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SMART HEALTH MONITORING SYSTEM USING IOT AND MACHINE LEARNING

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Abstract

The fundamental element of people's needs is health .Humans face a haul of surprising death and plenty of diseases because of varied diseases that are a result of lack of treatment to the patients at right time. The main objective of this project is to develop a reliable sensible patient health observance system victimization IoT so the attention professionals will monitor their patients. The sensors will be either worn or be embedded into the body of the patients, to unendingly monitor their health. the knowledge collected in such a fashion will behold on, analyzed, and well-mined to try and do the first prediction of diseases. A mobile device-based attention observance system is developed which may offer period on-line data regarding physiological conditions of a patient primarily consists of sensors, the information acquisition unit, Arduino, and programmed with code. The patient's temperature, heartbeat rate, pressure level, graph knowledge square measure monitored, displayed, and hold on by the system and senttothedoctor'sandpatient'smobilecontainingtheappliance. The sensible Health observance System monitors health standing and saves it on the online page.

Introduction

The Internet of things (IoT) describes the network of physical objects "things" that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the Internet. There are a number of serious concerns about dangers in the growth of IoT, especially in the areas of privacy and security, and consequently industry and governmental moves to address these concerns have begun including the development of international standards. The Internet of Medical Things (IoMT) is an application of the IoT for medical and health related purposes, data collection and analysis for research, and monitoring. The IoMT has been referenced as "Smart Healthcare" as the technology for creating a digitized healthcare system, connecting available medical resources and healthcare services. The IOT is generally considered as connecting objects totheInternetandusingthat connection for control of those objects or remote monitoring. But this definition was referred only to part of IOT evolution considering the machine to machine market today. But actual definition of IOT is creating a brilliant, invisible network which can be sensed, controlled and programmed. The products developed based on IOT include embedded technology which allows them to exchange information, with each other or the Internet and it is assessed that about 8 to 50 billion devices will be connected by 2020. Since these devices come online, they provide better life style, create safer and more engaged communities and revolutionized healthcare. The entire concept of IOT stands on sensors, gateway and wireless network which enable users to communicate and access the application/information. Specialized sensors can also

be equipped within living spaces to monitor thehealth and general well-being of senior citizens, while also ensuring that proper treatment is being administered and assisting people regain lost mobility via therapy as well.These sensors create a network of intelligent sensors that are able to collect, process, transfer, and analyze valuable information in different environments, such as connecting in-home monitoring devices to hospital-based systems. Other consumer devices to encourage healthy living, such as connected scales or wearable heart monitors, are also a possibility with the IoT. The application of the IoT in healthcare plays a fundamental role in managing chronic diseases and in disease prevention and control. Remote monitoring is made possible through the connection of powerful wireless solutions. The connectivity enables health practitioners to capture patient's data and applying complex algorithms in health data analysis. Health is a fundamental element of people's need for a better life. Unfortunately, the global health problem has created a dilemma because of certain factors, such as poor health services, the presence of large gaps between rural and urban areas, physicians, and nurses unavailability during the hardest timeThe Healthcare industry remains among the fastest to adopt the Internet of Things. The reason forthistrend is that integrating IoT features into medical devices greatly improves the quality and effectiveness of service, bringing especially high value for the elderly, patients with chronic conditions, and those requiring constant supervision. According to some estimates, spending on the Healthcare IoT solutions will reach a staggering $1 trillion by 2025 and, hopefully, will set the stage for highly personalized, accessible, and on-time Healthcare services for everyone. Networked sensors, either worn on the body or embedded in our living environments, make possible the gathering of rich information indicative of our physical and mental health. Captured on a continual basis, aggregated, and effectively mined, such information can bring about a positive transformative change in the health care landscape. The IoT is usedbyclinicalcare to monitor physiological statuses of patients through sensors by collecting and analyzing their information and then sending analyzed patient's data remotely to processing centers to make suitable actions. Not only for patients, it also useful for normal people to check the health status by using wearable devices with sensors.

Health has prime importance in everyone's life. currently, attention and eudaimoniam anagement is one every of the foremost promising applications of knowledget echnology. Among the applications that the Internet of Things (IoT) beyond any doubt reworking the attention trade, In general, IoT has been wide accustomed to interconnect advanced medical resources and to supply sensible and effective attention services to the individuals. In recent years the Internet of Things(IoT) plays

a key role in the healthcare industry. The world population is increasing continuously. In many parts of our country, people are not getting medical facilities at right time. Due to covid 19, many people unable to go to the hospital because of that people are unable to do their routine check-ups for their blood pressure and body temperature. Also, many peoples are not going because of a lot of lengthy processes or because of not availability of doctors. So, we are doing this project for reducing time consumption. In recent years the application of IoT in healthcare is increasing.So, having a smart patient health monitoring system is observed that it will reduce time, cost, and reduce efficiency. People can easily monitor themselves and can get the report at the same time. Because of that, it is easy for the early prediction of diseases. The body temperature, heartbeat rate, blood pressure are the main factors or parameters to diagnose the disease. This project gives temperature, pulse rate and Ecg data.

AIM AND SCOPE

AIM:

The primary goal of this project is to develop a smart patient health monitoring system in such a way that we can get all the necessary and detailed information of the disease.The proposed system measures the body temperature, pulse rate and ECG data.Health is always a major concern in every growth the human race is advancing in terms of technology.

Like the recent corona virus attack that has ruined the economy of China to an extent is an example how health care has become of major importance. In such areas where the epidemic is spread, it is always a better idea to monitor these patients using remote health monitoring technology.RemotebPatient Monitoring arrangement empowers observation of patients outside of customary clinical settings (e.g. at home), which expands access to human services offices at bring down expenses.

The fundamental element of people's needs is health .Humans face a haul of surprising death and plenty of diseases because of varied diseases that are a result of lack of treatment to the patients at right time.

The main objective of this project is to develop a reliable sensible patient health observance system victimization IoT so the attention professionals will monitor their patients. The sensors will be either worn or be embedded into the body of the patients, to unendingly monitor their health. the knowledge collected in such a fashion will behold on, analyzed, and well-mined to try and do the first prediction of diseases. The concept of Internet of things is recent and is defined as the integration of all devices that connect to the network, which can be managedfromtheweband in turn provide information in real time, to allow interaction with people theyuseit5. Another concept of IoT "is the general idea of things, especially everyday objects, which are readable, recognizable, locatable, addressable and controllable via the Internet - either through RFID, wireless LAN, wide area network, or by other means "6 . IoT The term itself was first mentioned by Kevin Ashtonin1998andaimsatthe exchange of information7 . On the other hand8 , the Internet of things can be seen from three paradigms, which are Internet-oriented middleware, things sensors oriented and knowledge-oriented semantics. Therefore, it is appropriate, such delimitation because the interdisciplinary nature of the subject. However the usefulness of the IoT is reflected when crossing between thethreeparadigmsinthe development of applications9 . The Internet of Things has a number challenges that are still working. IoT driven Fog Computing is developed in the healthcare industry that can expedite facilities and services among the mass population and help in saving billions of lives. The new computing platform, founded as fog computing paradigm may help to ease latency while transmitting and communicating signals with remote servers, which can accelerate medical services in spatial-temporal dimensions. The latency reduction is one of the necessary features of computing platforms which can enable completing the healthcare operations, especially in large-size medical projects and in relation to providing sensitive and intensive services. Reducing the cost of delivering data to the cloud is one of the research objectives.

OBJECTIVES:

- **To develop a reliable patient health monitoring system.**
- **To measure the body temperature, heartbeat rate and ecg.**
- **To design a system to store patient data.**
- **To do analysis of collected data of sensors.**

SCOPE:

This project will help in monitoring the patient's health which will be helpful for doctors and patients both. It will help in reducing and early prediction of disease. The core objective of this project is the design and implementation of a smart patient health tracking system that uses Sensors to trackpatienthealthandusesinternetto inform their loved ones in case of any issues. The objective of developing monitoring systems is to reduce health care costs by reducing physician office visits, hospitalizations, and diagnostic testing procedure Each of our bodies utilizes temperature and also pulse acknowledging to peruse understanding wellbeing. The sensors are linked to a microcontroller to track the status which is thusinterfacedto a LCD screen and additionally remote association with have the capacity to exchange alarms. If framework finds any sudden changes in understanding heart beat or body temperature, the framework consequently alarms the client about the patients status over IOT and furthermore indicates subtle elements of pulse and temperature of patient live in the web. In this manner IOT set up tolerant wellbeing following framework viably utilizes web to screen quiet wellbeing measurements and spare persists time. The increased use of mobile technologies and smart devices in the area of health has caused great impact on the world. Health experts are increasingly taking advantage of the benefits these technologies bring, thus generating a significant improvement in health care in clinical settings and out of them. Likewise, countless ordinary users are being served from the advantages of the MHealth (Mobile Health) applications and E-Health (health care supported by ICT) to improve, help and assist their health. Applications that have had a major refuge for these users, so intuitive environment. The Internet of things is increasingly allowing to integrate

SYSTEM DESIGN

EXISTING SYSTEMS

- The system used before in health observance is that the fastened observance system, which might be detected only the patient is within the hospital or bed. It takes
- abundant time for doctors additionally as patients. within the existing system, the
- patient has to get hospitalized for normal observance or routine medical. The systems are mensuration the health parameter of the patient
- These are used for under short-range communication to transfer the information. The doctor cannot fetch all the small print in the slightest degree times.

PROJECT IMPLEMENTATION

The system is implemented using the combination of hardware components. The smart patient health monitoring system will have sensors to detect body temperature, pulse rate and ECG data. The health monitoring sensors are used to collect health related data i.e. for data acquisition. Communication can be done by controller for sending data on internet wirelessly. Data processing has been done at server. All data collected and aggregated at server point. To get health related information in understandable format it can be shown on web page using Thing Speak IOT. All these data will be accessible in real time scenario for continuous monitoring. Health monitoring is the

major problem in today's world. Due to lack of proper health monitoring, patient suffer from serious health issues. There are lots of IoT devices now days to monitor the health of patient over internet. Health experts are also taking advantage of these smart devices to keep an eye on their patients.Withtons ofnewhealthcaretechnologystart-ups, IoT is rapidlyrevolutionizingthehealthcare industry.

Here in this project,we will make an IoT based HealthMonitoringSystem which records the patient heart beat rate and body temperature and also send an email/SMS alertwheneverthosereadingsgoesbeyondcriticalvalues.Pulserate and body temperature readings are recorded over ThingSpeak and Google sheets so that patient health can be monitored from anywhere in the world over internet. A panic will also be attached so that patient can press it on emergency to send email/sms to their relatives.

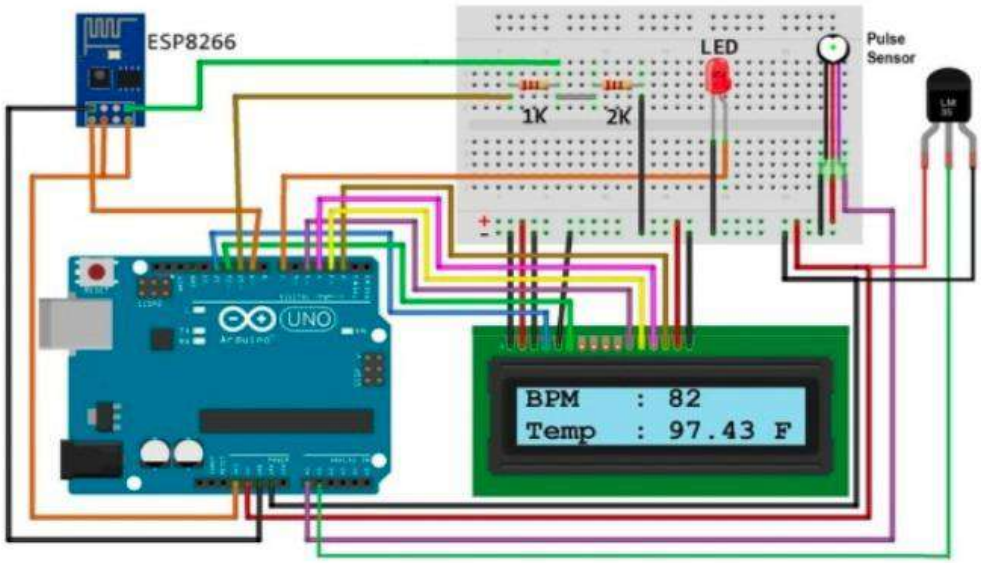


FIG-3.6 CIRCUIT DIAGRAM

HARDWARE REQUIREMENTS

- Arduino
- Temperature
- Sensor
- Pulse Sensor
- WIfi Module
- IOT Module
- Power Supply
- Connecting Cable

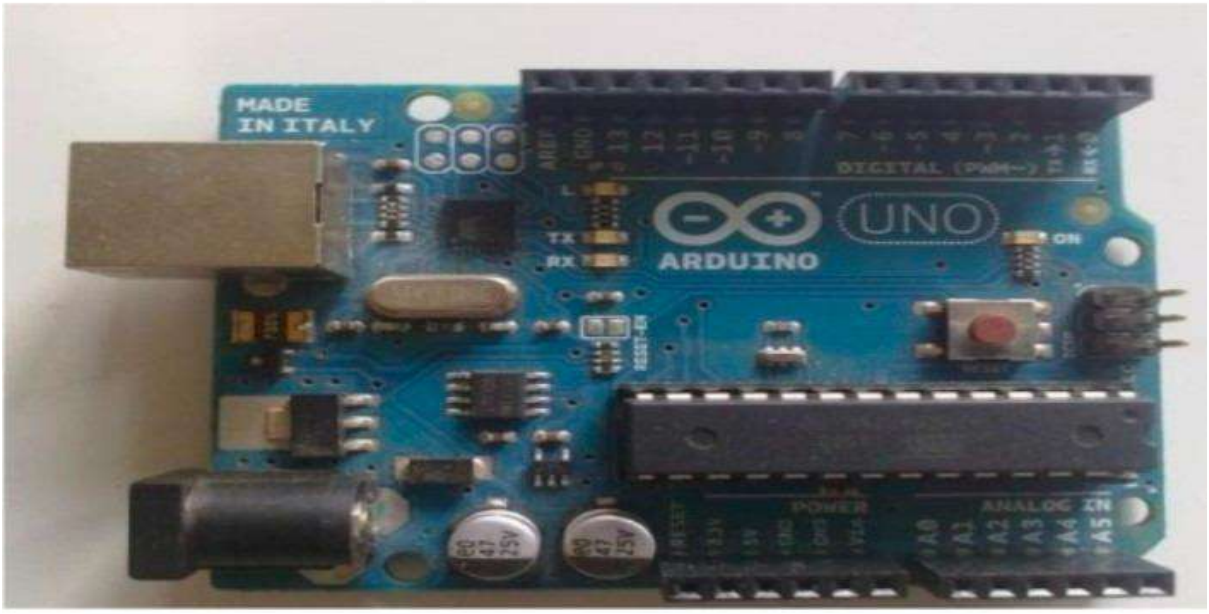
SOFTWARE REQUIREMENTS

- Arduino IDE
- Language: C
- ThingSpeak (IOT Cloud Server)

HARDWARE DESIGN

ARDUINO UNO AND ITS PROGRAMMING :

Arduino is a tool for making computers that can sense and control more of the physical world than your desktop computer. It's an open-source physical computing platform based on a simple microcontroller board, and a development environment for writing software for the board. Arduino can be used to develop interactive objects, taking inputs from a variety of switches or sensors, and controlling a variety of lights, motors, and other physical outputs. Arduino projects can be stand-alone, or they can be communicate with software running on your computer. The boards can be assembled by hand or purchased preassembled; the open-source IDE can be downloaded for free. The Arduino programming language is an implementation of Wiring, a similar physical computing platform, which is based on the Processing multimedia programming environment. The USB connection with the PC is necessary to program the board and not just to power it up. The Uno automatically draw power from either the USB or an external power supply. Connect the board to your computer using the USB cable. The green power LED (labelled PWR)shouldgoon.TheArduinoplatformhasbecomequitepopularwith people just starting out with electronics, and for good reason. Unlike most previous programmable circuit boards, the Arduino does not need a separate piece of hardware (called a programmer) in order to load new code onto the board -- you can simply use a USB cable. Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program. Finally, Arduino provides a standard form factor that breaks out the functions of the micro-controller into a more accessible package. Arduino is a great tool for people of all skill levels. However, you will have a much better time learning along side your Arduino if you understand some basic fundamental electronics beforehand. We recommend that you have at least a decent understanding of these concepts before you dive in to the wonderful world of Arduino.



Overview:

The Arduino microcontroller is an easy to use yet powerful single board computer that has gained considerable traction in the hobby and professional market. The Arduino is open-source, which means hardware is reasonably priced and development software is free. This guide is for students in ME 2011, or students anywhere who are confronting the Arduino for the first time. For advanced Arduino users, prowl the web; there are lots of resources. The Duemilanove board features an Atmel ATmega328 microcontroller operating at 5 V with 2 Kb of RAM, 32 Kb of flash memory for storing programs and 1 Kb of EEPROM for storing parameters. The clock speed is 16 MHz, which translates to about executingabout300,000linesofCsourcecodepersecond.Theboardhas14 digital I/O pins and 6 analog input pins. There is a USB connector for talking to the host computer and a DC power jack for connecting an external 6-20 V power source, for example a 9 V battery, when running a program while not connected to the host computer. Headers are provided for interfacing to the I/O pins using 22 g solid wire or header connectors. The Arduino programming language is a simplified version of C/C++. IfyouknowC, programming the Arduino will be familiar. If you do not know C, no need to worry as only a few commands are needed to perform useful functions.

An important feature of the Arduino is that you can create a control program on the host PC, download it to the Arduino and it will run automatically. Remove the USB cable connection to the PC, and the program will still run from the top each time you push the reset button. Remove the battery and put the Arduino board in a closet for six months. When you reconnect the battery, the last program you stored will run. This means that you connect the board to the host PC to develop and debug your program, but once that is done, you no longer need the PC to run the program.

The Arduino Uno is a microcontroller board based on the ATmega328.It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

PIN CONFIGURATION:

The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically.External (non-USB) power can come either from an AC-to-DC adapter (wall- wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector.

The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

RESULT AND CONCLUSION

Our goal is to implement a smart patient health monitoring system that can monitor the heartbeat and body temperature. The smart patient health care monitoring system developed by us has numerous applications. These

types of healthcare systems can be implemented in hospitals as wellasathomeplaceswhereaperson needs to have immediate medical attention whenever his/her health goes unstable. As we are using the Thing Speak IoT platform with the help of Thing Speak we can easily capture sensor data. This allows to keep a track of patients' heartbeat and body temperature value with change intime.Thiswouldgivethedoctoramorewide perspective of treating the patient in a much effective way within less time. The system developed patient monitoring based on Internet of things, is an alternative that can be used to help patients with chronic diseases. Likewise with this set of solutions the aim is to improve the quality of life of patients, not just monitoring them, but also to enable direct them to improve their eating habits and workout routines. The context model developed for the system proved to be efficient when making inferences related to the context, such as recommendations for taking measures through sensors, as well as recommendations and workout routines tips to improve the eating habits of patients.

CONCLUSIONS:

The Internet of Things is considered now as one of the feasible solutions for any remote value tracking especially in the field of health monitoring. It facilitates that the individual prosperity parameter data is secured inside the cloud, stays in the hospital are reduced for conventional routine examinations and most important that the health can be monitored and disease diagnosed by any doctor at any distance. In this paper, an IoT based health monitoring system was developed. The system monitored body temperature, pulse rate and room humidity and temperature using sensors, which are also displayed on a LCD. These sensor values are then sent to a medical server using wireless communication. These data are then received in an authorized personals smart phone with IoT platform. With the values received the doctor then diagnose the disease and the state of health of the patient. The main objective of the experiment was successfully achieved. All the individual modules like Heartbeat detection module, fall detection module etc. and remote viewing module gave out the intended results. 55 The designed system modules can further be optimized and produced to a final single circuit. More important fact that came up during project design is that all the circuit components used in the remote health detection system are available easily. In this paper, we found the importance and fruitful benefits of implementation of IoT in remote health monitoring systems.The compact sensors with IoT will makea huge impact on every patient's life, that even though they are away from home and physician, this helps them to reduce the fear of danger. The sensory data can be acquired in home or work environments. Also, the challenges in sensing, analytics and prediction of the disease are also highlighted and those can be addressed toprovide aseamless integraton..Thefundamentalelementofpeople's needs is health .Humans face a haul of surprising death and plenty of diseases because of varied diseases that are a result of lack of treatment to the patients at right time. The main objective of this project is to develop a reliable sensiblepatient health observance system victimization IoT so the attention professionals will monitor their patients. The sensors will be either worn or be embedded into the body of the patients, to unendingly monitor their health. the knowledge collected in such a fashion will behold on, analyzed, and well-mined to try and do the first prediction of diseases

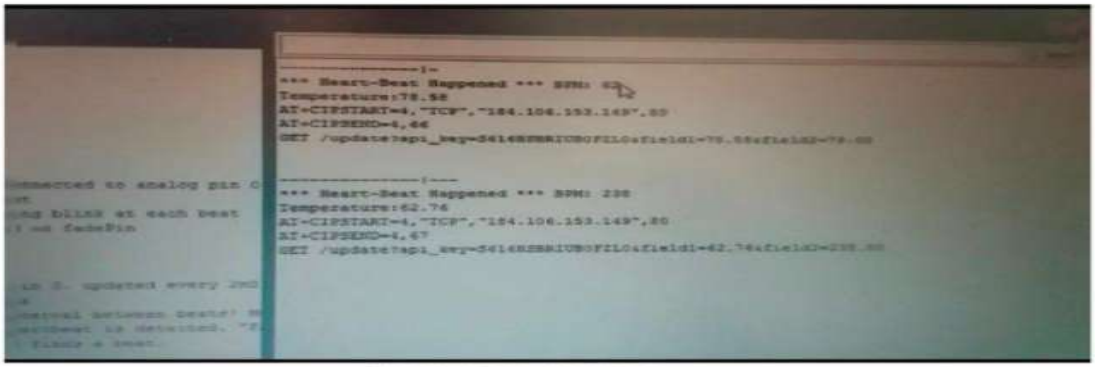
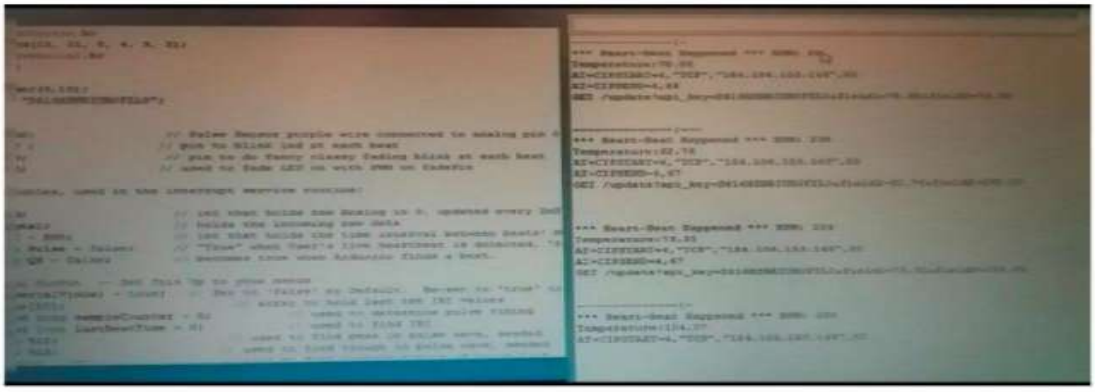


FIG.5.1 SERIAL MONITOR



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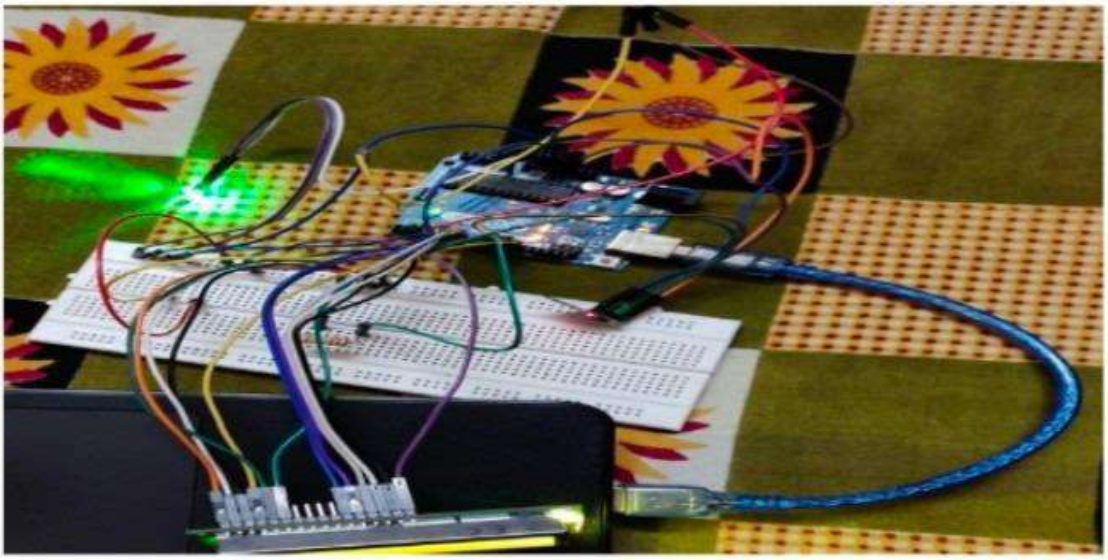

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