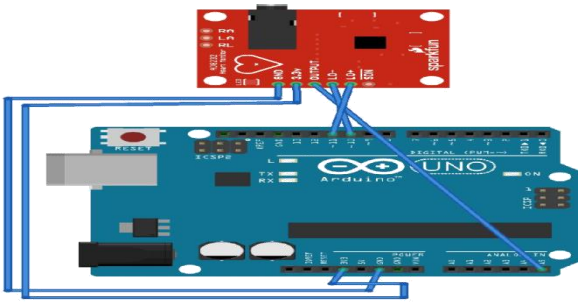

Fig.8 Circuit of ECG with Arduino Uno

4.2 Interfacing GLCD with Arduino Uno:-

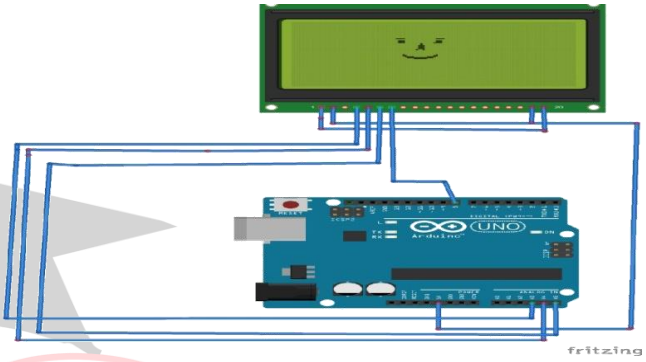

Fig. 9 Circuit of GLCD with Arduino Uno

4.3 Interfacing ESP8266 with Arduino Uno:-

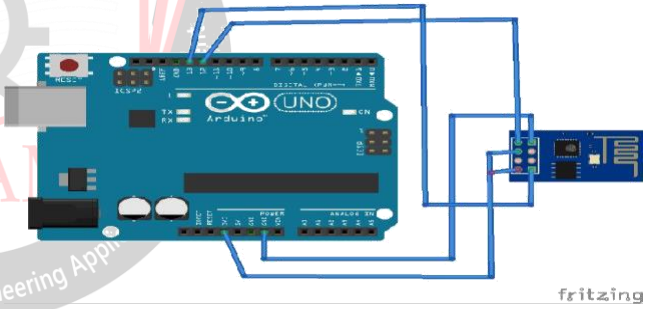

Fig.10 Circuit of ESP8266 withArduino Uno

4.4 Interfacing Temperature Sensor with Arduino

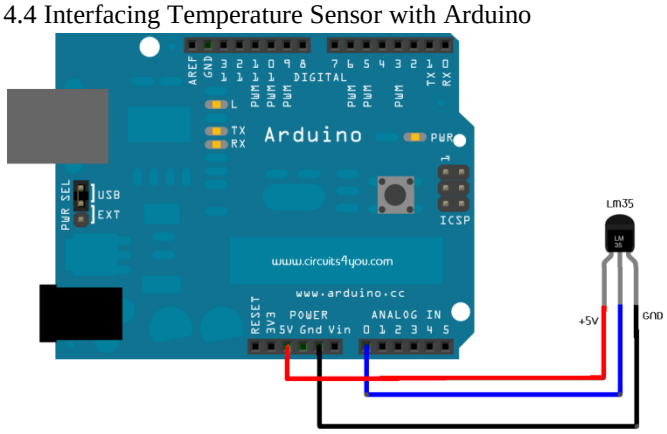

Fig 11. Circuit of Temperature Sensor with Arduino

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V. RESULT AND DISCUSSION

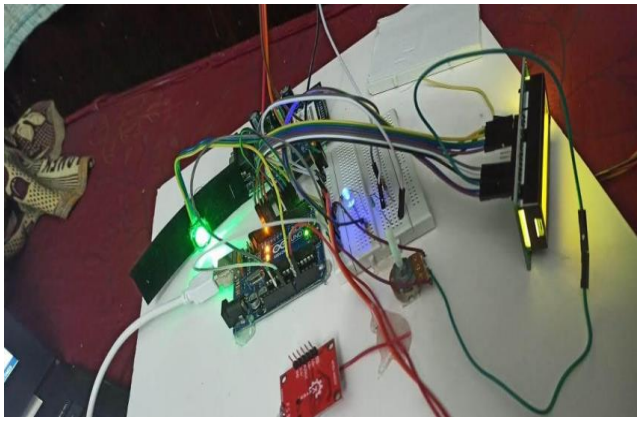

Fig 12. Circuit Connections

We made the connections as shown in fig 11. and we can see the output on GLCD. We have checked blood pressure, temperature and heart rate (ECG) through this model. We also used thingspeak to display, store and retrieve the data for future .This data can be shared with doctors and can be monitored everyday if required.

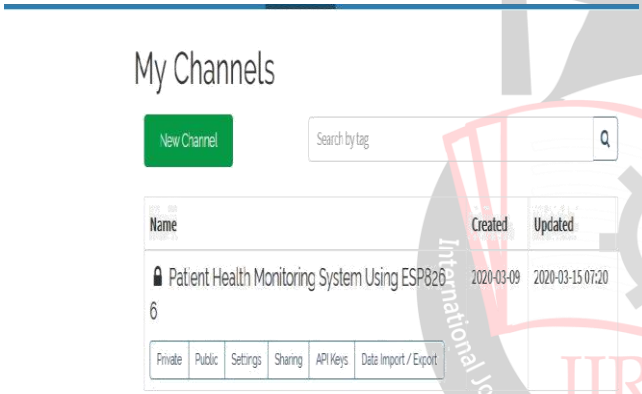

Fig .13 Thingspeak main channel interface

VI. CONCLUSION

We presented the design and implementation of a Remote Patient Monitoring system based on wireless technology by sending an SMS (Short Message Service) to the medical staff using a mobile phone. This is a simple, realistic, low-cost, and highly efficient method of communicating critical information to the public. The system monitors patient's health status, such as ECG, heart rate, and temperature. In the scenario that any of these parameters exceeds preset critical values, the location parameters from the attached GPS module are sent via SMS to a pre-defined phone number via a GSM module. All data obtained from the human body through sensors and an ECG filter circuit is then transmitted to the microcontroller system as digital values. The values obtained from like ECG, heart rate and temperature are also displayed on the attached LCD in alphanumerical form.

FUTURE SCOPE

IoT has enabled health monitoring system to become more feasible and effective. Patients could previously only be treated in a medical dispensary or at home by relatives or home nurses. If a patient chooses to be treated in a hospital, their vital signs, such as temperature, heart rate, and pulse, may be monitored by medical personnel. However, if a patient chooses to recover at home with the aid of family, they can easily monitor disease using a small kit. We are sending the data with the help of a Wi-Fi module to thing speak and we can collect that data via phone through things view so that we can send that data to any doctor for consultation.

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