



IOT ENABLED SMART MEDICINE BOX

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Abstract: Advances in IoT healthcare are seen as a huge benefit for the elderly. Elderly people and people suffering from chronic diseases need to take tablets regularly and on time. Caregivers in their busy daily schedule may forget the instructions and time regarding the pills that are prescribed to the patient. Also, caregivers who are dealing with an increased number of patients can feel hectic sorting the medication list for the appropriate patients at the right time. A lot of research has been done in this area before and various pill boxes have already been designed. The smart medicine box designed in this work has specialized functions and provides timely residuals for the patient or caregiver in an Android application such as handheld devices such as a smartphone. Overdose and incorrect intake of medicines can lead to serious health problems in the elderly, to prevent the misuse of medicines, a simple verification process is carried out either by the caregiver or the patient himself. The proposed drug is much safer because it clearly informs about the time, dosage, stock of the drug and sorts the different pills into the correct sub-boxes during further filling by the administrator.

Keywords- ESP32, Stepper Motor, Voice Module (aPR33A series C2.x), 12C LCD Display, Power Supply, Medicine Box, DS1307 Real Time Clock.

I. INTRODUCTION

Medications have become an essential part of daily life for many people, and with advancements in medical technology, serious illnesses are now treatable. However, for elderly patients with memory disorders or those who have difficulty remembering their medication schedule, a support system is necessary, which can be provided by a doctor, nurse, caregiver, or device. The costs associated with such support systems can be a burden for patients, especially those from poor rural areas. Therefore, a more affordable solution is needed, such as a technology-based system, which can provide reminders and help ensure correct medication intake.

The development of technology has revolutionized various fields, including home automation, transportation, and agriculture, and it can also play a significant role in healthcare. The Internet of Things (IoT) can connect medical devices to create real-time sensor data analysis, which can be used for appropriate corrective actions. This technology can provide solutions to major healthcare challenges and make medical applications and healthcare systems more accessible to the general public, including online medical consultations. The assistance should be provided to illiterate patients who cannot identify medication names. Smart systems can replace old methods and improve performance, with the added benefit of reduced human power and time consumption.

It is common for elderly and disabled individuals to require medication at scheduled times to maintain their health. Failing to take the correct medication at the appropriate time can lead to severe health issues, which can result in unnecessary hospitalizations due to negligence. Additionally, taking the wrong medication can have serious side effects, and approximately 30% of visually impaired individuals have experienced adverse effects from overdosing on medication. As a result, it's crucial to take the right medication at the right time. However, it can be challenging for blind and elderly individuals to keep track of the number of pills and the time they need to take them, which is also the case for nurses who care for elderly patients. Blind individuals face the additional challenge of being unable to read the name of the medicine before taking them.

Patient autonomy and easy monitoring have become important areas of focus for researchers. To improve these aspects, a safety medicine box has been proposed. The box is equipped with a phone application that can notify the patient of the appropriate time to take their medication, as well as whether they have taken the correct dose. The application also displays the number of pills remaining in the box, and the box itself can automatically lock to prevent children from accessing the medication.

II. RESEARCH METHODOLOGY

The article describes the development of a smart medicine box (SMB) that features individual compartments that can be customized to suit various user requirements. The SMB helps patients or their caregivers by indicating the necessary dosage and exact time for taking pills each day, as well as alerting them when certain pills need to be refilled. The accompanying application is designed to accommodate various categories of users, including patients with chronic conditions, elderly individuals with scheduled medication, and nurses who provide care for these patients. The smart pharmacy system's workflow diagram is also provided below.

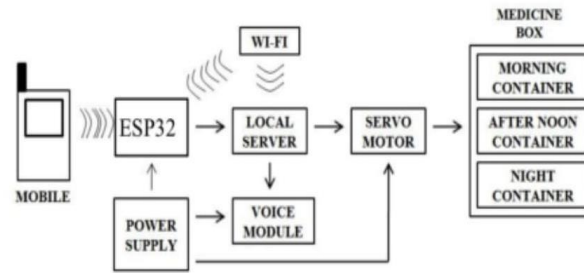


Figure 1: General operating block diagram of smart medicine box.

2.1 Flow diagram

- We have considered three-time line for dispensing medicine morning, afternoon and night.
- There are two modes of operation Manual and Automatic.
- In manual mode user has to press the button from the android app to control the smart medicine box based on his required time suggested by the doctor.
- In Automatic Mode, there is no need of user to press button to open or close the smart medicine box.
- Based on the timer set by user smart medicine box opens during morning, afternoon and during night based on the time set by the user.

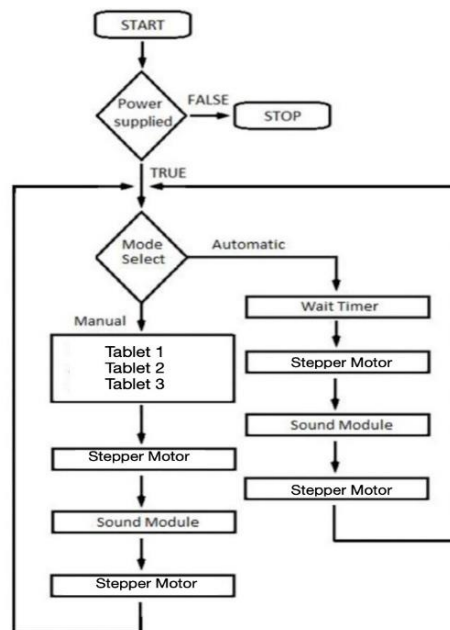


Figure 2: Flow diagram of SMB

III. LITERATURE REVIEW

Mrs. Husna Tajwar [1] In this paper, they have proposed a Android Application Plan for Programmed Tablet Allocator, that the alert module informs the individual by the caution to admissions the pills or capsules on time. The drugs are filled once in a month. It reminds the persistent and demonstrates what session it is i.e. morning, evening, and night.

P.A.Harsha Vardhini et al., [2] The researchers developed an IoT-based framework called the Keen Medication Assistive Framework for Memory Disability Quiet. This framework is designed to gather patient information and provide medication reminders tailored to the individual's needs when the hub MCU and framework are turned on. The purpose of this framework is to provide pharmaceutical support to individuals who may not have access to specialized medical professionals or caretakers. Additionally, this framework has been expanded to allow for online ordering of medication when the pill box is empty.

Gleiston Guerrero et al., [3] The authors suggested an IoT-based Keen Medication Container for managing and monitoring medication intake. The container is capable of sending notifications to caregivers, informing them of the medication dispensed to

their dependents via their smartphones, even if they are not physically present. Moreover, patients who are able to use the mobile app can receive reminders every time they need to take their medication.

K. Bhavya et al.,[4] The authors suggested an IoT-enabled Smart Medication Box for managing medication administration. The device uses a Wi-Fi connection to link the hardware and software modules. The status of each medication (i.e. taken or missed) is displayed on the device's screen, while also being simultaneously transmitted to a cloud server to provide physicians with up-to-date information on their patients' daily medication adherence.

S. A. Ishak et al.,[5] The authors designed a Smart Medication Box as part of their plan to improve medication adherence using an intelligent monitoring system. This system, described in the paper, is specifically designed to remind elderly patients to take their medication on time and notify their family members to monitor their medication intake. The effectiveness of this system is demonstrated by its ability to track and store medication intake data in a web-based database.

R. Al-Shammary et al., [6] The authors of this paper introduced a proposal for a Smart Medication Box (SMB), which will be discussed in this section. The design and intended features of the SMB will be thoroughly examined, along with the specific hardware components used in its implementation. Furthermore, this section will provide a detailed explanation of how the SMB is intended to be used, utilizing three main components: the microcontroller, the PC control unit, and the mobile application.

Ryan Dias et al.,[7] The authors presented a proposal for a Smart Medication Box, based on a Health-IoT platform, to address the issues of forgetfulness and memory loss in elderly individuals, as well as to make the device accessible for disabled individuals. The Intelligent Medication Box is designed to be used by patients without any medical knowledge or expertise.

Sonam V. Maju et al., [8] The authors presented a proposal for a Secure Health IoT system for continuous monitoring, which includes a Smart Medication Box. To facilitate the process of refilling and dispensing medication, a steady pill box management software and database are utilized. The medication box is refilled and programmed for a one-month duration, with the data being fed into the system. The medication box can generate up to three alerts for the patient, although this limit can be increased as the system is dynamic.

Sulthan Ahmad et al., [9] The authors developed an IoT-based system for updating and monitoring medication intake. This system, described in the paper, includes an alert mechanism to remind patients when it is time to take their medication. Additionally, sensors are used to detect the status of the medication taken. Users can access information such as the medication name, the number of doses, the frequency of intake, and the reminder schedule within the application.

Hiba Zeidan et al [10] The authors put forth a proposal for a Smart Medication Box Framework, which includes the microcontroller's software and a mobile application. This system monitors patients' medication intake to ensure accuracy. The framework can also detect if incorrect doses of pills were taken, if doses were missed, and if there is a shortage of pills in the medication box. All of the devices utilized in this system are cost-effective and highly efficient.

Ben-bin Chen et al. [11] The authors proposed a research and implementation of a Smart Medication Box. The paper presents a design for the smart medication box which utilizes 3D printing technology. The medication box and the mobile application can transmit information synchronously through a wired connection.

IV. CONCLUSION

This article discusses the development of a smart medicine box (SMB) which is designed to have compartments that can be customized to meet the needs of different users. The SMB helps both the caregiver and patient by specifying the dosage and timing of medication, and reminding users to refill certain pills as needed. The associated application is designed to support a variety of users, including those with chronic illnesses, the elderly who require scheduled medications, and healthcare professionals who assist these patients.

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