Smart Medicine Box

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Abstract: Many people, especially seniors, struggle remembering to take their medications correctly. Busy lifestyles and reliance on technology can make it easy to forget. For elderly patients, memory loss can lead to missed or mistaken medication doses. Even healthcare professionals, such as nurses, may overlook administering medications to patients due to heavy workloads.

To address this issue, an innovative smart medicine box has been developed. This user-friendly device allows patients to set medication reminders, which trigger an alarm and flashing LED lights to guide them in taking the right medicine at the right time. It aims to make medication management simpler, safer, and more effective.

1. INTRODUCTION:

Remembering to take medications can be challenging at any age, but it becomes particularly problematic for an elderly individual. An older adult typically takes an average of 8 to 10 medications daily, as revealed by a survey conducted by the American Society of Health-System Pharmacists. However, age-related forgetfulness, memory-related diseases such as Alzheimer's, depression, and even side effects of certain medications like beta-blockers or antidepressants exacerbate the difficulty of adhering to prescribed regimens. These challenges often lead to skipped doses, incorrect intake, or overdoses, resulting in worsened health, hospitalization, or even death.

For an elderly person, physical limitations and complex medication schedules make managing medicines even harder. They may struggle to remember the drug's name, purpose, dosage, and timing, especially on hectic days. Research indicates that poor medication adherence contributes significantly to delayed recovery, disease progression, and fatalities. Furthermore, it imposes a massive financial burden, with an estimated $100 billion annual cost in the U.S. alone due to non-adherence.

Globally, the issue remains widespread. Statistics Canada, for instance, highlighted that an older Canadian, particularly one over 80, was prescribed an average of 74 medications annually in 2005. Over 75% of individuals aged 65 and older take three or more medications daily, further complicating adherence due to the sheer complexity of the regimens. Simplifying these regimens, increasing awareness about side effects, and leveraging technological and caregiver support are essential to address this growing public health challenge. By doing so, healthcare providers and caregivers can improve the health outcomes and quality of life for the elderly individual.

1.1 Objectives:

1. Ensure Timely Medication: Notify patients about their medication schedule through alarms and LED indicators, ensuring they take the correct medicine at the right time.

2. Promote Medication Adherence: To reduce missed or incorrect doses by providing clear guidance and reminders to patients.

3. Support Caregivers and Doctors: To assist caregivers and healthcare providers by sending reminders for pill refills, prescription renewals, and updates on patient medication adherence.

4. Enhance User Experience: To design a user-friendly device and app interface that can be easily operated by patients, caregivers, and doctors.

5. Improve Health Outcomes: To reduce complications arising from improper medication management and support faster recovery and better health for patients.

6. Leverage Technology: To utilize IoT and app integration for real-time monitoring, notifications, and seamless communication between patients, caregivers, and doctors.

2. LITERATURE SURVEY:

[1] Introducing a revolutionary solution to combat the widespread problem of medication forgetfulness, especially prevalent among individuals of all ages, notably impacting seniors grappling with memory challenges. This innovative smart medicine box is meticulously designed to offer a compact and cost-effective remedy. Boasting a user-friendly knob interface, users or caregivers can effortlessly set medication timings, thereby activating a timely alarm alert. Whether the medication is essential for medical conditions, cosmetic enhancements, or supplemental needs, this ingenious device serves as an unwavering ally, fostering consistent adherence to prescribed regimens amidst the chaos of modern-day lifestyles. It is made by using the Raspberry Pi 3 along with the servo motors, 16*2 LCD, and LEDs related to the output indication of the process.

[2] Patients who suffer from loss of memory, such as elderly patients, may neglect to take the right medications at the right time. This all is effect proliferation of technologies and lifestyle. Due to a busy schedule or sometimes laziness, people have irregular intake of medicines. Elder patients forget

to take the right medicines at the right time. Also, some people tend to miss some of their medicines due to very long prescriptions, which are hard to remember and confuse patients. Resulting in ineffective treatment. We saw these problems in hospitals where nurses forget to give medicine to patients because they have so many people in the ward; thus, based on these problems, we made an IoT-based smart medicine box by which they can set the timing of medicine. And whenever the patient forgets to take their medicine, it reminds them by alarming a buzzer. Also, the LED lights present above various compartments will guide the patients to take the right medicine at scheduled times.

[3] The project aims to make a smart medicine box for those who regularly take medicines. This work mainly helps old people who are suffering from permanent diseases like diabetes, high blood pressure, cancer, heart problems, and several other health issues. This cabinet will be connected to mobile applications that can cause multiple warnings when the medication is about to finish. It also provides a warning signal to the caretaker when the patient fails to take the medication in time. Additionally, information will be sent to the medical store through the GPS when the medication is to be ordered.

3. DESIGN AND METHODOLOGY:

3.1 Specification of Smart Medicine Box:

The proposed smart pillbox system will feature three compartments for storing pills, each equipped with a dedicated LED indicator. A buzzer will serve as an auditory alert, ensuring that medication is taken on time. To confirm medication intake, the user will be required to press a designated button, which will then send a confirmation notification to the caretaker. Additionally, the system will notify the caretaker when the pill count in any compartment falls below a predefined threshold, such as five pills.

An Android application will serve as the primary interface for scheduling and notifications. Users will be able to set specific schedules for each of the three medicines.
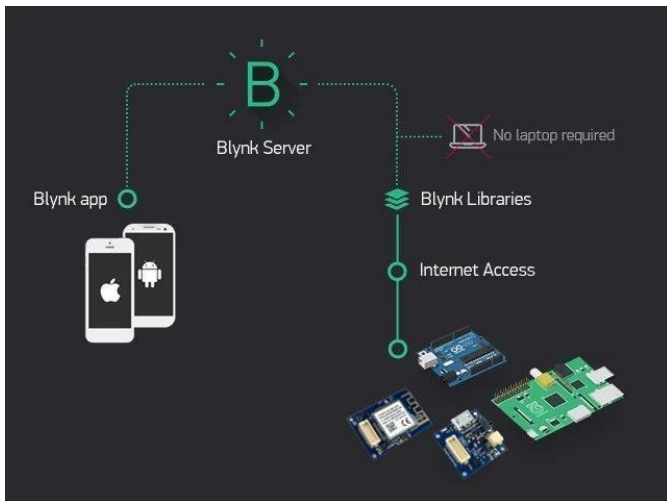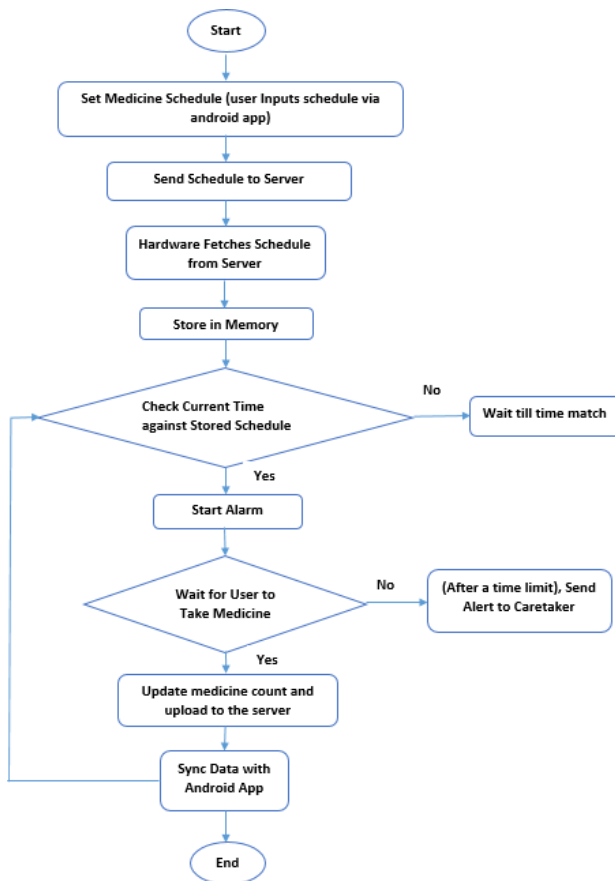
Fig 1. Block Diagram

3.2 Specification of hardware used:

1. The system will utilize an ESP32 microcontroller, which features built-in Wi-Fi and will function as the central processing unit.

2. A 20x4 I2C LCD module will provide a visual display, featuring 20 characters per line across two lines.

3. LED indicators will be used to highlight the compartment containing the medicine to be taken.

4. An Android application will be developed to control and monitor the smart pillbox, offering scheduling features for each medicine.

5. The application will enable users to set reminders and receive notifications.

6. This smart pillbox system aims to assist users in adhering to their medication schedule, ensuring timely intake, and notifying caretakers when necessary.

3.3 Specification of Software used:

1. Arduino IDE: A programming environment for writing, compiling, and uploading code to Arduino and ESP32/ESP8266 microcontrollers. It supports C/C++ and various libraries for hardware control.

Fig 2. Arduino IDE

2. Android Development Software: Tools like Android Studio or MIT App Inventor are used to build Android applications. Android Studio is the official IDE for Java/Kotlin-based development.

Fig 3. Android Development software

3. Blynk IoT Cloud: A cloud-based platform for building IoT applications. It allows remote monitoring and control of devices via a mobile app, making it easy to integrate hardware like ESP32 with the cloud.

Fig 4. Blynk IoT

4. WORKFLOW:

The Smart Pill Box ensures users take their medicine on time by automating reminders, tracking doses, and notifying caregivers if a dose is missed.

Users set a weekly medicine schedule, which is uploaded to a server. The pillbox retrieves this schedule, storing the medicine timings in its

memory. It continuously checks the current time against the schedule. When it is time for a dose, the corresponding compartment opens, and a buzzer alerts the user. The alarm continues until the user takes the pill.

If the user does not take the medicine, an alert is sent to a caregiver. Once the pill is taken, the count updates on the server, and the Android app reflects the changes. This cycle repeats for each scheduled dose, ensuring timely medication intake and improved adherence.
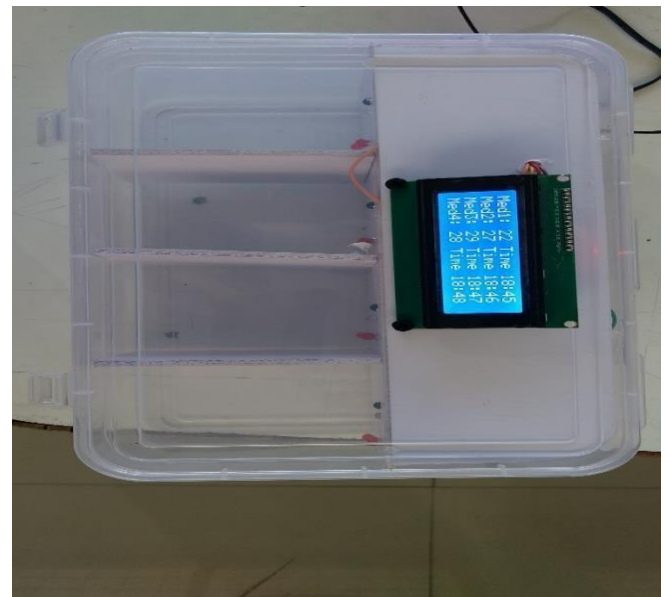
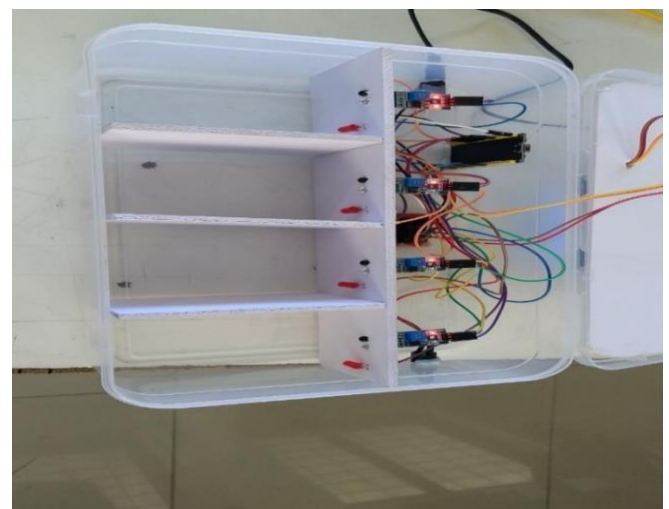## 5. REAL TIME IMAGES:

Fig 5. Dose Schedule Display

Fig 6. Smart Medicine Box: Internal View

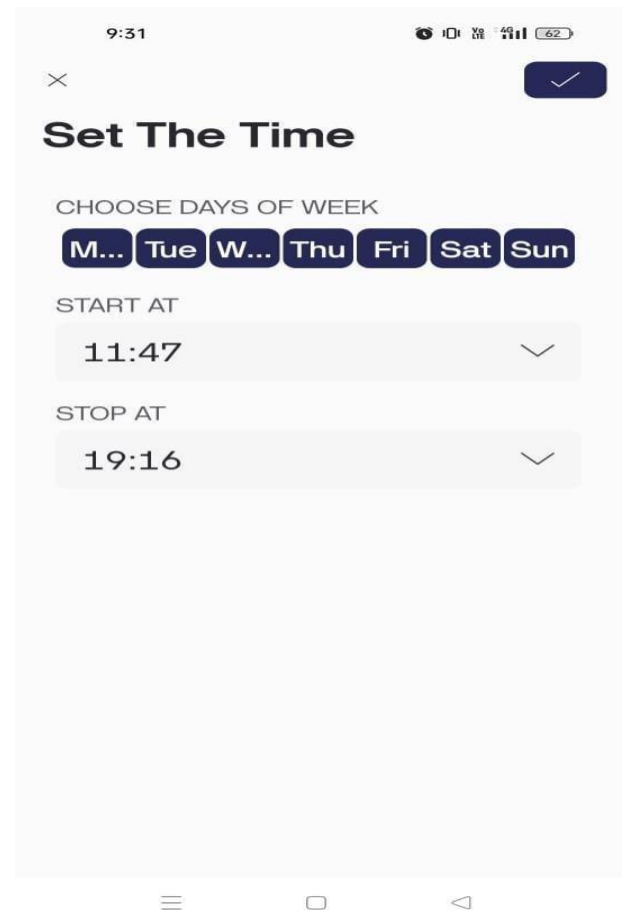**Fig 7. LED Indication for Medicine**

Fig 8. Apps Interface

Fig 9. Time Setting

6. CONCLUSION

The expected outcome from the system is to alert users at prescheduled times and keep track of the pill counts in their respective compartments. It aims to serve as a better caretaker for patients than ever before.

In conclusion, the Smart Medicine Box project successfully addresses the challenges of medication adherence by integrating technology into daily healthcare routines. The device's combination of visual and auditory reminders, secure medication storage, and real-time monitoring ensures that patients take the correct medications at the prescribed times. The inclusion of a mobile application enhances user engagement and allows caregivers and healthcare providers to monitor adherence remotely, facilitating timely interventions when necessary. By automating medication management, the Smart Medicine Box reduces the risk of missed or incorrect doses,
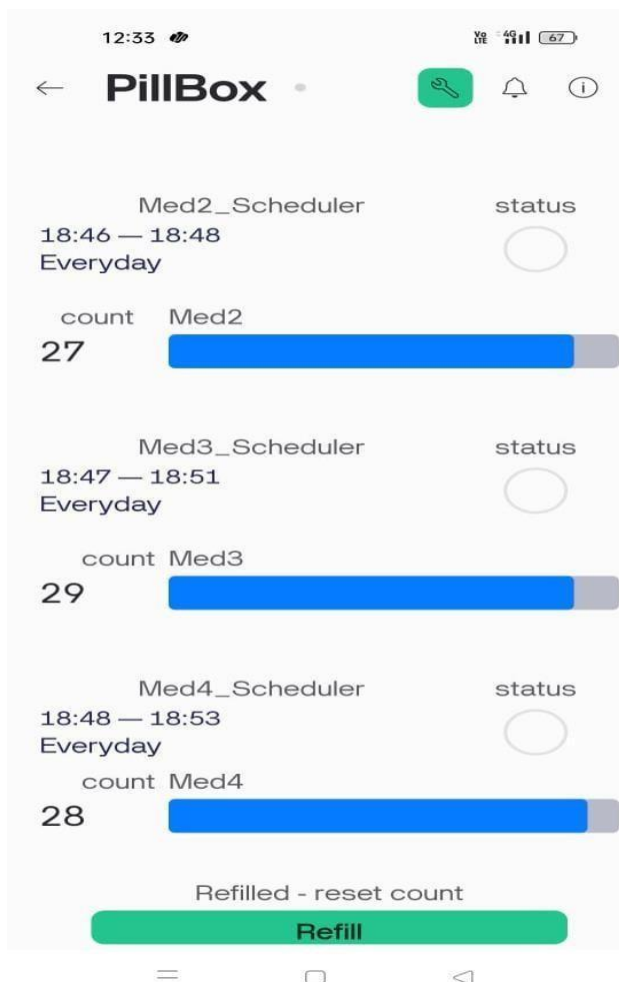
thereby improving patient outcomes and promoting independence among users. Future developments could focus on expanding the device's capabilities to accommodate a wider range of medications and integrating additional health monitoring features to provide a more comprehensive healthcare solution.

7. REFERENCES

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