



## Real time Remote Patient Monitoring using IOT

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**Abstract—** *The idea of digital world where different types of sensors and local processing connected to share information is used in many industries nowadays. There are various products which are developed based on these ideas. Healthcare industry is one where lot of improvements is taking place. Medicines play important role for prevention and cure for most of the diseases. Many Harmful and risky diseases can be cured through proper medication. The proposed system consists of an IoT enabled medication reminder system and it gives timely alerts for the patients about their medication time. It alerts the patient to take medicines at proper time by providing audio-visual alert. The system helps to monitor whether patient has taken the medicine and it's healthcare data.*

**Keywords:** *Internet of Things; Medical reminder system; Arduino Module;*

### I. INTRODUCTION

Internet and embedded systems are one of the major growing fields that can change the way people live their daily lives. The objective of embedded devices is that they build a unique computing system. An embedded system generally runs as a single operation. However, these

embedded devices that are connected to the internet can communicate through other network devices. Moreover, these devices provide flexibility and facilities to improve the domestic environment.

People have the control to operate and monitor the devices remotely through the IoT (Internet of Things) features. In hospitals there are provisions for continuous monitoring of patients. Their ECGs, heartbeat, are continuously monitored. There is no provision to check the parameters when they return to home. Also there is no need for a number of medical personnel for accompanying with patients to be physically present to check the health condition of the coma affected person, The goal is to remotely monitor health condition of any individual. In the recent days, the health care system is advancing to provide better facilities to the mankind there is a major role played by technology in this marathon of advancement lifestyle always makes things easier for oneself. Integration of technology with the patient health monitoring, facilitates the health care providers and the patients as well. There are multiple health parameters which requires continuous monitoring in the hospital setup or at home for a chronically ill patient. These parameters should include body temperature, pulse rate, heart rate and respiratory rate etc. In a hospital setup, we see a monitor is fixed bed-side for each and every patient for continuous vital parameters monitoring. This setup requires manual checking of any change in the parameters which a normal person could not identify but always a health care provider is in need. This is basic drawback of regular health monitoring until recent past the integration of IOT (internet of things) to the health monitoring system would be a boon to both health care providers of the patients. It is a centralized system providing wireless transmission of patient data with the help of sensors, software and exchanging data over the internet.

## II. LITERATURE REVIEW

Mohammed S. Jasses et al [1], utilized Pi to monitor body temperature in cloud based system. In order to cover a wider range of patients wireless sensor networks (WSN) is used, Pi acquires temperatures and transmit it wirelessly. Then the acquired data is included and displayed on the website which is used to store the information.

Karandeep Malhi et al [2] introduce a system capable of monitoring body temperature with the help of microcontroller and ZigBee module. Different sensors are used to collect information which are interfaced with the microcontroller. ZigBee module is also connected to the microcontroller through which the data is transmitted to the designated receiver.

Hasmah Mansor et al [3] use LM-35 to monitor body temperature. The temperature sensor is connected to Arduino board. Arduino board is connected to the Website in SQL database format. Sensors reading are sent to the website. Anyone can monitor temperature from anywhere.

M. Wcislik et al [4] used ARM cortex M4F micro controller in order to track and monitor patient's body temperature, pulse rate, ECG wave and even the position of the patient's body. Android app was also created to monitor the patient's condition. Bluetooth connection is used for connecting microcontroller and Android phone.

Nithin P. Jain et al [5] introduced a system that monitors temperature, blood pressure and heart rate of the patient. ATmega 32 is used for for this purpose and all the sensors were interfaced with it. GSM module is used to generate SMS alerts in case of any abnormality. After collecting data, if the value is low SMS is send to the doctor.

In [6] Jose Reena K, R. Parameswari "A Smart Health Care Monitor System in IoT Based Human Activities of Daily Living: A Review", 2019.

The proposed system uses diverse techniques that

monitor the well-being of the elderly and disabled humans. There are lot of statistics mining techniques that are being used for the data which is received from such things as smart meter, equipment utilization, and video surveillance. Random forest and VSM are suggested to be the excellent models that may be utilized in M-Health care prediction to get the accurate human activity recognition.

In [7] A Divya Priya, S Sundar "Health Monitoring System Using IoT", 2019. This paper presents a proposed venture which makes use of temperature and pulse rate sensor to degree the body temperature and pulse rate that is an critical parameter for seriously ill sufferers. So that health practitioner will monitor and may immediately take action straight away. If the circumstance turns into essential, the physician is alerted so that he can treat patient immediately

[8]. It provides a very user friendly touchscreen application to perform all events. The personal activities and independence can be well managed and improved by AT(Assistive Technology) to do better. But very few people know and access assistive Technology, because it is costly and there is lack of training, availability, and awareness. As per a survey, 2 billion people will require at least 1 assistive product by 2050. In the same time, the older people may need 2 or more assistive products. Jaun et al. have proposed "The Intelligent Pill Box"

[9]. They explain how to design and implement Assistive Technology devices using open source technologies. This provides a new way to manage medication dosages. They used Arduino Mega 2560 as main controller. This assistive technology provides more option for taking the medicine. It is based on an automatic alarm system, that uses interacted interface and notice system via GSM network. A pillbox based on an MCS-51

The Internet of Things (IoT) was first introduced by Kevin Ashton in 1999 when he stated that computers needed to connect to objects in the real world to further improve the quality of human life . As IoT is still a new and expanding field, it has huge potential to bring major changes to the way we live. With IoT, it will connect both machine and humans, leading to a more connected life.

In the case of this study, the elderly are required to consume multiple medications due to their physical and in some rare cases, mental functions decline. With that in mind, the concept of an IoT-Based Smart Medicine Reminder Device will be a wonderful opportunity for the market.

The block diagram of proposed system is given above:

There are three sensor fixed in the system for monitoring patient's health. They are Sweating Probe, Temperature sensor and Heartbeat sensor for measuring , temperature of the patient and heartbeat respectively. Temperature sensor LM35 and sweating probe will provide the output in the Analog form which is given to the microcontroller and values are displayed on website designed for monitoring purpose. Heartbeat sensor will generate the output in digital form and it will also be given to the microcontroller and value of heartbeat will be displayed on website designed. If the value crosses the reference values given in the program then alert will be given to the caretaker of the patient in the form of SMS by the GSM that Patient's health is not good.

### III. SYSTEM ARCHITECTURE

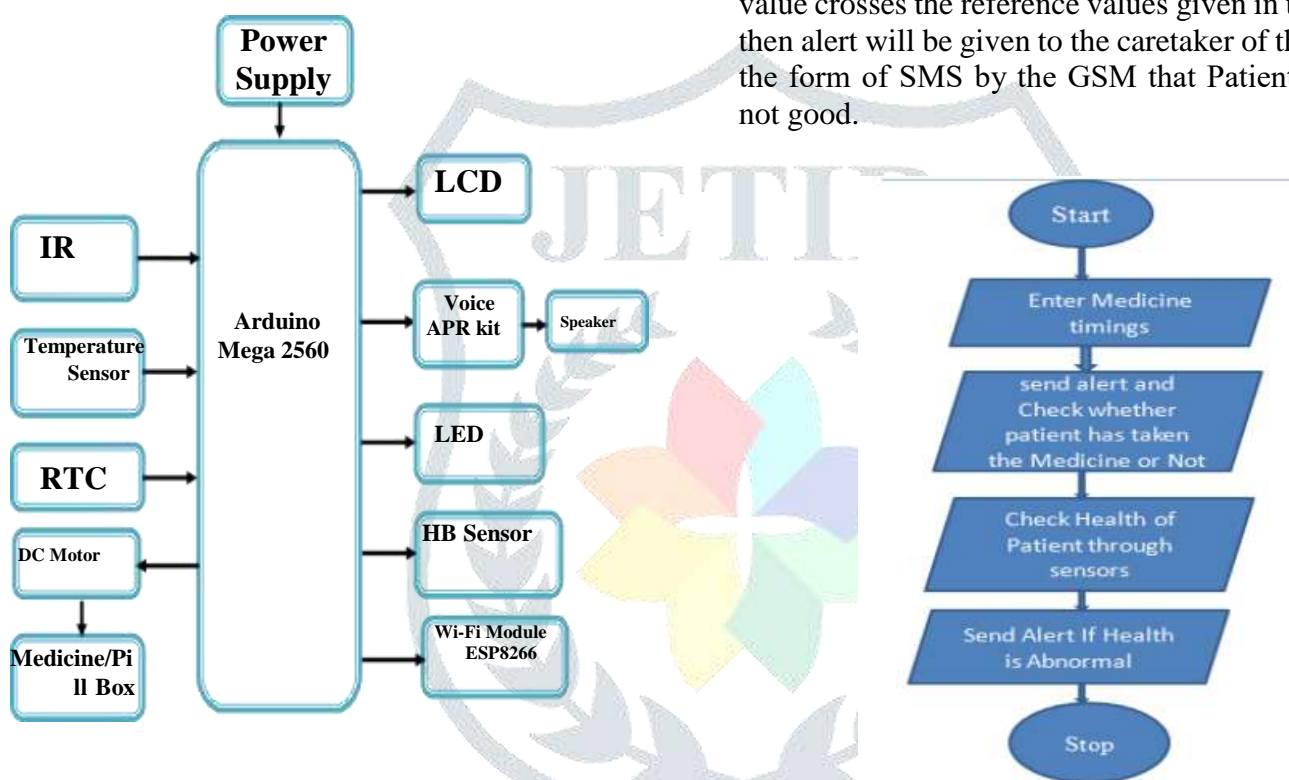


Fig 1.System Architecture

Flowchart for the System

The Medicine reminder system consist of pill box provided with a set of compartments. It is designed in such a way that normal people can use it easily for their medication. The control system of pill box consists of LEDs for giving the visual alerts to the patient for medicine. There is buzzer in the system which alerts the patient in audio form. It will buzz for particular time, within that time only the person have to press the key by taking the medicine, otherwise the alert will be given in the form of SMS to the caretaker of the patient by GSM that patient has not taken the medicine at the time prescribed by the doctor. The buzzer and LEDs are giving the alerts at the proper time set by the caretaker.

RTC DS307 is interfaced with arduino by I2C interface which keeps the track of timings for medicine. If the power fails due to some reason then it has capability of automatic switching. LCD in the system will display medicine name to the patient. Confirmation key interfaced to the microcontroller will provide digital output and can be pressed by the patient when the medicine is taken.

## IV. IMPLEMENTATION

### Interfacing of LCD with Microcontroller :

RS: RS is the register select pin. We need to set it to 1, if we are sending some data to be displayed on LCD. And we will set it to 0 if we are sending some command instruction like clear the screen (hex code 01).

RW: This is Read/write pin, we will set it to 0, if we are going to write some data on LCD. And set it to 1, if we are reading from LCD module. Generally, this is set to 0, because we do not have need to read data from LCD. Only one instruction “Get LCD status”, need to be read some times.

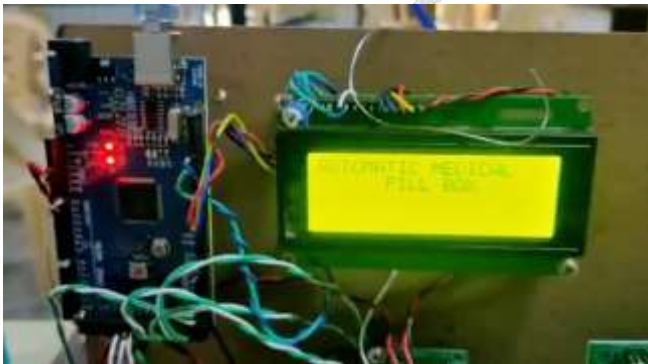


Figure 2 Implemented picture of LCD with Microcontroller

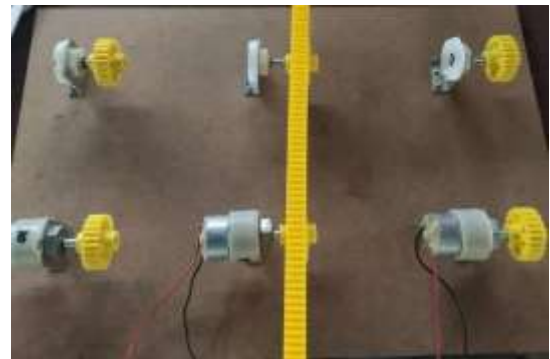


Figure 3 Implemented Pictures of DC Motor with Microcontroller

### Implementation of DC Motor with Microcontroller:

The first image depicts the arrangement of DC Motor for the smooth movement of the medicine boxes on the strip.

The second image shows, how the medicine boxes have been placed inside the Smart Medication Box.

The third image shows how the box will open at the appropriate time to provide the medicine kept inside.

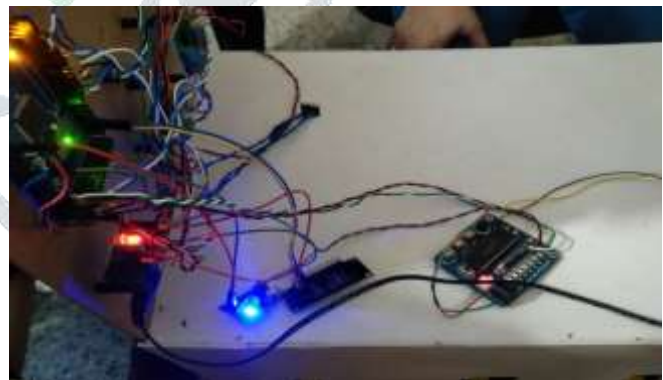




Figure 4: Setup of Proposed System

## V. CONCLUSION

This system prevents wrong dosage of the patient and also safe to the patient. It will reduce the effort of patient as well as the caretaker of the patient in remembering medicine and patient will get alert of medication at appropriate time.

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