

## IOT Based Smart Health – Care Center

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### ABSTRACT

We know that , timely access to health care in both urban and rural settings is a worldwide challenge and also if one desires to monitor multiple body parameters, they are forced to use multiple data acquisition devices. Most of the time, diagnosis is half the cure, the rest is medicine. This project deals with giving access to remote and connected quality diagnosis for long-term, remote and emergency patients using an IoT system and necessary operational processes that will help the patients and doctors in providing early attention to the upcoming health hazards.

**Keywords**-Remote,Bedridden,Healthcare,Sensors,ESP32,Interface, Doctor’s monitoring,Cloud.

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### I. INTRODUCTION

As the potential of Internet access and technological advancements in healthcare electronics is increasing rapidly, consumer access to health information and portals for health monitoring and the health care-related services are made easily available and accessible. These facts are changing the healthcare system and the people concerned (patients, hospitals and clinics, public health organisations, and health insurance agencies).The Internet allows patients and family members to acquire, on their own,large amounts of health-related information.

This project describes the monitoring of human health using Internet Of Things (IOT) from a remote location automatically and dispensing prescription/medicines given by the Doctor concerned thorough Cloud . This can be achieved by fetching the measured data from the Sensors connected to a System-on-Chip device which has various inbuilt peripherals and Wifi that will allow users to have a reliable and interactive health monitoring system.

This provides a channel of interface of various health sensors and data acquisition devices such that the individual himself or an authorized health provider can monitor and analyze the physical activity of an individual on a regular basis. This platform also finds great use in cases where patients are under transportation, homecare or frequent health checkup.

The main aim of this project is to provide patients like the elderly and the chronically ill, who have high levels of medical needs or need regular

checkups, reducing the number of clinic visits and hospitalizations, and the duration of hospital stay, which benefits patients for whom traveling long distances may be a concern.

### II. RELATED WORK

A. *Paper [1] -IoT Based Smart Health Monitoring Alert Device.*

**Author ->** <sup>1</sup>K Hari Kishore,<sup>2</sup>K V Surendra Nath,<sup>3</sup>K V N Hari Krishna,<sup>4</sup>D Pavan Kumar,<sup>5</sup>V Manikantha,<sup>6</sup>Fazal Nor Basha.

This paper describes a system that is designed to gather the data by using heart beat pulse and the output of heart pulse are sent to the cloud.When the abnormality of heart pulse in the patient is observed then the system gets activated. The activation alerts the system by sending the messages through GSM module for the emergency contacts.The prototypes provide the real time solution of observing the patient heart pulse rate with reliability.

A. *Paper [2] - An IoT based Patient Health Monitoring System.*

**Author->** <sup>1</sup>D.Shiva Rama Krishnan,<sup>2</sup>Subhash Chand Gupta, <sup>3</sup>Tanupriya Choudhury.

This Paper deals with the patient well-being nursing scheme by the requirements suggested by the Patient. Because of wireless Sensor network and data transfer over the internet,the Health-monitoring system takes less than a minute to compute the result of ECG,

Blood Pressure and Temperature Monitoring . From all this health related data and information of the Patients will be easily accessed on doctor's phone. Instantaneous medication associated to Patient's health-care conditions is also provided.

A. *Paper [3] -Smart Health Monitoring and Controlling Using Raspberry Pi3.*

**Author->** <sup>1</sup>Khan Adil Parvez, <sup>2</sup>Prof. J.D. Bhosale.

In this paper an efficient Health monitoring and controlling is developed to monitor the up to date status of the patients health irrespective of the presence of the doctor. The system collects information like temperature, blood pressure and pulse rate of the patient and updates on GUI. If any parameter of patient health goes beyond the limit notification is generated and doctor is able to provide medication by clicking on the respective button of tablet. Medication box provides tablet whenever Doctor click button on Internet Page.

A. *Paper [4] – A SURVEY ON HEALTH CARE MONITORING SYSTEM USING IoT.*

**Author->** <sup>1</sup>Sasipriya Saminathan, <sup>2</sup>K Geetha

This paper focuses on a real-time health-care monitoring system using IoT and cloud computing service which are more beneficial for elders and chronic diseases' patients. This paper proposes an intelligent real-time patient monitoring system that monitors the subject's vital parameters such as temperature, pressure, fall detection, breath activity and ECG through a prototype model as well as detects any abnormality accurately. Appropriate medications are suggested based on the diagnosis of the provided set of symptoms.

A. *Paper [5] – A Survey on Patient's Health monitoring system in real time using Raspberry Pi*

**Author->** <sup>1</sup>Yogesh Panduranga, <sup>2</sup>Shubhangi Borkar

Basically this paper deals about the patient's located at the village , remote area and bed reddens . In this paper they have used different sensors to measure the body parameters of the patients and they have installed a new parameter that is a camera. This camera helps the doctor to interact with the patients and give them proper treatment. They have also used Raspberry Pi which is a credit-card sized computer to transfer the data faster through GSM or Zigbee Module. To transfer the data TCP/IP protocol is been used. Hence the system provides faster transfer of data to the doctor which helps in quick treatment of the patient.

A. *Paper [6] – Smart Health Monitoring System.*

**Author->** <sup>1</sup>Tarannum Khan, <sup>2</sup>Manju K Chattopadhyay

In this project they basically have built an android application, arduino UNO controller, LCD display and the data is stored in cloud/server. The same data is converted into JSON link so that the data can be viewed on the android application. They also used some body sensors to check the body temperature and heart rate. As they are using android application they 1st senses the body temperature and store there readings in a SD card in CSV format, later they write a PHP code for the CSV format to convert it to a JSON link. the android application helps in having a track on the measured body parameter and it will also give a remainder to take medicines.

A. *Paper [7] – Healthcare Monitoring System in Internet of Things (IoT) by using RFID.*

**Author->** Sarfraz Fayaz Khan.

This paper basically deals with RFID (Radio-frequency Identification) tags for wireless communication. Here the sensores are directly embedded in the patient's body and based on the sensor signals the patient's body parameters are measured. In this paper they have measured the heart rate, blood pressure, temperature and the blood glucose level in the body. The sensors continuously monitors the patient and in case of any emergency the doctor is immediately reported through an android application. The signal from the sensors are analog which should be converted into digital therefore a ADC is used. They have used ATmega32 as there microcontroller.

A. *Paper [8] – Health monitoring system using IoT*

**Author->** Himadri Nath Saha<sup>1</sup> ,Supratim Auddy<sup>2</sup>

Basically, this paper provides practical and economical means for ordinary patient's to easily manage their own medications and taking right dosage of medicines at prescribed time in a fully automated way. This paper provides the usage of iot healthcare system. Patients Vital parameters transmitted to smart phones and laptops then to doctors through cloud,nature of disease is predicted by determining the pattern of the parameters observed.

A. *Paper [9] –Internet of thing based healthcare monitoring system*

**Author->** Shreya Saha Chaudhury<sup>1</sup> ,Debasmita Paul<sup>2</sup>

In this paper they have focused on the implementation and development of an effective healthcare monitoring system based on IoT. The

system monitor the vital parameters and transmits the data through the wireless communication, doctors are notified immediately through an audio signaling device, design an efficient remote monitoring system, security plays an important role of this system. Hence system provides quality healthcare to all.

A. *Paper [10] – Health Monitoring System Based on IOT Using Raspberry Pi.*

**Author->** Amandeep Kaur<sup>1</sup>, Ashish Jasuja<sup>2</sup>

This paper discusses about body temperature, Oxygen saturation percentage and heart rate using Raspberry Pi. In this system their objective is to trace patient's health with the help of sensors and internet. No project has been done before, In a single system they have integrated Blood pressure, Temperature and pulse rate sensors. With the absence of doctor also they can grasp the patient's condition.

A. *Paper [11] – Real Time Patient Monitoring System Based on IOT.*

**Author->** Mohammad Salah Uddin<sup>1</sup>, Jannat Binta Alam<sup>2</sup>, Suraiya Banu<sup>3</sup>

Many patients died in ICU due to carelessness of incharge person. In this condition this system is more beneficial and which improves the service quality. This system can able to detect the critical condition of a patient by processing sensors and provides push notification to the incharge person or doctor or nurses. Doctors and nurses get benefited from this system without visiting the person.

A. *Paper [12] – Smart Health Care System Using Internet of Things.*

**Author->** K. Natarajan<sup>1</sup>, B. Prasath<sup>2</sup>, P. Kokila<sup>3</sup>

In this paper, use of Iot technology in healthcare not only brings benefits for doctors to access wide range of data source but also in accessing heterogeneous Iot data in mobile environment of real-time Iot application system. Raspberry pi collects and stores the medical data through the sensors attached, the collected data is transferred to the user through apps, the information provided through apps improves the health of the patients.

A. *Paper [13] – Remote Health Monitoring Using Internet of Things.*

**Author->** Prabhakaran R<sup>1</sup>, Jili K P<sup>2</sup>

This project describes the monitoring human health using Iot from a remote location. A doctor can monitor individual health condition from anywhere in the world. This is achieved by fetching the measured data from the sensor node located on individual premises and send the same to the central node

through wireless communication modules. This data upload to the web world which could be accessed by doctors using web interface. Sensor Node includes two sensors for measuring patient body temperature and heart beat. These measured parameters can be transmitted to the central node using zigbee module. The microcontroller PIC16F877A act as the brain of this node. Central Node includes Zigbee modules which collect the measured parameters from Sensor Node. This data should be processed and uploaded to the internet world using a web interface. A GSM module is connected to send the critical condition to the doctor. ARM LPC2368 is the brain of this node. But the real implementation of remote health monitoring is more complex work and will require a IoT of effects. So this project implemented a prototype of remote health monitoring. If a client wants to monitor the status of parameters, IP address of web server is to be given on the remote host. As a result, the HTML web page stored on the web server is opened and it shows the real time parameters.

A. *Paper [14] – Wireless Patient Health Monitoring System.*

**Author->** Deepesh K Rathore<sup>1</sup>, Ankita Upmanyu<sup>2</sup>, Deepanshu lulla<sup>3</sup>

This paper presents a wireless system which enables real-time health monitoring of multiple patients. The proposed system monitors the heart rate and other such data of patient's body. Heart rate is measured through a photoplethysmograph. A transmitting module is attached which continuously transmits the encoded serial data using Zigbee module. A receiver unit is placed in the doctor's cabin, which receives and decodes the data and continuously display it on user interface visible on PC/Laptop. Thus doctor can observe and monitor many patients at the same time. The alarm system connected to the system gives an audio-visual warning signal that patient of a particular room needs immediate attention. If in case doctor is not on his chamber, GSM modem connected to the system also sends a message to all the doctors of that unit giving the room number of the patient who needs immediate attention.

A. *Paper [15] – Architecture and Design Flow of Tele-Health Monitoring System Using STM32 Platform.*

**Author->** Sufian Kaki Aslam and Jafar Saniie

This paper discusses the architecture and design flow of a tele health monitoring platform using effective usage of the computation power and various inbuilt peripherals of STM32 microcontroller that will allow users to have a reliable and interactive health monitoring system. The proposed platform provides a channel to interface various health sensors and data acquisition devices such that the individual himself or an authorised health provider can monitor and

analyze the physical activity of an individual on the regular basis. This paper also facilitates patients and doctors to maintain and integrate the health records, and availability of various peripherals makes this platform easy to interact.

## II. RESEARCH GAPS

1. Limitation of this paper [1] is that it is meant for elderly individuals only, who are unable to take care of themselves whereas our proposed system can be used for each and every individual.
2. Limitation of this paper [2] is that the operation of the device is complex and is difficult to understand for any common person whereas our proposed system is operated similar to an ATM machine and hence very simple and understandable.
3. Limitation of this paper [3] is that only a single pill is dispensed at a time whereas in our proposed system a sheet of tablets can be dispensed at a time.
4. Limitation of this paper [4] is that it requires high speed internet access for its entire operation in order to send the alert messages to the respective authorities.
5. The disadvantage of paper [5] is that it consists of a camera. So basically to have an interactive session with the doctor the camera should be of a very good lens which is costly therefore it can increase the overall cost of the system. Whereas in the proposed system we use ESP32 which has inbuilt WiFi and Bluetooth modules which helps in reducing the overall cost of the system.
6. The limitations of this paper [6] is that they use an Android application which is a good idea for the urban areas but not the rural areas because most of the people in rural area does not have a smart phone with them. In the proposed system we have included a parameter to check the blood glucose level in our body using glucometer.
7. Limitations of this paper [7] is that the patient should be under the range of RFID to check and transfer the data to the concerned person and while checking these parameters they have to enter the computer details of the medical assistant which can be a lengthy propose. Whereas in the proposed system to a particular rural area a separate doctor will be assigned. So the patient should only enter their personal details to check their body parameters.
8. Limitation of paper[8] it is meant only for elderly individuals who are unable to take care of themselves whereas in our proposed system can use each and every individual.
9. Limitation of paper[9] it does not explain about the level of security of the information stored in the cloud, whereas in our proposed system we can store the entire data in the cloud with the

accurate date rate.

10. Limitation of paper[10] They have used raspberry pi which is costlier. Prescription will be sent to their phone whereas in rural areas everyone can't afford phones. In our proposed system we are using ESP32 it's cheaper than raspberry pi and it is latest microcontroller too.
11. Limitation of paper[11] is that it requires high speed Internet access for its entire operation in order to send the alert messages to the respective authorities and entire operation and maintenance is complex whereas in our proposed system complexity is less.
12. Limitation of this paper [12] only medical data is collected and tells the information to the patient. It doesn't give the health care based information, and they use RFID technology that can cover only short area.
13. Limitation of paper [13] is that the real implementation of remote health monitoring is more complex work though wireless sensor technology finds a lot of applications in remote health wireless technology.
14. Limitation of this paper [14] they have proposed a system which can be very helpful for Bio-medical applications, where doctors can monitor the subject condition from the place where they are sitting and hence proper and timely care to the patient can be given.
15. Limitation of paper[15] is that they have not designed anything regarding medicine dispenser or a prescription dispenser whereas in our project we have both of the above listed.

## III. CONCLUSION

Remote patient monitoring is a technology to enable monitoring of patients outside of conventional clinical settings, such as in the home or in a remote area, which may increase access to care and decrease healthcare delivery costs. By using the Internet of Things (IoT) which is a system of interrelated computing devices, mechanical and digital machines, objects, etc and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction we can develop an effective and efficient centre for smart healthcare monitoring of patients who are bedridden or live in remote areas.

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