iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL
FOR RESEARCH
IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 9 **Issue:** IV **Month of publication:** April 2021

DOI: https://doi.org/10.22214/ijraset.2021.33932

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue IV Apr 2021- Available at www.ijraset.com

Healthcare Device for Smart Campus

Prof. M. C. Hingane[1], Pratiksha D. Shinde[2], Aishwarya G. Kalbhor[3], Manali A. Rahinj[4], Deepali B. Kakade[5]
[1]*Assistant Professor, Department of Computer Engineering, PDEA's College Of Engineering, Pune, India.*
[2, 3, 4, 5]*Students, Department Of Computer Engineering, PDEA'S College Of Engineering, Pune, India.*

Abstract: An IOT based healthcare system can ensure better well-being of patients and condition of life especially in remote areas where there is no healthcare system. In this project, the vital signs of health like body temperature, pulse rate and oxygen level are measured using the sensors like LM35 and MAX30100, the measured data is sent over to the IOT cloud to get recorded history of the patient. An android app is also designed to display the current parameter values. We tried to proposed a model which is non-invasive in nature and can monitor the patient in remote area through sensor connected networks. The principle aim of this model is to provide healthcare facilities in Hospitals, Malls, Schools, Offices, Commercial & Residential Areas etc.
Keywords: Internet of things, IOT in healthcare, Healthcare device.

I. INTRODUCTION

In healthcare sector IoT plays an important role as it is reliable, flexible and affordable system, it offers an optimizing technology to acquire the leading healthcare services and can meliorate the current medical services . India has a vast healthcare system and this system is divided into two sectors: public and private but there are many differences in the level of healthcare of rural and urban area resources, as well as also in the public and private healthcare facilities. With rapid increase in population, is getting very challenging for health division of India to provide a proper and well-ordered healthcare for the rural area and remote population. Even 75% of the healthcare infrastructure are in urban areas where only 27% of the population is living. E-healthcare is an appropriate way to provide medical care to the remote area patients with cheap and easily overcome the problem of unavailability of doctors in isolated areas.

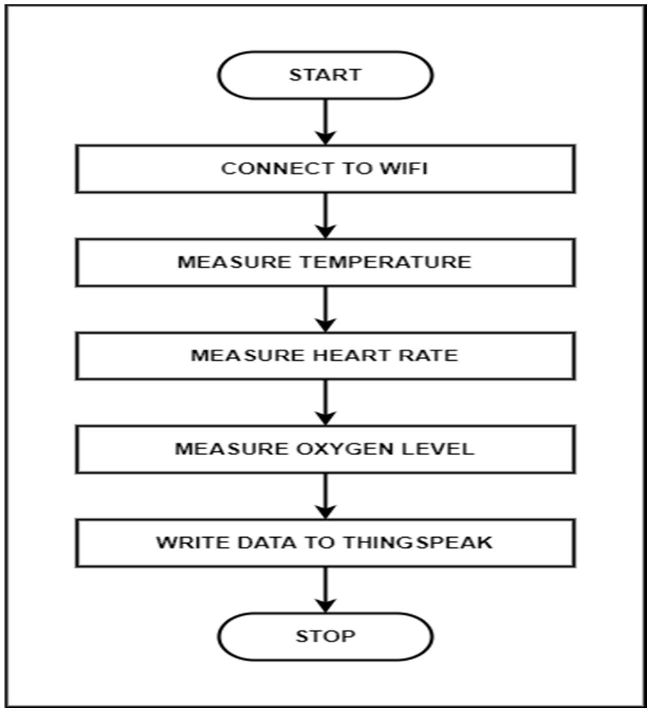
II. LITERATURE SURVEY

In present scenario, many wireless body sensor networks have been introduced, that continuous keep track of an individual health condition. The first WBSN which the researchers made uses the atmega-8 microcontroller with various sensors integrated to it [1]. A Galileo board [2] is an integrated sensor based IOT device that provide medical platform for review of electrocardiogram (ECG) signals and based on that algorithm used to monitored heart function. By Woo et al. [10] pay attention on the essential issue of fault tolerant health data services. To do so, authors present a fault tolerant algorithm and the proposed architecture provide a gateway that can be linked to form a connected network for fault tolerance. Furthermore, the copy of the previous gateway is stored in the gateway for backup. Nonintrusive sensor based small wearable device [15] will enable enormous data to be collected automatically. This will help in reducing the expenses and also the frequent visit to the health professional or medical centre. By Swaroop et al. [3] focused on the design of real time health monitoring system which can back-up the patient's health record and also focused on various mode of transmission of data using mobile application, messaging service and internet. Implementing medical care system for remote population should provide continuous data analysis and can be easily accessible for anyone with little knowledge. For remote health monitoring a diagnosis system is needed instead of wearable device, wearable devices cannot be afforded by rural area people.

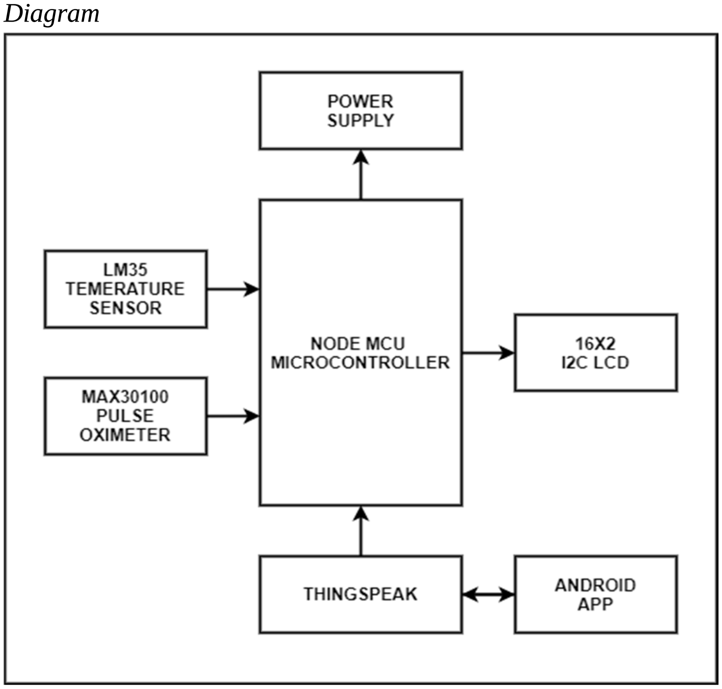
III. PROPOSED METHODOLOGY

1) NodeMCU ESP-12E is used as the microcontroller in this project.
2) LM35 sensor is used for measuring temperature of the user.
3) MAX30100 is used to measure heart rate of the user as well as oxygen level of the user.
4) The data measured is then displayed locally using I2C LCD.
5) The NodeMCU being an internet enabled microcontroller it connects to Wi-Fi access point for internet.
6) The data measured is then logged to remote server.
7) The server used is Thing Speak Cloud.
8) This data is also displayed in custom made Android App.
9) The Android App is developed using MIT App Inventor 2.

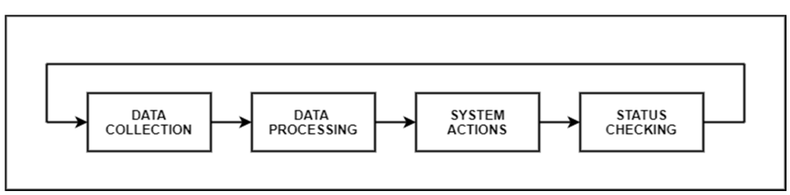
A. Flowchart



B. System Architecture / Block Diagram

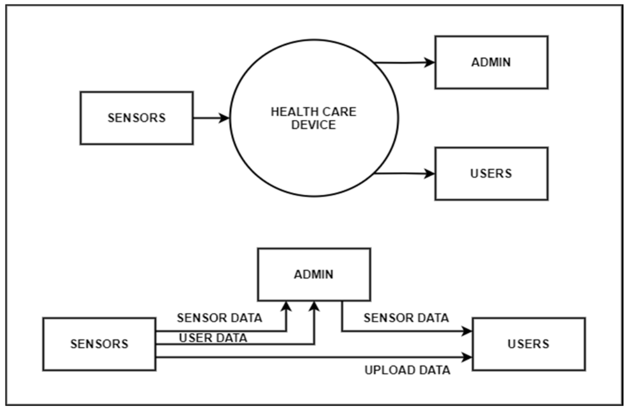


C. High Level Design

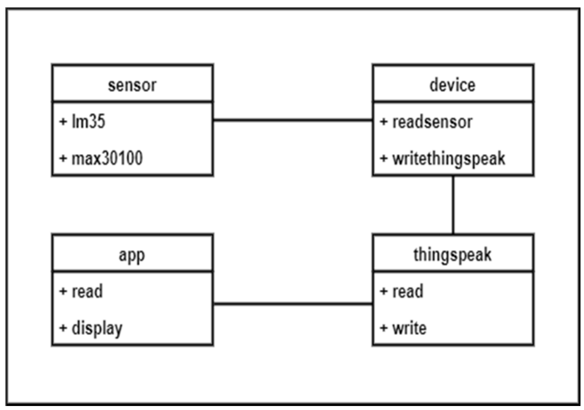


International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue IV Apr 2021- Available at www.ijraset.com

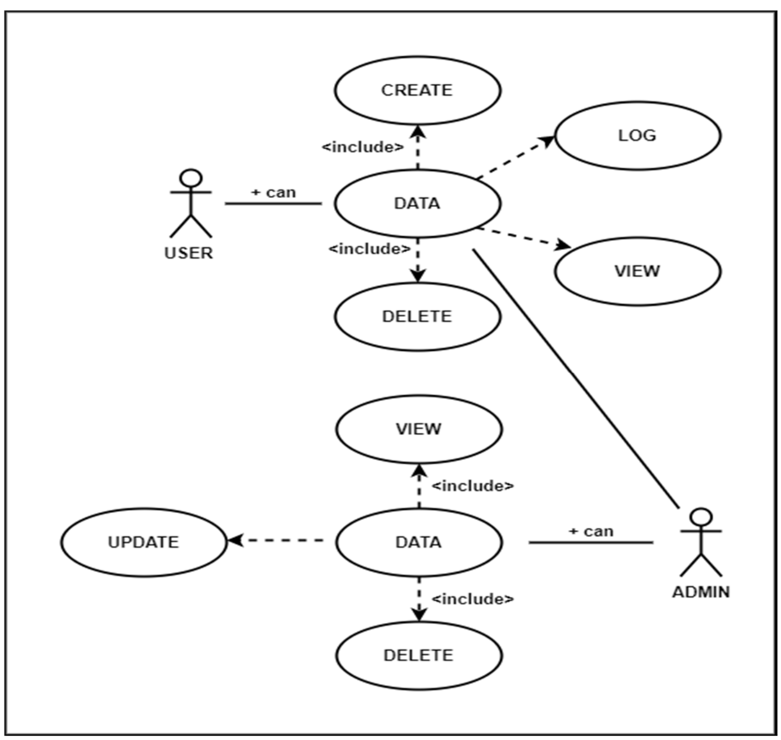
D. Data Flow Diagram



E. Class Diagram

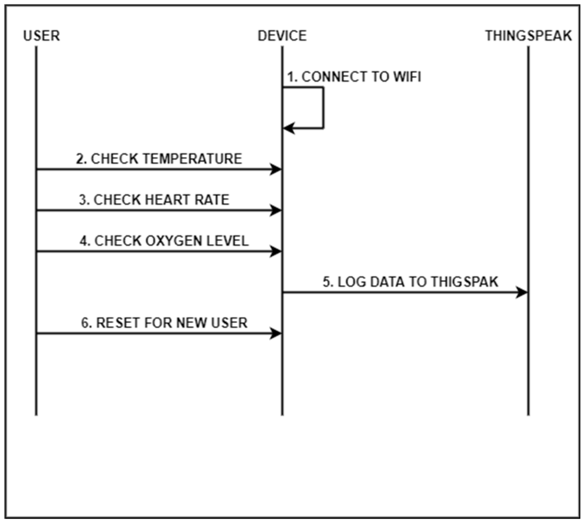


F. Use Case Diagram



International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue IV Apr 2021- Available at www.ijraset.com

G. Activity Diagram



IV. HARDWARE USED

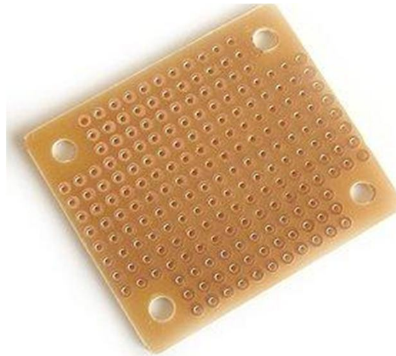
A. NodeMCU ESP12-E Microcontroller

NodeMCU is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the development kits. The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266. It uses many open-source projects, such as lua-cjson and SPIFFS.

B. I2C LCD (16X2)

I2C_LCD is an easy-to-use display module; it can make display easier. Using it can reduce the difficulty of make, so that makers can focus on the core of the work. The Arduino library for I2C_LCD, user just need a few lines of the code can achieve complex graphics and text display features. It can replace the serial monitor of Arduino in some place, you can get running information's without a computer. Through the bitmap convert software you can get picture displayed on I2C_LCD, without the need for complex programming.

C. Zero PCB

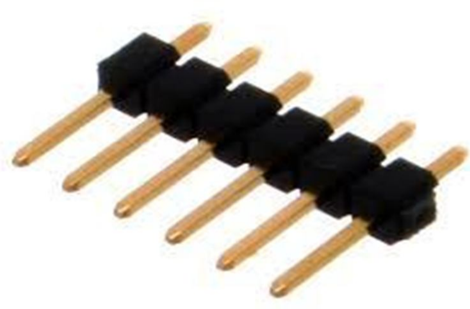


Perfboard is a material for prototyping electronic circuits (also called DOT PCB). It is a thin, rigid sheet with holes pre-drilled at standard intervals across a grid, usually a square grid of 0.1 inches (2.54 mm) spacing. These holes are ringed by round or square copper pads, though bare boards are also available. Inexpensive perfboard may have pads on only one side of the board, while better quality perfboard can have pads on both sides (plate-through holes). Since each pad is electrically isolated, the builder makes all connections with either wire wrap or miniature point to point wiring techniques. Discrete components are soldered to the prototype board such as resistors, capacitors, and integrated circuits. The substrate is typically made of paper laminated with phenolic resin (such as FR-2) or a fiberglass-reinforced epoxy laminate (FR-4).

D. Connecting Wire

Connecting wires allows an electrical current to travel from one point on a circuit to another because electricity needs a medium through which it can move. Most of the connecting wires are made up of copper or aluminium. Copper is cheap and good conductivity. Instead of the copper, we can also use silver which has high conductivity but it is too costly to use.

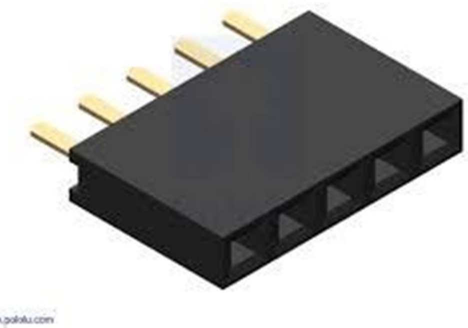
E. Male Header



Male pin headers are often associated with ribbon cable connectors. When used alone, they can be recipients of jumpers, which have spacings of 2.54 mm (0.1 in) and 2.00 mm (0.079 in). The spacing distance between pins (measured from centre to centre) is often known as pitch.

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue IV Apr 2021- Available at www.ijraset.com

F.   Female Header



0.1″ (2.54 mm) female header strips are commonly used as low-cost connectors for custom-made cables or perforated prototyping PCBs.

G.   LM35 Temperature Sensor

LM35 is a precession Integrated circuit Temperature sensor, whose output voltage varies, based on the temperature around it. It is a small and cheap IC which can be used to measure temperature anywhere between -55°C to 150°C.There will be rise of 0.01V (10mV) for every degree Celsius rise in temperature.

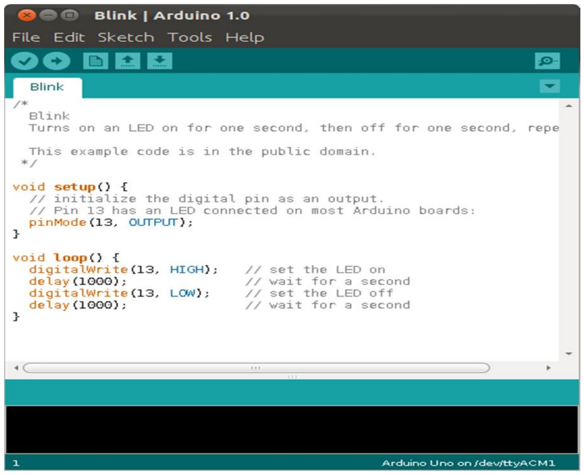
H.   Oximeter

The MAX30100 is an integrated pulse oximetry and heart-rate monitor sensor solution. It combines two LEDs, a photodetector, optimized optics, and low-noise analog signal processing to detect pulse oximetry and heart-rate signals. The MAX30100 breakout operates from 1.8V and 5.5V. When the heart pumps blood, there is an increase in oxygenated blood as a result of having more blood.
As the heart relaxes, the volume of oxygenated blood also decreases. By knowing the time between the increase and decrease of oxygenated blood, the pulse rate is determined. It turns out, oxygenated blood absorbs more infrared light and passes more red light while deoxygenated blood absorbs red light and passes more infrared light.

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue IV Apr 2021- Available at www.ijraset.com

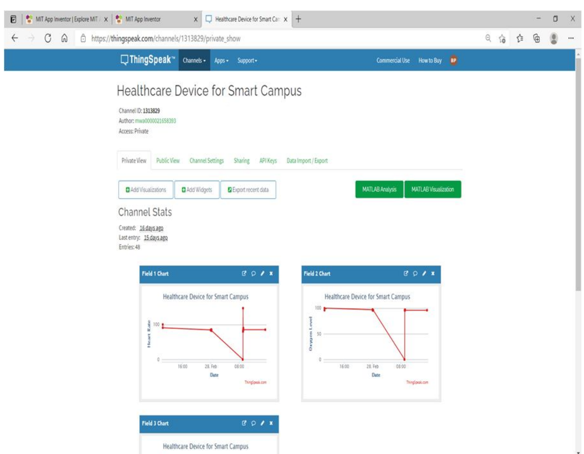
V. SOFTWARE USED

A. Arduino IDE



The Arduino integrated development environment (IDE) is a cross-platform application (for Windows, macOS, Linux) that is written in the programming language Java. It is used to write and upload programs to Arduino board. The source code for the IDE is released under the GNU General Public License, version. 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 tool chain, 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.

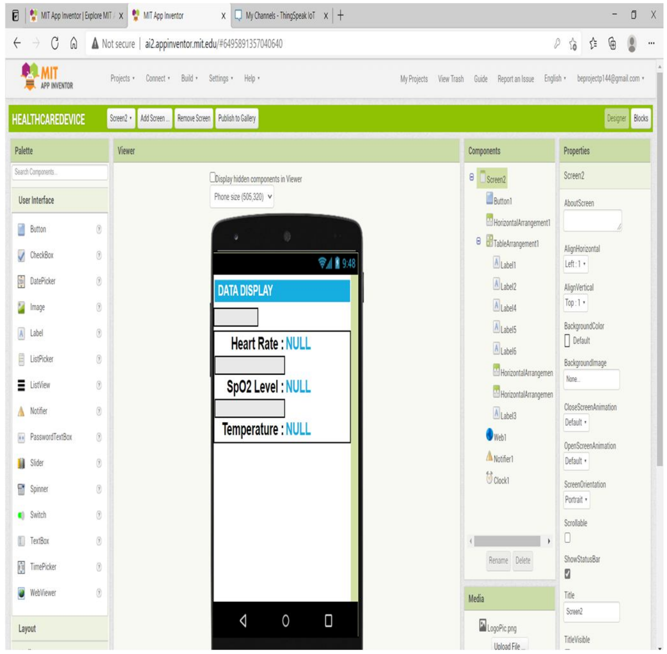
B. Thingspeak Cloud

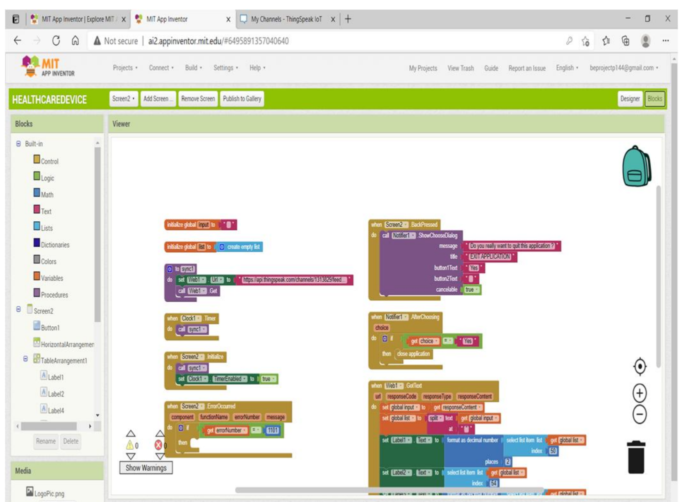


According to its developers, "ThingSpeak is an open-source Internet of Things (IoT) application and API to store and retrieve data from things using the HTTP and MQTT protocol over the Internet or via a Local Area Network. ThingSpeak enables the creation of sensor logging applications, location tracking applications, and a social network of things with status updates". ThingSpeak was originally launched by ioBridge in 2010 as a service in support of IoT applications. ThingSpeak has integrated support from the numerical computing software MATLAB from MathWorks, allowing ThingSpeak users to analyze and visualize uploaded data using MATLAB without requiring the purchase of a MATLAB license from MathWorks. ThingSpeak has a close relationship with MathWorks, Inc. In fact, all of the ThingSpeak documentation is incorporated into the MathWorks' MATLAB documentation site and even enabling registered MathWorks user accounts as valid login credentials on the ThingSpeak website. The terms of service and privacy policy of ThingSpeak.com are between the agreeing user and MathWorks, Inc. ThingSpeak has been the subject of articles in specialized "Maker" websites like Instructables, Code project, and Channel 9.

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue IV Apr 2021- Available at www.ijraset.com

C. MIT app inventor 2





App Inventor is a web application integrated development environment originally provided by Google, and now maintained by the Massachusetts Institute of Technology (MIT). It allows newcomers to computer programming to create application software (apps) for two operating systems (OS): Android, and iOS, which, as of 8 July 2019, is in final beta testing, scheduled to be released publicly in summer 2019. It is free and open-source software released under dual licensing: a Creative Commons Attribution ShareAlike 3.0 Unported license, and an Apache License 2.0 for the source code. It uses a graphical user interface (GUI) very similar to the programming languages Scratch and the StarLogo TNG user interface, which allows users to drag and drop visual objects to create an application that can run on mobile devices. In creating App Inventor, Google drew upon significant prior research in educational computing, and work done within Google on online development environments. App Inventor and the projects on which it is based are informed by constructionist learning theories, which emphasize that programming can be a vehicle for engaging powerful ideas through active learning. As such, it is part of an ongoing movement in computers and education that began with the work of Seymour Papert and the MIT Logo Group in the 1960s, and has also manifested itself with Mitchel Resnick's work on Lego Mindstorms and StarLogo.F

D. Advantages

1) The device combines all the necessary sensors into a single system. Hence there is no need of different devices.
2) Data can be viewed at local as well as remote levels.

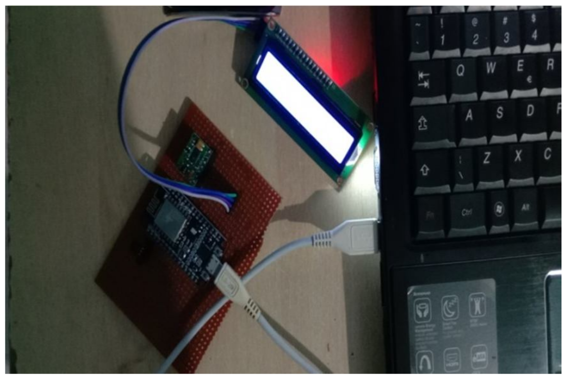
E. Disadvantages

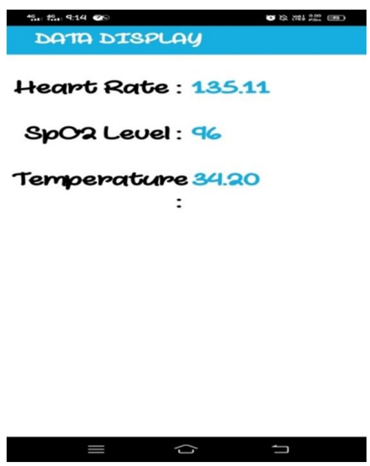
1) Requires an active internet connection for operation.

F. Applications

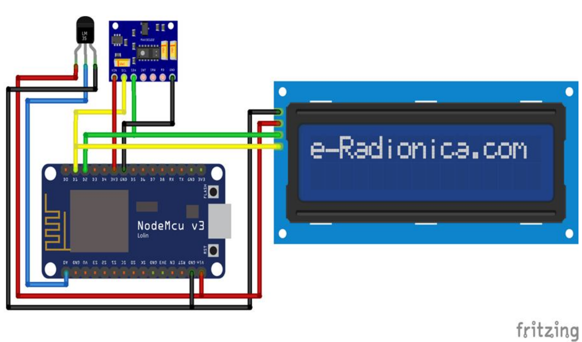
Hospitals, Malls, Schools, Offices, Commercial & Residential Areas etc.

VI. RESULT





A. Circuit Diagram



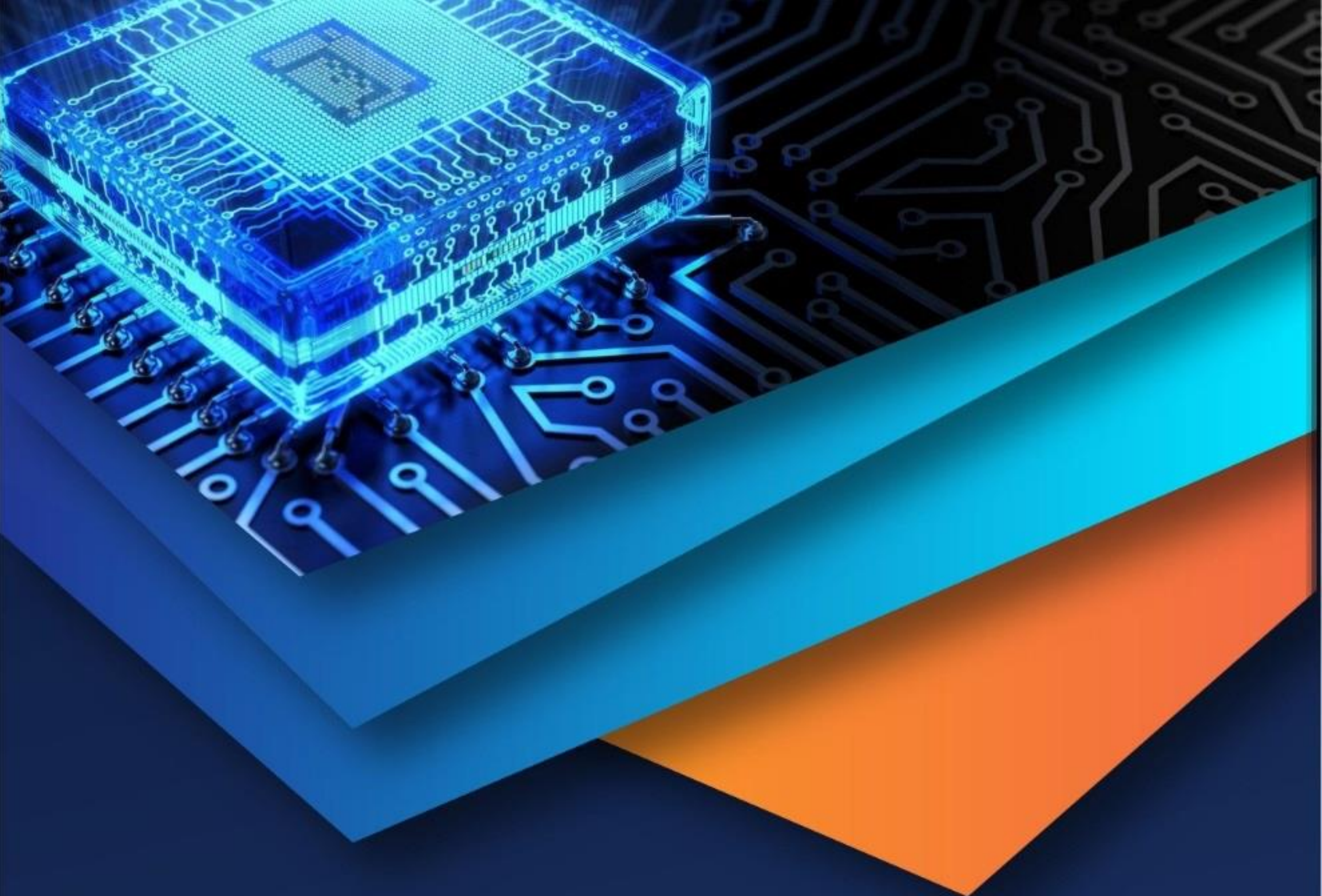
1) NodeMCU ESP-12E is used as the microcontroller in this project.
2) LM35 sensor is used for measuring temperature of the user.
3) MAX30100 is used to measure heart rate of the user as well as oxygen level of the user.
4) The data measured is then displayed locally using I2C LCD.
5) The NodeMCU being an internet enabled microcontroller it connects to Wi-Fi access point for internet.
6) The data measured is then logged to remote server.
7) The server used is Thing Speak Cloud.
8) This data is also displayed in custom made Android App.
9) The Android App is developed using MIT App Inventor 2.

VII. CONCLUSION

On selecting NodeMCU as a suitable interface, we aim to provide an easily compatible facility at an economically feasible rate. Hence, on adopting this methodology, we will be able to implement precautionary measures and facilitate people to use these effectively.

REFERENCES

[1] D. S. R. Krishnan, S. C. Gupta, and T. Choudhury, “An IoT based Patient Health Monitoring System,” in 2018 International Conference on Advances in Computing and Communication Engineering (ICACCE), August 2018, pp. 1–7.
[2] D. Azariadi, V. Tsoutsouras, S. Xydis, and D. Soudris, “ECG signal analysis and arrhythmia detection on IoT wearable medical devices,” in 2016 5th International Conference on Modern Circuits and Systems Technologies (MOCAST), June 2016, pp. 1–4.
[3] K. N. Swaroop, K. Chandu, R. Gorrepotu, and S. Deb, “A health monitoring system for vital signs using IoT,” Internet of Things, vol. 5, pp. 116–129, March 2019.
[4] G. Manogaran, R. Varatharajan, D. Lopez, P. M. Kumar, R. Sundarasekar, and C. Thota, “A new architecture of Internet of Things and big data ecosystem for secured smart healthcare monitoring and alerting system,” Futur. Gener. Comput. Syst., vol. 82, pp. 375–387, May 2018.
[5] S. V Zanjal and G. R. Talmale, “Medicine Reminder and Monitoring System for Secure Health Using IOT,” Procedia Comput. Sci., vol. 78, pp. 471–476, 2016.
[6] F. Firouzi et al., “Internet-of-Things and big data for smarter healthcare: From device to architecture, applications and analytics,” Futur. Gener. Comput. Syst., vol. 78, pp. 583–586, January 2018.
[7] B. Farahani, F. Firouzi, V. Chang, M. Badaroglu, N. Constant, and K. Mankodiya, “Towards fog-driven IoT eHealth: Promises and challenges of IoT in medicine and healthcare,” Futur. Gener. Comput. Syst., vol. 78, pp. 659–676, January 2018.
[8] M. Hassanalieragh et al., “Health Monitoring and Management Using Internet-of-Things (IoT) Sensing with Cloud-Based Processing: Opportunities and Challenges,” in 2015 IEEE International Conference on Services Computing, August 2015, pp. 285–292.
[9] J. Saha et al., “Advanced IOT based combined remote health monitoring, home automation and alarm system,” in 2018 IEEE 8th Annual Computing and Communication Workshop and Conference (CCWC), February 2018, pp. 602–606.



10.22214/IJRASET

INDEX COPERNICUS

45.98

IMPACT FACTOR: 7.129

TOGETHER WE REACH THE GOAL

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY