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Design and Implementation of IOT Based Programmable Assistive Intelligent Adaptive Pillbox Using RFID and Health Monitoring

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Abstract: Taking medicine in any form on time as prescribed by the medical professionals is to ensure the drugs essential to cure the disease from the body with an estimated time. In case if the process of time is not followed , the recovery time may increase and until then the disease exist in the body, which may create resistance to the drug .In any treatment simply makes on and off process ,means while taking the medicine the symptoms reduces and ensures recovery from the illness. If the course of time the next time medicine is not taken, the symptoms again is develops and continues the illness, which may create uncertainty in treatment. To solve the above issue and makes the patients comfortable all the time an effective solution presented in this research. Medicines play a crucial role in maintaining health, preventing illness, managing, chronic conditions and curing the disease. IoT based assistive, adaptive pillbox is a machine which delivers the medicine in emergency cases and ensure availability of basic drugs 24x7 and hence the name "All Time Medicine". ATM will be very useful in saving life in case of an accident on highways, remote areas, rural areas and places where medical stores are not within the reach in case of emergency. At least first aid can be made easily accessible with the help of this system.
The proposed research consists of Advanced ESP32 micro controller which controls the other sub systems such as RFID Reader, Tablet dispenser, inventory control (IoT). RFID tag identifies the specific user. IoT sends the message to the inventory control and we can figure when the medicines need to be refill. Tablet Dispenser is the storage part of the machine, which stores the medicine. Here we are using 3 tablets Dispenser, each carrying with an individual type of tablet. These medicines can alter or changed according to the user or situation where the device may be used.

Keywords: IoT – Internet Of Things , ATM – All Time Medicine , RFID – Radio Frequency Identification Tag, ESP32 - Espressif Systems 32.

I. INTRODUCTION

While medication has the ability to ease pain and relax a rushing mind, it comes with a great deal of responsibility. Taking the right medication at the right time is hard on its own, and adding in factors like multiple pill bottles, missed doses, and sorting a pill box according to the right schedule can all contribute to medication errors that could, at the least, result in some unpleasant effects, and at the worst, hospitalization. While pill organizers and storage have remained a great approach towards handling medication adherence, they still fall short with a major issue: they require *someone* to manage the medication, whether it's yourself, a caregiver or a family member.

Medication adherence is extremely important when it comes to medication management. The dangers of non-adherence are no joke. Studies have found that up to 60% of older adults have had a medication mistake, whether that's taking the wrong medication, missing a dose, or taking the pill at the wrong time. As a result, nearly 140,000 people pass away each year. Seniors who improperly take their medications are 76% more likely to experience a large decline in their health.

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Common adverse effects include headaches, dizziness, nervousness, and insomnia, though some people have more extreme reactions. Taking smart drugs can cause psychotic episodes, extreme paranoia, and suicidal thoughts. Taking high doses of smart drugs also puts you at risk of an overdose, the above discussions could be the disadvantages of automated medicine dispenser.

Figure 1 shows an Automatic medicine reminder and medicine dispensing means, significantly reduced chance of missing a dose. The device will take care including sorting and dispensing of medicine. When it's time to take your medication, the dispenser will inform you with a pleasant chime and a colorful display. Simply push the center button, and your pills will begin dispensing.

Figure 1Automatic medicine dispensing system in the market

Figure 2 Automatic medicine organizer with dispensing system (Smart) in the market

Figure 2 The SMART Dispenser is an automatic medication dispenser that organizes, schedules and delivers patient medication with the touch of a button. The SMART dispenser is available to patients of a Wellness Pharmacy.

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II. INTRODUCTION TO THE PROPOSED SYSTEM

Internet of Things (IOT) is a network where many of the objects that surround us will be networked in one form or another. By using this technology the health statistics of medication are observed. In this process of encryption the schedule data or doctor's prescription are send to pill box through mobile app. They are placed for indication and buzzer for alarm alerts and reset button is used to count for medicine in cloud platform. The existing techniques to the market for the reminder include a pill box. But this does not help in checking the medicine. This proposed idea is valuable solution to the medical non-compliance problem. The innovation scheme to help patient keep trail of their medicine consumption through a series LED alarm indicator signal and audio alarm indicator signals.

Medication compliance (adherence) describes the degree to which a patient correctly follows medical advice. The definition by Cramer et al.: Adherence "refers to the act of conforming to the recommendations made by the provider with respect to timing, dosage, and frequency of medication taking.".According to the study of Times of India, over 20\% of the India's population suffers from at least one of the non-communicable diseases (NCDs), which are estimated to cost India $6.2 trillion during the period 2012-2030 (Times of India). As per the data from World Health Organization (WHO), non-communicable diseases or chronic diseases, such as cancer, heart ailments, respiratory diseases and diabetes, 38 million people dies in every year. The aging of the population increases the prevalence of chronic diseases. According to Frost & Sullivan, in Europe a total of 50% of the hospital bed occupied by the patients suffering from chronic illnesses such as diabetes and COPD (chronic obstructive pulmonary disease). This places a huge strain on the health care In order to track the physical status of the elderly and in the meanwhile keep them health the following two daily tasks are essential real-time monitoring and analyzing vital signs to early detect or predict life-threatening adverse events checking whether they are following their prescribed treatment, including taking their prescribed medicine on time.

However, with rapidly aging populations, these daily tasks have brought great pressure and challenges to global health care systems. One review estimates that about 25% of the adult population does not adhere to their prescribed medication, which may lead to poor health outcomes and increased mortality. Poor medication adherence is a major problem for both individuals and health care providers. Technology improvements in health care facilities and services are highly desirable to meet the requirements of this giant group.

A complete solution for in-home health care is still missing. A desirable system should be capable of taking care of the patients from all aspects, covering personalized medication, vital signs monitoring, on-site diagnosis and interaction with remote physicians. In addition, the existing systems rarely integrate new materials or apply new manufacturing approaches, which are always the key elements for bringing new devices or solutions into healthcare fields.

Recent technological advances in sensors, low-power integrated circuits, and wireless communications have enabled the design of low-cost, miniature, lightweight, and intelligent physiological sensor nodes. These nodes, capable of sensing, processing, and communicating one or more vital signs, can be seamlessly integrated into wireless personal or body networks for health monitoring. These network promise to revolutionize health care by allowing inexpensive, non-invasive, continuous, ambulatory health monitoring with almost real time updates of medical records via the Internet

To resolve these issues, developing an intelligent medicine box equipped with medication reminders and IoT module focusing on problems faced by the elderly required to take medication. The system consists of three parts, health monitoring part, medicine box and IoT module. The sensors attached with the person and monitor the real time data and sends to the medicine box. By comparing these values with normal values, if any abnormalities are present in the values a text

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message will be sent to the doctor/relatives through the embedded GSM module. The medicine box compares the time with real time clock and opens the each medicine slot according to the prescribed medicine time. The doctor can reset the medicine time through IoT module.

When a patient consults a doctor or hospital, his/her details including medicine prescription should be uploaded to the web server and each patient gets a unique user ID. The information about the patient is given to cloud. So at any time the doctor or relative can visit the web page and can follow the current status of the patient. According to the value of sensors the doctor can provide on-line solution

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Internet of Things (IOT) is a network where many of the objects that surrounds us will be networked in one form or another .By using this technology the health statistics of medication are observed. In this process of encryption the schedule data or doctor's prescription are send to pill box through mobile app. The LEDs are placed for indication and buzzer for alarm alerts and reset button is used to count for medicine in cloud platform. The existing techniques to the market for the reminder include a pill box. But this does not help in checking the medicine. This proposed idea is valuable solution to the medical non-compliance problem.The innovation scheme to help patient keep trail of their medicine consumption through a series LED alarm indicator signal and audio alarm indicator

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according to the prescribed medicine time. The doctor can reset the medicine time through IoT module.Figure 3 and Figure 4 indicates the commercially available and the model proposed in this research.

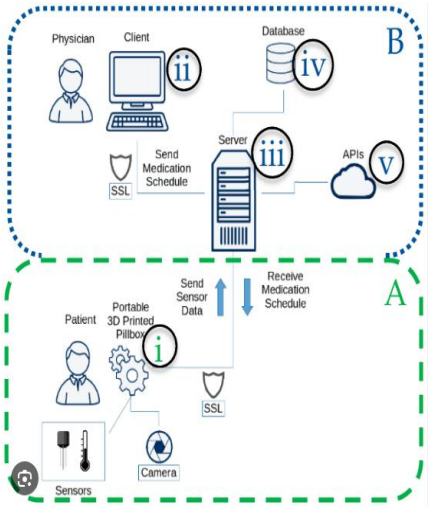

Figure 3. Commercial pill box system

III. EXPERIMENTAL RESULTS

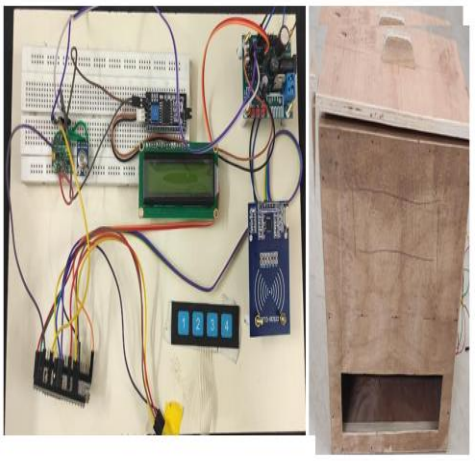

Figure 4. Proposed Inexpensive System pill box system

IV. IOT MODULE FRONT END

IOT – INTERNET OF THINGS

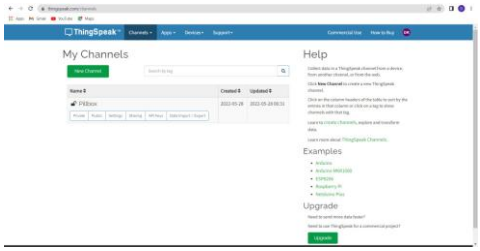

Figure 5. Proposed Inexpensive System pill box system IoT interface

Figure 5 Shown above is the frontend display of the IoT screen for the user to access the process and Figure 6,7,8 are the various kinds of results obtained from the proposed research in a real-time.

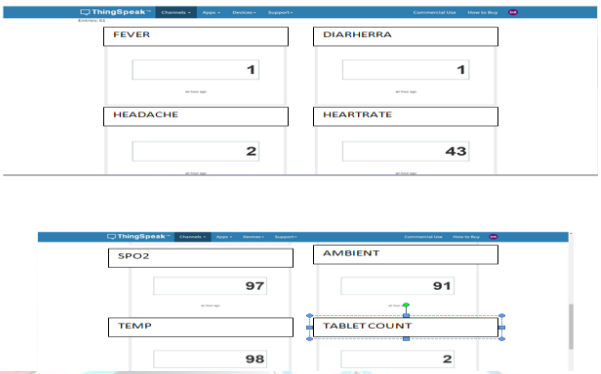

Figure 6. Proposed Inexpensive System pill box system Data Acquiring

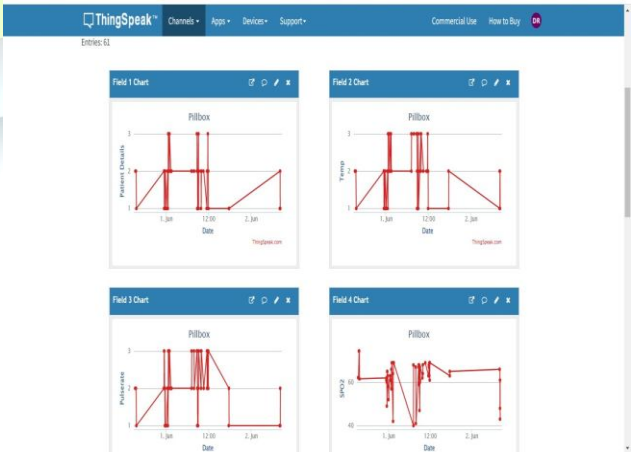

Figure 7. Proposed Inexpensive System pill box system Data Acquiring Display system

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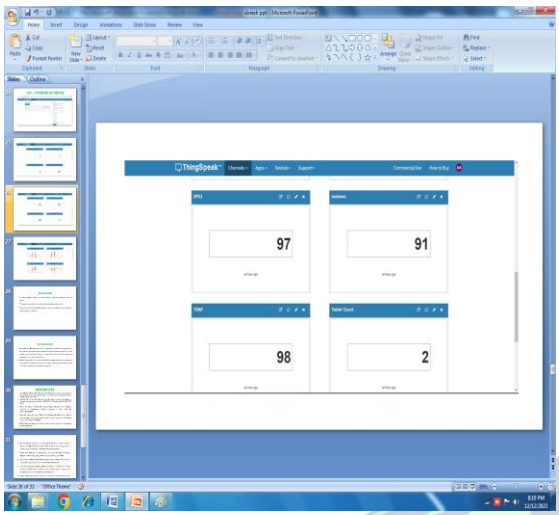

Figure 8. Proposed Inexpensive System pill box system Data Acquiring Part 2

V. CONCLUSION

To improve medication safety and to avoid confusion in taking tablet among the elderly and patient's. This paper proposed a smart pillbox which sense problem aswell as generate tablet. The proposed pill box can reduce family member's responsibility towards ensuring the correct and timely consumption of medicines .By implementing IOT based adaptive pillbox , simple medical problems will be diagnosed with an easy reach. This system can be further improved to diagnose the health problem also. A central platform can be provided for patience to interact with specialists of fields through video conferencing i.e., to provide a health service. One more development is that to provide automated e-emergency diagnisation and pharmacy for patients which can be meant that at the health care, when a card being inserted the whole body of the user will be scanned and the problem will be diagnosed.

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