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IOT Based Patient Health Monitoring System

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Abstract: ***Patients are facing a problematic situation of unforeseen demise due to the specific reason of heart problems and attack which is because of non existence of good medical maintenance to patients at the needed time. This is for specially monitoring old age patients and informing doctors and loved ones. So, we are proposing an innovative project to dodge such sudden death rates by using Patient Health Monitoring that uses sensor technology and uses the internet to communicate to the doctor in case of problems.***

This system uses temperature, heartbeat,ECG, Saline-level sensor for tracking patient's health. These sensors are connected to the Arduino-uno. The patient health is tracked with the controller which is in turn interfaced to an LCD display, bluetooth and WI-FI connection to send the data to the web-server (Thinkspeak).In case of any abrupt changes in patient heart-rate or body temperature alert is sent about the patient using IoT. This system also shows patients temperature ,saline level and heartbeat tracked live data with timestamps over the internetwork. Thus, a Patient health monitoring system based on IoT uses the internet to effectively monitor patient health and helps the user monitor themselves.

I. INTRODUCTION

1) Background/context

The system used for health monitoring is the fixed monitoring system, which can be detected only when the patient is in hospital or in bed. Recently accessible systems are huge in size and available only in the hospitals in the Intensive Care Unit.In existing system, patients need to get hospitalized for regular monitoring of the patient. It is not possible once he/she is discharged from the hospital. This system cannot be used at home.The system which we prefer to develop would not only help in monitoring the health of the patient when he is in bed but also when he is out of bed. The main idea of the system is to transmit the information through the web page to continuous monitoring of the patient over the internet. Such a system would continually detect the important body parameters like temperature, pulse rate and would compare it against a predetermined range set and if these values cross the specific limit, it would immediately alert the doctor and the patient.

2) Motivation

Currently, the COVID-19 pandemic is one of the major global issues faced by health organizations. Hospitals only admit people who are in serious condition and quarantine people who are having mild symptom.Therefore, to monitor these people and old aged people who require constant monitoring we proposed the idea to develop a system which can monitor and store patients health parameters in a database.

3) Aim And Objective

The personal health monitoring of each individual is considered very important because of the rise in health problems in today's world and visiting a doctor everytime is not feasible.

The objective of our project is to develop a device which helps to monitor a patient's health. It is used to detect parameters like temperature, heart rate, saline water level, etc. It also displays messages regarding patient's health.

II. THEORETICAL DESCRIPTION

A. Theoretical Description

1) *Microcontroller:* Microcontroller is the most important unit of the entire system. It is actually responsible for all the process being preceded. It will access and control all the peripheral devices or components connected in the system..Arduino Uno is the microcontroller used in the system.Arduino Uno is an open-source microcontroller board that uses an Atmega328 microprocessor. Arduino Uno used to read sensors electrical signals like photodiode, Wi-Fi module, etc., performs logical operations.

2) *Heartbeat Sensor:* Heart beat sensor is used to give digital output of pulse rate when a finger is placed on it.When a finger is placed on it, it will start reading and send the data to the arduino uno.
3) *Temperature Sensor:* The LM35 series are integrated circuit temperature sensors, whose output voltage is linearly proportional to the Centigrade temperature.Similarly like heart sensor it reads data and sends to the arduino uno.
4) *Water-Saline Sensor:* The saline fluid level is predicted by using the Wireless water level sensor. This sensor is to indicate whether the saline bottle has a high or low saline level.This sensor is connected to arduino.
5) *ECG Sensor:* This sensor is used to measure the electrical activity of the heart. This electrical activity can be charted as an ECG or Electrocardiogram and output as an analog reading.ECG can be analyzed by studying components of the waveform. These waveform components indicate cardiac electrical activity. The first upward of the ECG tracing is the P wave. It indicates atrial contraction.The QRS complex begins with Q, a small downward deflection, followed by a larger upwards deflection, a peak (R); and then a downwards S wave. This QRS complex indicates ventricular depolarization and contraction.Finally, the T wave, which is normally a smaller upwards waveform, represents ventricular repolarization.
6) *Bluetooth:* Bluetooth module(HC-05) is used to connect the system wirelessly with two-way.

B. ALGORITHM

The workflow is divided in three stages:

1) *Stage 1:* Patient makes contact with the sensors(like heart rate sensor, temperature sensor, ECG sensor, etc).
   All the sensor output is given to Arduino UNO
2) *Stage 2:* Arduino UNO collects the data from all the respective sensors and transmits the data to ThinkSpeak platform via cloud and to Bluetooth terminal Application via bluetooth.
3) *Stage 3:* The system displays the output result on LCD and on bluetooth terminal application and also in graphical form on the ThinkSpeak platform.

III. SYSTEM DESIGN

A. Block wise design

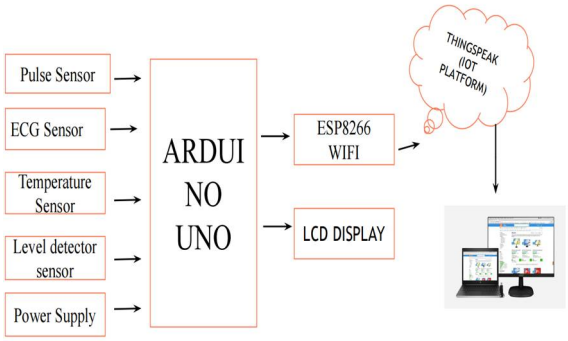

Fig. 3.1 Block diagram

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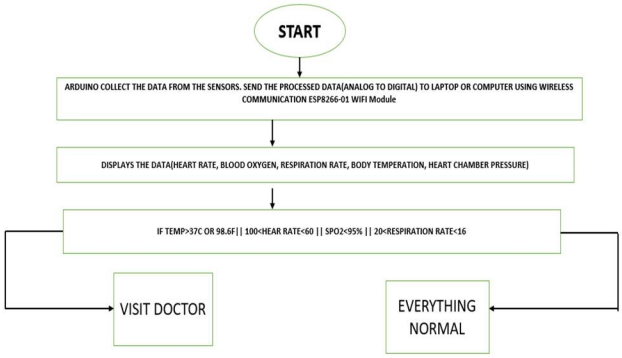

IV. IMPLEMENTATION AND TESTING

Initial Flow :

In this project, the patient makes contact with the sensors and the data collected from the sensors is sent to the arduino uno.The arduino Uno receives the data from all the respective sensors.

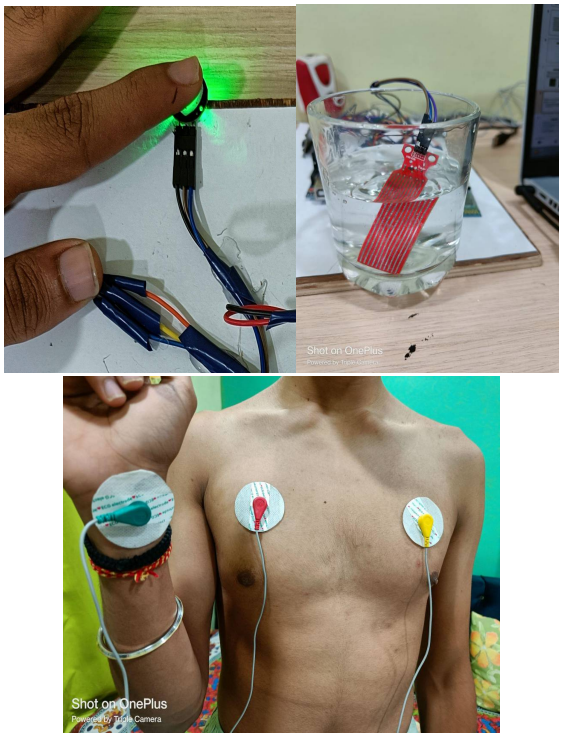

Fig 4.1 contact with sensors

The Arduino Uno transmits the data to the ThinkSpeak platform via cloud using the internet and to the bluetooth terminal application via bluetooth(HC-05).

V. RESULT

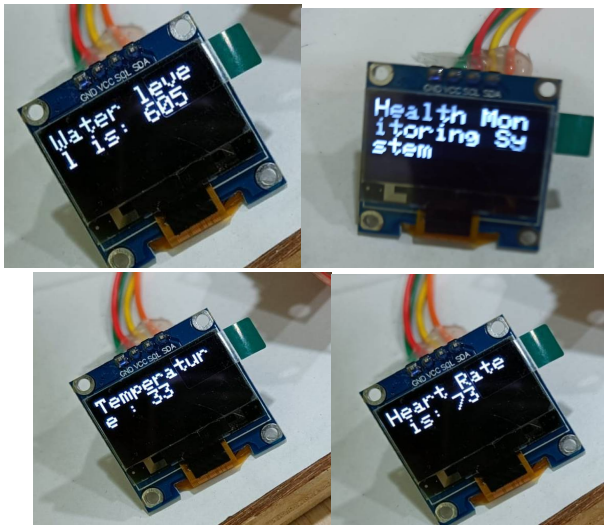

Fig 5.1 LCD display

In Fig 5.1 the results are displayed on the LCD of the patient health monitoring system.

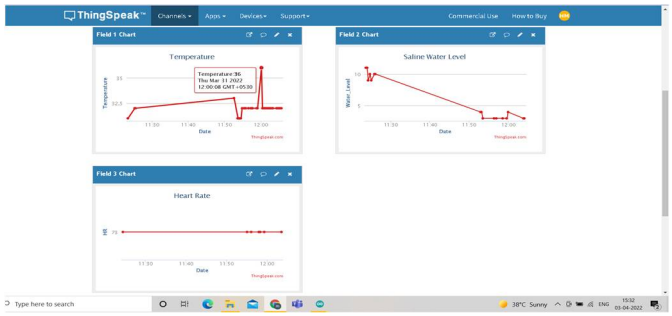

fig 5.2 ThinkSpeak platform

In Fig 5.2, after logging into the ThinkSpeak account the results are displayed and updated timely.

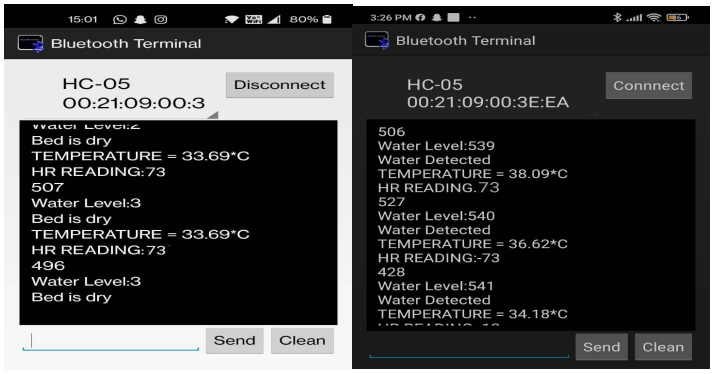

Fig 5.3 Bluetooth Terminal application

In Fig 5.3, the above image is from the bluetooth terminal when the water is not detected and it states 'BED IS DRY' and the below image states that the 'WATER IS DETECTED'. Along with water level it also displays the other parameters of the system.

V. CONCLUSION

The proposed system of health monitoring can be highly used in emergency situations as it can be daily monitored, recorded and stored in a database. Through our project doctors can also monitor patient health remotely using IOT.All the individual sensors like heart-rate sensor, temperature sensor etc give out the intended results.

VI. FUTURE SCOPE

Health Monitoring System can be widely used remotely as well as in hospitals for monitoring patient's health from anywhere around the world . As it is a user friendly cloud based device and therefore can be used anywhere and anytime. The system can be further improved by adding Artificial Intelligence system components to facilitate the doctors and the patients. It can provide real-time data as well as store past medical records to make it easy for the doctors to predict and optimize critical clinical decision making regarding the health of patients.The system can also make Virtual patient data available through mobile devices which can help them to analyze their reports along with the doctors to be in sync with them.

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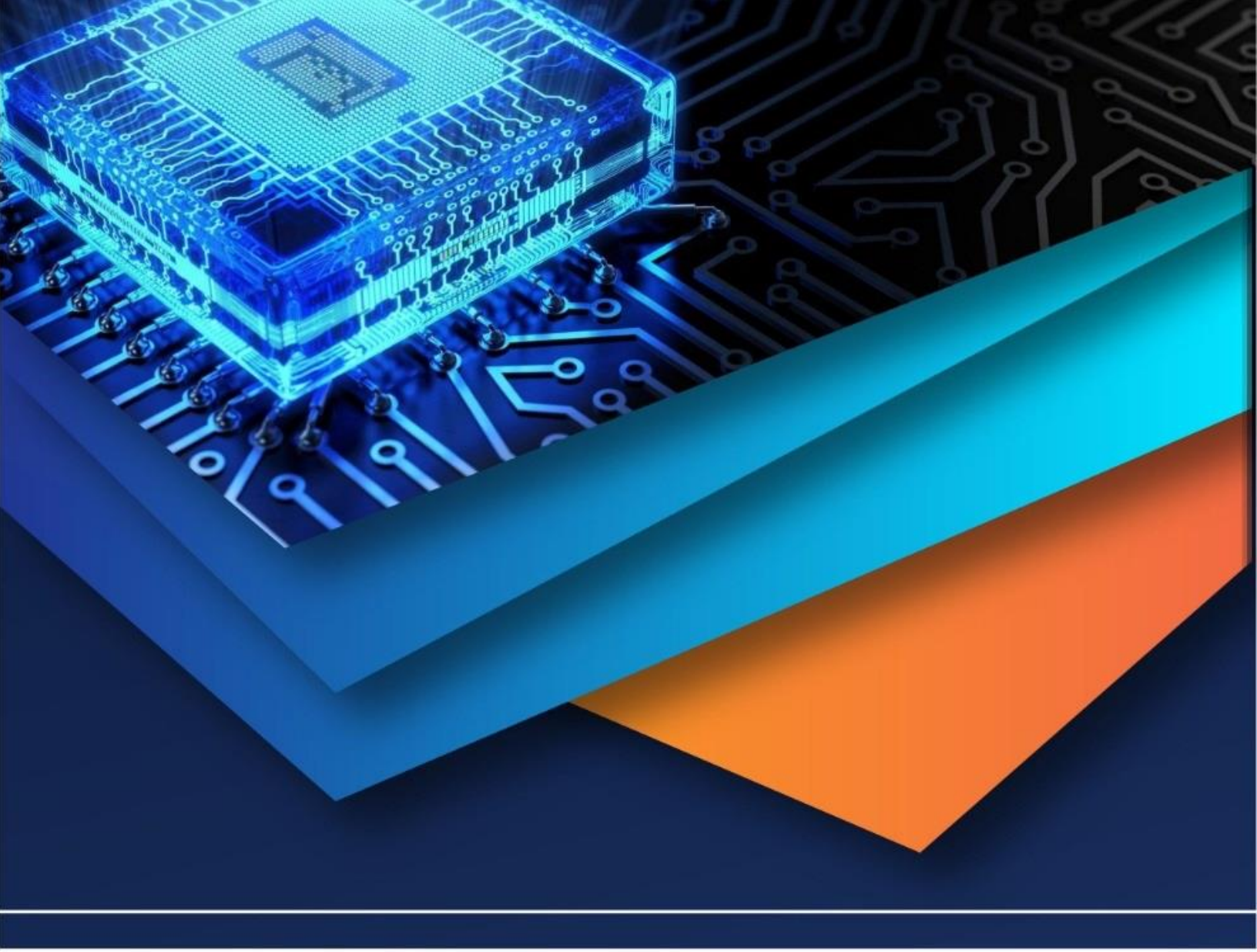

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