

INTERNET OF THINGS (IOT) BASED SMART HEALTHCARE MEDICAL BOX FOR ELDERLY PEOPLE

Padmini V¹, Pallavi KS², Prema M³, Priya Hegde⁴, Dr.Sreenivasa Setty⁵

¹ BE Student, Department of Information Science and Engineering, Dayananda Sagar Academy of Technology and Management, Karnataka, India

² BE Student, Department of Information Science and Engineering, Dayananda Sagar Academy of Technology and Management, Karnataka, India

³ BE Student, Department of Information Science and Engineering, Dayananda Sagar Academy of Technology and Management, Karnataka, India

⁴ BE Student, Department of Information Science and Engineering, Dayananda Sagar Academy of Technology and Management, Karnataka, India

⁵ Associate Professor, Department of Information Science and Engineering, Dayananda Sagar Academy of Technology and Management, Karnataka, India

ABSTRACT

Here, the healthcare field is uninspiring in taking over IoT (Internet of Things) than the other fields, IoT (Internet of Things) in the medical field aims to keep the people safe, secure, and healthy in which the main intention of our project is to step-down the cost of healthcare in the upcoming future. The IoT-based smart healthcare system has been advised here, which will hold an intelligence medicine box affiliated with sensors and servers for usual health supervising. The smart medicine box which is having wireless internet connectivity will help the patients to get easy communication between the doctor and the patient without influencing physically and also to get a regular health checkup. This advised medicine box assists the user/patient to use up the exact medicine with an email at the exact time which will facilitate the patients to take the medicines. A laptop is used to store the elaborate data about the doctor and the patient along with the prescription and designation date. Here, the laptop is used as a server. Both the doctors and the patients will have their unique IDs' and passwords for approaching the server. For the doctor's comfort, the temperature and the medication information of the patients are stored on the server. The patient's prescription can be modified by the doctors if essential or in a serious condition, which will also be advised through email. Furthermore, the doctors can take quick action in the case of an exigence.

Keyword : Internet-of-Things (IOT), smart medicine box, server, remote observation, Health- IoT.

I. INTRODUCTION

The life expectancy of the human has been increased because of the advances in the medicines. For most instances, patients will forget to take the medicines at the prescribed time. As a result, the expected remedy becomes very difficult for elderly people to follow a medicine that has insufficient knowledge. The people who need to take lots of medicines daily will find it difficult to remember the time and medicine details. For those people, medicine intake at the right time is the very most important thing. Home healthcare plays a major role in reducing the consumption of treatment. People can get the services easily through advanced health care technologies. Through IoT, we can provide better treatment because medical fields are more

functional than other fields. So IOT is hope in the healthcare field. In real-time monitoring, patients can improve their quality of health.

II. Disease management, fitness, and health education, we can get information through mobile apps. Nowadays the IOT based medical components/equipment and medicine monitoring systems have become very comfortable. The history of the patient's disease can be stored in the server which has become very easy which in turn helps in storing/recording the history of the patient's family. It can also help in providing improved and better treatment to the patient by the doctor. To help the people there are a lot of many techniques, projects, and researches in the present world. There are many projects which are designed based on Microcontroller, IOT, RFID and some other techniques which will create awareness of the medicines to the patients in the proper time by providing some information based on their medicines.

II. EXISTING SYSTEM

In the proposed system the patient's health is monitored through smartphones which are based on IOT. Here, we are using the Radio-Frequency Identification technique which is one of the core technologies of IOT. In this project, we are using different types of sensors and Buzzer. Each sensor will do their specific jobs in different ways which will make it easy to identify and do better performance. And Buzzer help to indicate a person who is nearby the patient, if the patient is in a serious stage/condition. To establish wireless communication here we are using RFID tags which provides the monitoring of health parameters of the patient health, data security, Efficiency, and assurance for privacy and send all the health details to the specific doctor to whom the patient has consulted. The main job of an RFID reader is to send and receive signals like it will send query signal to the tag and then it will receive back the exact/mirrored signal from the tag. If the condition of the patient is bad, GSM module is used to deal the patients. GSM module use a SIM card so Wellbeing data is sent to the website. Radio waves are used by the Wi-Fi modules which do not expect any wire. The temperature sensor will check the calculated temperature estimation and by default, the designed system will act as a standard Digital Clock. The Medicine reminder is set for 3 times a day that is for the morning, afternoon, and night. According to this, the particular alarm is regulated by an identical operation. When the time and the Alarm register values become equal, Buzzer will alert the patient by giving a beep sound and the LED will be blinking on the particular compartment. Then the box will open and a message on the LCD screen will be displayed as "Time to take pill 1". The buzzer and LED will remain ON until the patient has taken the pill. As soon as the patient takes the pill the door will close after the delay of a few seconds.

III. METHODOLOGY

HARDWARE USED:

Servo sg90 micro, ESP32-WROOM-32, Buzzers, Switch DIP X01, Hall Effect sensor, IC 7805, Capacitors, OLED, DS18B20(sensor), DC jack, Header pins, RMC pins, Hard Foam Sheet, Solder lead.

SOFTWARE USED:

Arduino IDE, Visual Studio Code, Firebase.

PROCEDURE:

The main goal of this project is to assist the elderly people and patients who rely upon medication, by reminding them at specific intervals of medication time, through mail services and alerting systems. This eliminates the cause of danger that happens when a patient fails to take the medicine or when the wrong medicine is taken at the wrong time. To achieve this we have compiled components that are efficient and comprehensible.

We have used the ESP32 microcontroller as a base, that acts as the brain of the whole system, integrating different components to it, forms the whole unit of the Smart medical box.

1. ESP32 is a dual-core that combines wifi and Bluetooth wireless capabilities connected to 0.9 inch OLED to display the medication details and its intake time. OLED module will have 4 pins: Vin, GND, SCL, and SDA. This module is integrated on top of the medicine box which is graphical, guides the user, and is viewable from a certain distance.
2. Hall effect sensors are connected to ESP32 to detect proximity and calculate positioning. This feature helps in detecting the closing and opening of the drawer. Here, six hall effect sensors are used, two for each drawer.
3. Servo motors are integrated into each drawer and connected to ESP32 to handle the lock and unlock mechanism of each drawer. It has three pins: power, GND, and signal. Servos are controlled by Pulse Width Modulation(PWM) signals, which when sent to the motor, the shaft's position can be determined and directed.
4. DS18B20, a one-wire digital temperature sensor is connected to ESP32 for measuring the patient's body temperature. It requires one data line and GND to communicate with ESP32. The temperature value sensed is directly stored in the firebase.
5. The buzzer is connected to alert the patient at the time of medication. it stops making a beep sound when a user opens the right drawer, which the system assumes that the patient has taken the medicine. The exterior surface of this box is made of a hard foam sheet that is rigid, insulated, and easy to handle.

At the time of medication, the patient will get a mail to his/her email address, with an alert message and the tablet intake timings with the date. IFTTT is a free web-based service which we have used for sending the mails to patient's addresses, IFTTT incorporates very well with iot components, Sensor can be used as a trigger, when the sensed value is in a certain range, then the message is sent.

The patient will get the reminder message at the time of medication, the details such as medicine taken or skipped are stored in the firebase as 1 and 0 respectively, along with the time when the patient took medicine and body temperature. These three elements are stored in the firebase account and are fetched by the doctor and patient websites, which are displayed graphically helping the doctor to know the medication status of his/her patient. Any changes in the patient's body temperature, or the fall of a graph showing the history of tablets being skipped, the doctor can change the prescription if necessary or make different observations.

IV. RESULTS AND SNAPSHOTS:

1. The outlook of Smart Medical Box:



It is having three compartments to store the medicines, and compartments are driven by the servo motors. This box is compact, accessible, handy, and easy to use.

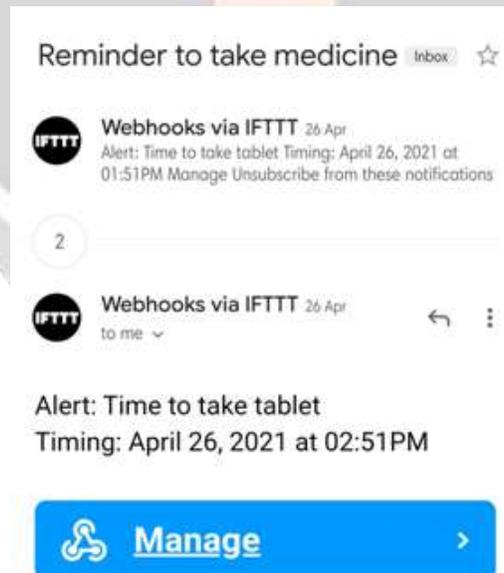
2. Display of OLED:



This module display is mono colored and is triggered by the ESP32, display will perpetually be on. It is helpful in displaying the medicine's names and their timings that patient can view and consider it accordingly.

3. Reminder to take the medicine:

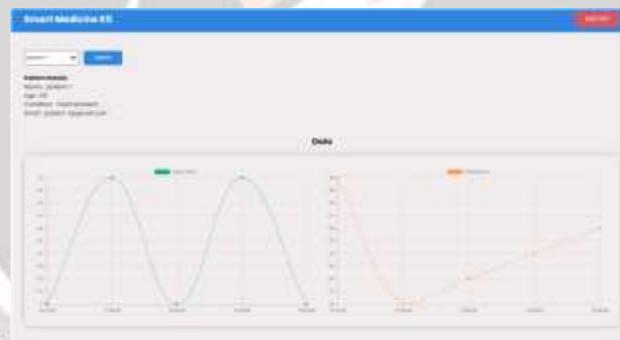
This message alerts the user to take the medicine right at the mentioned medication time. IFTTT senses the changes in the value that is sensed by the component then reflects that as a reminder message in the patient's mail id.



4. Websites for doctor and patient:



This is the website for a patient. To access the website, the patient(user) has to log in with credentials. On entering the website, Doctor's details like name, specialty, and phone number will be displayed. Also, two graphical presentations, showing the status of medication and body temperature will be displayed, in order to help the patient monitor his/her health condition.



This is the website for a doctor. After logging into the website, the doctor can select his/her patient's name out of the list of patients he/she is treating. Selected patient details like name, age, condition, and mail id will be displayed, along with the two graphical presentations showing the status of the patient's medication and body temperature. Any variations found in the observation, the doctor can directly interact with the patient and change prescription if needed.

V. CONCLUSION

This type of application which uses the Internet of Things with the essence of new technologies creates a whole new tendency in society and helps people in getting their regular health monitoring. The problem of lacking conversation between doctor and patient can be eradicated by using this smart medical box. Elder people need not take the assistance of someone for the medicine intake, instead can be guided easily by the ingenious features of the medicine box. The extra facilities provided by this box such as servers to store the medication details, temperature sensor, and basic health monitoring make this project a whole compact package that can be used by any patient irrespective of his/her age, wealth, and wellness. The box can be used effortlessly by common people with simple operating because of its flawless features.

I. REFERENCES

- II. [1] N. Patel, "Internet of things in healthcare: applications, benefits, and challenges." Internet: <https://www.peerbits.com/blog/internet-of-things-healthcare-applications-benefits-and-challenges.html>
- III. [2] H. Bauer, M. Patel, J. Vieira, "The Internet of Things: sizing up the opportunity." Internet: <https://www.mckinsey.com/industries/semiconductors/our-insights/the-internet-of-things-sizing-up-the-opportunity>, December 2014.
- IV. [3] D. V. Dimitrov. (2016, Jul). "Medical Internet of Things and Big Data in Healthcare." Health Inform Res. [Online]. 22(3), pp. 156-16 Available: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4981575/>
- V. [Jul. 31, 2016]. hj
- VI. [4] L. Zhang. "Applications of the Internet of Things in the Medical Industry." Internet: <https://dzone.com/articles/applications-of-the-internet-of-things-in-the-media-1>, Jun. 24, 2018.
- VII. [5] G. Alex, B. Varghese, J. G Jose, A. M. Abraham. (2016), "A Modern Health Care System Using IoT and Android". International Journal on Computer Science and Engineering (IJCSE), vol.8. Issue.4, [Online]. Available URL: <http://www.enggjournals.com/ijcse/doc/IJCSE16-08-04-031.pdf>. [Accessed: 11-Nov-2018]
- VIII. [6] Z. Penge, "Technologies and architectures of the (IoT) for health and well-being," Ph.D. dissertation, Dept. Electron. Syst., School Inf. Commun. Technol., Royal Inst. Technology (KTH), Stockholm, Sweden, 2013.
- IX. [7] L. Li and W. Benton, "Hospital technology and nurse staffing management decisions," J. Oper. Manag., vol. 24, no. 5, pp. 676–691, 2006.
- X. [8] L. Li and C. Markovski, "An analysis of hospital capacity management patterns using Miles," Int. J. Manag. Enterp. Dev., vol. 3, no. 4, pp. 312–338, 2006.
- XI. [9] E. Becker, V. Metsis, R. Arora, J. Vinjumur, Y. Xu, F. Makedon, "SmartDrawer: RFID-Based Smart Medicine Drawer for Assistive Environments," Proceedings of the 2nd International Conference on Pervasive Technologies Related to Assistive Environments, PETRA, 2009, DOI: 10.1145/1579114.1579163
- XII. [10] S. Bhati, H. Soni, V. Zala, P. Vyas, Y. Sharma. (2017, April) "Smart Medicine Reminder Box," International Journal of Science Technology & Engineering. [Online]. 3 (10). Available: <http://www.ijste.org/articles/IJSTEV3I10093.pdf>
- XIII. [11] N. U. Nyapathi, B. Pendlimarri, Karishma, Kavya," (2016, May) "Smart Medicine Box using ARM 7 Microcontroller", International Research Journal of Engineering and Technology (IRJET). [Online]. 3 (5). Available: <https://www.irjet.net/archives/V3/i5/IRJET-V3I5569.pdf>.
- XIV. [12] V. Shah, J. Shah, N. Singhal, H. Shah & P. Upadhyay. (2016) "Smart Medicine Box," 2 (5). Available: <https://www.irjet.net/archives/V3/i5/IRJET-V3I5569.pdf>