Design of a Portable Real-Time Health Monitoring Model using IOT and Thing Speak

Nayana P N
UG Students, Dept. of TCE,
GSSSIETW, Mysuru

Umme Hani R
UG Students, Dept. of TCE,
GSSSIETW, Mysuru

Latha M
Asst. Professor, Dept. of TCE,
GSSSIETW, Mysuru

Ameena Khan
UG Students, Dept. of TCE,
GSSSIETW, Mysuru

Bindu Reddy L
UG Students, Dept. of TCE,
GSSSIETW, Mysuru

***ABSTRACT*—Wearables are considered as the biggest innovation in technology since the smartphone – and the possibilities in this are endless. The components are the following: a hand worn device with Arduino board, an ECG (electrocardiogram) sensor, a water proof temperature sensor, an accelerometer gyro sensor, a pulse rate sensor, a pressure sensor, a GPS module, Wi-Fi module, a buzzer and LCD (liquid crystal display). Wearable devices are the new trend. These devices collect data from the person wearing (like pulse, location, ECG etc.) and send to the cloud for storage and analysis. This multi-sensor device assembles a system which is very helpful for monitoring of wearer's health. The real time indication of the wearer's health state and can be further analyzed for medical diagnosis. The wearer or the care taker or the doctor are alerted in case of potential emergency i.e., if there is a fall detected or if the heart rate drops low or becomes high or if any unusual health changes occur. The wearer's location can be tracked immediately so that emergency measures can be taken without wasting much time and this very helpful in protecting life. Harmful situations can be easily avoided.**

I. INTRODUCTION:

This system helps to provide good interaction between the wearer, his environment and his care taker. This smart device enables different forms of interaction, communication, cooperation and integration between humans and electronic automated information systems. The use of several small sensors makes the overall cost low, transmission module used is Wi-Fi module and ATmega328P processor. These are well-suited to keep track of physical health monitoring and do not impose limits on time or location. This system gives the collective information of several individual sensors. This feature can be considered as an advantage because comprehensive multi-parameter sensing model is more effective for analysis and evaluating each parameter separately. This is the best and most effective way. Medical diagnosis can be further analyzed by the data retrieved by the Wearable. Medical diagnostic center & guardian of the patient will get the first hand biometric information through a standard Wi-Fi communication protocol. Data can be sent to a cloud computing system to perform permanent storage or visualized in real-time by sending the information directly to a laptop or smart phone. Data can be transferred securely using encryption techniques which also meets privacy concerns. Data mining can be performed, main aim of the data mining process is to obtaindetails from the data set and transform it into a comprehensible structure so that it is possible to find earlier unknown information to make conclusions regarding the user's health. Figure 1 below shows how we can achieve our goal analyzing the physiological conditions of the wearer and provide better interaction between the wearer and his environment.

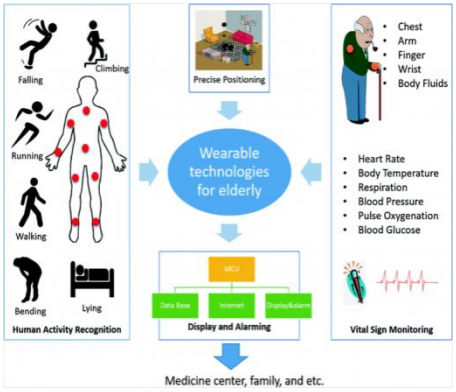


Fig 1: Example of patient status from wearable device

II. MOTIVATION OF THE PROJECT:

In this modern and constantly updating world, where time is a key factor for individuals, the working class of people particularly, spends most of the time balancing between various tends and tasks, they tend to ignore their health and fitness. Sometimes even a simple appointment with a doctor in a clinic requires several tests set for interpretation, prescription, and finally treatment, which consumes lot of time and energy. So many patients seek the need to go to a clinic only when they are suffering from a serious illness. Hence, people are seeking for a substitute, such as a device that can be worn on the body, which would continuously monitor the user's health in real time but also provides timely awareness on various health parameters to the user as well as his or her physician or his or her care taker. This is not only helpful for young people to monitor their health and fitness but it can also help elderly and ill people to avoid unnecessary hospital stays or a presence of a care taker which may be costly.

III. PROBLEM STATEMENT:

The Device Cannot Give the Proper Information About the Patient at Home Itself. Especially Elderly Ill People or Stroked Person Need to Stay at Hospital for Longer Duration of Time as shown in figure 2. Sometimes It Will Be Expensive for Staying. In Critical Condition Sporadically It Will Be Too Late for The Patient If the Hospitals are not

nearby. The Data Storage of the Ill People Is Not Permanent and There Is Some Time Delay for Sending Data.

Fig 2: patient has to visit hospital for a regular checkup

IV. PROBLEM SOLUTION:

We Can Obtain the Current Information of the Patient, Live Location of the Patient and Can Be Used by Anybody or Anywhere. In Advance Body Checkup I.E., Blood Pressure, Temperature of The Body, Diabetes, Heart Beat Etc. Can Be Done Easily Without Any Delay. This Can Generates Alert Depending Upon the Current Condition of the Patient. The Data Storage of the Patient Is Permanent, which we have tried to depict in the below figure 3.

Fig 3: Through wearable health monitoring is easy and can be done anywhere

V. EXISTING SYSTEM VS PROPOSED SYSTEM

The existing system of theproject involves alerting the doctors through software called ThingSpeak. If any important parameters of patient's healthdeviates from the normal value. ThinkSpeak allows only authorized users to access patient's or wearers data hence data is also secure and data cannot be lost, because it is always updated to a cloud where analysis can be done. Existing system is integrated into a large compact unit. It acts as a personal server so that it cannot be access the data from anywere. It does not have any permanent data storage capacity to recollect and access the previous data from the cloud. It is not wearable s that it is not easy to carry the device from one place to another. It cannot be detects the body condition and location of the patients in emergency. The data stores in the raspberry PI which acts as a personal server. Fall detection is also a major concern.

It will keep as a reference for researchers and developers in this scientific areas and to provide directions for future research and their improvements. It containsmultiple number of sensors,to collect all the medical health monitoring data from its wearer. It can be used by everyone and make our health management easier than available systems in our daily life. It will reduce the risk in individual in their overall harmful situations. It consists of permanent data storage capacity to recollect and access all the previous data stored in the cloud. The LCD provides the wearer some additional visual feedback of the current health states of the patient's, and the wearer's fall can also be detected and reported as emergency condition. It is wearable and it can easily carry a device from one place to another. It will detect the body condition and location of the patients in emergency situations. Micro electro mechanical system (MEMS), this system measures and recognizes movements of the person and it is used for fall detection.

VI. OBJECTIVES

- To build a patient health monitoring system, which measures temperature, pulse rate, ECG, fall and location of the patient.
- Data storage in cloud through Thing Speak for further analysis.
- Remote access of data by doctor and care taker, and also alerts if emergency.
- Easy stay for elderly without a care taker.
- To avoid additional diagnosis time.

VII. LITERATURE SURVEY

Health monitoring is a major concern these days, due to demands of the expanding market. In this expanding market there is a constant need for updating the system regularly

According to Mr.Nayeemuddin et.al [1] focuses on administration of patient's health which gives continuous data on the web information about physiological conditions of a patient. Their system works on specific target issue of the patient by measuring and screening basic physiological data of a patient remembering the ultimate objective to exactly depict the status of her/his prosperity and health on web. The information is used by social protection master who can give crucial therapeutic admonishing. This system consists of sensors, data verifying unit, microcontroller, and programming through the help of LabVIEW. The data checked are patient's temperature, heart beat rate, circulatory strain and ECG. Proposed structure can check the patient's physiological data with a high precision, this can be considered to be a major advantage. The further improvements could be the wearability of the device.

KyeonghyeGuk et.al [2] in their paper conveys their concern on elderly population growth globally and measures to be taken to avoid or monitor various chronic and acute diseases as an increasingly important social issue. They address the issues through biomedical monitoring systems, which enable continuous measurement of critical biomarkers for medical diagnostics and physiological health monitoring. There is a need for point-of-care (POC) diagnosis and real-time monitoring of long-term health conditions because of dramatic change in medical industries. Evolution of wearables is observed in this manner accessories, integrated clothing, body attachments and body inserts. They discuss the evolution of wearables are tremendous development in electronics, biocompatible materials and nanomaterials. They have also discussed the technical barriers and challenges in the development of wearable devices. The future prospects on

wearable biosensors for medicine, prevention and real-time health monitoring. The future improvements could be while providing point of care diagnosis the data needs to be able to stored and analyzed for use.

In the paper named "A Smart Patient Health Monitoring System Using IOT" by C.Senthamilarasi et.al [3] shed light on the fact that people are facing Issues with respect to unexpected deaths due to various illness which happens because of lack of medical attention to the patients at right time. The aim of the system they have designed is reliable patient monitoring system using IOT, so that the healthcare professionals like doctors can monitor their patients who are hospitalized or at home from anywhere and at any time using an IOT based integrated healthcare system which monitors patients movements and also checks that they are cared properly. Their system was designed and developed to provide real time information about physiological conditions of a patient via internet or online. System consists of sensors which collects the data, microcontroller which is programmed with a software to obtain desired results. Patient's heart rate, temperature, EEG, etc. It is displayed and stored inthe device. The doctor also gets the information related to the patient through mobile containing the specified application. This patient monitoring system ensures the patient's health status and can be very helpful in saving life on time. The further improvements can be to know the location of the patient when they are in emergency condition so that required actions could be taken.

S.S. Abarna et.al [4] mentions in their paper about, they have discussed about the major roles in healthcare which is not only for a device with various sensors but also the device should be able to communicate with the care taker or the doctor. The recorded data should be sent to care taker or the doctor and the device should also be able to display the data to the wearer. They have also mentions the importance of monitoring various medical parameters. The catalyst for healthcare and healthcare applications is IOT according to author. ATMEGA328 microcontroller is used with the interfaced usage of various sensors such as temperature sensor, blood pressure sensor, MEMS sensor and pulse sensor. Controller collects data from sensors and sends it to network through Wi-Fi to provide a real time healthcare. Doctor can access the data anytime. It's made secure by password protected Wi-Fi module ESP8266 which will be encrypted by standard AES128. Quick provisional medication can be easily suggested by the doctor through this system. The further improvements can be to reduce the bulkiness of the system and to detect emergency situations that the patient is going to face or being fac.

According to the author Mehmet Taştan [5] the important part of our life is internet. For enabling and controlling the devices in everyday life internet is important. The rapidly growing sector is Health applications powered by IOT with cloud or thing speak. The model especially monitors the patient's health parameters like Heart Rate, Body Temperature, blood pressure etc. Values can be recorded continuously depending upon the patients' health condition. The model consists of wearable sensors to constantly monitor the health of the ill person. The model is external interface with the wireless connection i.e. any smart device. Here also the further improvements required will be the storage of the data for further analysis.

According to P.Cedillo et.al [6] If we consider the main input of this paper is basically it presents a novel system, the WISE i.e. Wearable IOT-cloud-based health monitoring system, for real-time health monitoring of a patient. BASN (body area sensor network) is adopted by WISE framework usually in the support of real-time health monitoring system. Many different wearable sensors are enabled, that is heartbeat, body temperature, and the blood pressure sensors. And mainly the present wearable health monitoring systems need smart devices like mobile phone. This will be used to handle the data. If we consider WISE, data gathered from the BASN are directly spread to the cloud. The further improvements could be the data security.

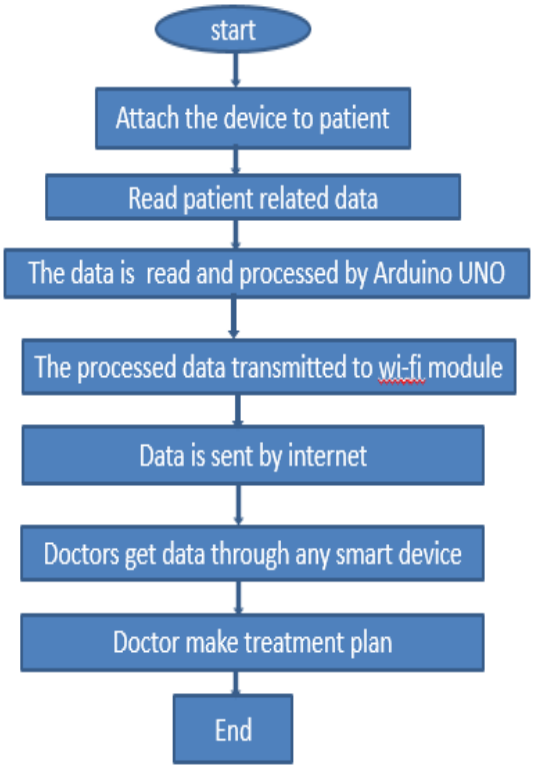
Shreya Raj Kumar et.al [7] In this paper conveys a health monitoring system which monitors vital parameters of the patient such as temperature and heart rate using sensors as well as a fit bit which are related to a raspberry pi board. The task involves alerting the doctor through SMS if any vital parameter of the patient diverges from the normal rate. Separately from helping the doctor observer the patient's basic health parameters which ensures that the patient takes the prescribed medication at the right intervals. The raspberry pi acts as a personal server which records the details of the patient's medication and reminders to take medicines through SMS according to prescription. The further improvements could be to locate the patent when emergency occurs and to detect an emergency situation.

Md.Humayun et.al [8] this paper suggests an IOT based intelligent and automated system that senses patients' health condition which stores the information about the patients' health and informs the doctor or concern person about it regarding serious condition and all. This model is user friendly that is easy to implement. In this system the doctors can get the information about the patient immediately and take the measure. If there is any bad condition about the patient the buzzer will start beeping and it gives alert messages regarding the patients' health condition. Of usable lives will increase due to remote monitoring. By using this system percentage of mortality rate is reduced. The further improvements can be to monitor the location of the patient and to make it wearable.

VIII. METHODOLOGY

In this project we have blood pressure, temperature, ECG, fall detection and Arduino UNO interface with different sensors is used to detect the different parameters of the patient. So as to detect the current location of the patient GPS module is used.[16]

Bluetooth module is used for communication between Arduino device and Real-Time health monitoring system. In this system we have method of tracking the heart rate is more efficient than the traditional method.



The sensors we have used in this model fed their parameters to Arduino UNO. Received inputs were continuously read through the Arduino UNO and those inputs will be send to the cloud.After receiving the emergency information about the patient the doctors will take immediate actions and can be able to save the life of a particular patient.

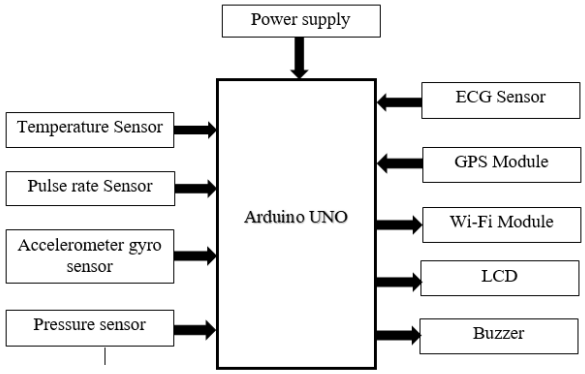


Fig4: Block diagram of our model

As we know Arduino Uno is a microcontroller based which can be observed in the above figure 4. Our model is basically a removable device. Which has dual-inline-package which is known as DIP. And mainly it has ATmega328 AVR (Advance virtual RISC) microcontroller. It has 20 digital input/output pins in that 6 can be used as PWM outputs and 6 can be used as analog inputs.

Here DS18B20 sensor is one consisting of single wire protocol which can be used as digital temperature sensor and it can be able to measure temperature in the range of -67F to +257F or -55C to +125C with the accuracy of +/-5%. To measure the electrical activity inside the heart the component used is AD8232. The output is an analog reading and electrical activity can be an ECG. In stand-alone GPS receivers the NEO-6 module series is one. The cost effective and flexible receivers offer numerous connectivity options in a miniature with the package of 16 x 12.2 x 2.4 mm. The LCD display i.e. 16X2 screen with i2c (inter-integrated circuit) interface is able to display two lines. If we consider the main advantage of an I2C LCD Display is that the wiring is very simple. The directional movement or acceleration of object is measured using accelerometer gyro sensor. The angular velocity can also be done in this sensor. In emergency situation Buzzer is used for alerting.

IX. ADVANTAGES

- Compact & portable wearable device
- The system can detect fall of the patient
- Low power consumption
- Easy Interface with the user
- High performance & Quick response rate
- Can reduce mortality rate

X. APPLICATIONS

- Medical use
- Fitness and wellness

XI. CONCLUSION

- Portable and easy to use.
- Reduces the consumption of unnecessary medicines.
- Data sent in server can access the patient from any place.
- The emergency alert messages minimizes the death rate.

XII. RESULT

In this project we are using both software and hardware components. In advance body checkup i.e. blood pressure, heart beat, temperature of the body, diabetes etc. can be detected easily. The main thing in this model is that it can give information about the current location and alert messages. It is easy to use because its portable. It can be used by anyone and anywhere. The system can store the information about the patient permanently.

XII. FUTUER SCOPE

In future, this system can be enhanced in following ways:

- The improvement in accuracy of measuring the parameters.
- To provide communication without internet or to obtain a better way for connectivity.

ACKNOWLEDGEMENT

We gratefully acknowledge the help & cooperation offered by Dr. Parameshachari B D, Professor and Head, Department of Telecommunication Engineering, our guide and project coordinator Mrs. Latha M, Asst. Professor, Department of Telecommunication Engineering, and management of GSSSIETW, Mysuru for providing help and support to carry out the project.

REFERENCES

[1] Nayeemuddin, S.Zahoor-ul-Huq, K.V.Rameswara Reddy, P.Penchala Prasad a survey on "IoT based Real Time Health Care Monitoring System using LabVIEW", June 2019.
[2] Kyeonghye Guk, Gaon Han, Jaewoo Lim, Keunwon Jeong, Taejoon Kang, Eun-Kyung Lim and Juyeon Jung a survey on "Evolution of Wearable Devices with Real-Time Disease Monitoring for Personalized Healthcare", May 2019.
[3] C.Senthamilarasi, J.Jansi Rani, B.Vidhya, H.Aritha a survey on "A Smart Patient Health Monitoring System Using IoT", 2018.
[4] S.S. Abarna, D. Renija, S. Saffana Parveen, S. Saradha Preetha "Smart wearable health monitoring system for diagnosing diseases in patients", Feb 2018.
[5] Mehmet Taştan "IoT Based Wearable Smart Health Monitoring System", 2018.
[6] P. Cedillo, C. Sanchez, K. Compos, A. Bermeo on "Wearable IoT enabled real-time health monitoring system",2018.
[7] Shreya Rajkumar, Malavika Srikanth on "Health Monitoring System using Raspberry PI",2017.
[8] Md. Humayun Kabir, Md. Mahiuddin, Md.Jaibul Hoque on "Internet of things based patient health monitoring system using wearable biomedical device",2018.
[9] M.Vengateshwaran1, S.Subhalakshmi, "A modern approach for smart healthcare monitoring system remotely using IoT and Raspberry Pi",2018.
[10] Sumalatha V, Dr. R. C. Biradar "IoT based Health Monitoring System",2017.
[11] D.Shiva Rama Krishnan, Subhash Chand Gupta, Tanupriya Choudhury "An IoT based Patient Health Monitoring System", June 2018.
[12] Se Jin Park, Murali Subramaniyam, Seoung Eun Kim, Seunghee Hong, Joo Hyeong Lee, Chan Min Jo and Youngseob Seo " Development of the Elderly Healthcare Monitoring System with IoT", 2017.
[13] Jetendra Joshi, Divya Kurian, Satyam Bhasin Prakhar Awasthi, Sibeli Mukherjee, Sanya Mittal, and Shribbha Sharma "Health Monitoring Using Wearable Sensor and Cloud Computing", 2016.
[14] Rebaz Mohammed Dler Omer, Nawzad Kameran Al-Salihi, "HealthMate: Smart Wearable System for Health Monitoring (SWSHM)", 2017.
[15] Yogita G. Bobade1, Prof. Rupal .M. Walli " IoT & Cloud Server Based Wearable Health Monitoring System",2017.
[16] Parameshachari B D et. Al Optimized Neighbor Discovery in Internet of Things (IoT), 2017 International Conference on Electrical, Electronics, Communication, Computer and Optimization Techniques (ICEECCOT), PP 594-598, 978-1-5386-2361-9/17/$31.00 ©2017 IEEE.