Smart Medi Box

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Abstract – This paper addresses the prevalent issue of medication mismanagement among older individuals in families, a problem observed not only in our personal context but also widespread across various demographics. Many elderly family members struggle with the complexity of multiple medications, leading to missed doses and inadvertent intake of incorrect medicines. Recognizing the urgency of this concern, we embarked on a mission to devise a solution, resulting in the conceptualization and development of a Smart Medi Box. This innovative device aims to streamline medication management by incorporating smart technology to facilitate accurate dosage scheduling and timely reminders. The impetus for this initiative stems from the staggering statistic that 16 crore (160 million) Indians rely on daily medications. Through the Smart Medi Box, we aspire to enhance medication adherence, mitigate risks associated with incorrect usage, and ultimately improve the overall well-being of individuals managing chronic illnesses.

*Key Words***:** Medication management, Smart Medi Box, adherence, medication scheduling, elderly care, health technology, chronic illnesses, reminder system, healthcare innovation, Indian population.

1. Introduction

In contemporary society, the management of medication for individuals, especially the elderly, has become a significant concern within families. Many older relatives grapple with the challenge of adhering to complex medication schedules, often leading to instances of missed doses or accidental ingestion of incorrect medications. This pervasive issue, observed within our own familial context, is not an isolated occurrence but a widespread challenge faced by countless individuals globally. Recognizing the critical need for an innovative solution, we embarked on a journey to develop the Smart Medi Box – a comprehensive system aimed at revolutionizing medication adherence.

Motivated by the staggering statistic that 16 crore (160 million) Indians consume medication on a daily basis, we sought to address the pressing need for a reliable and intelligent medication management system. The Smart Medi Box is a multifaceted device comprising both hardware and software components. The hardware aspect features a compact box housing multiple containers, each designated for specific times of medication intake. These containers are equipped with LED indicators that illuminate at the prescribed times, providing a visual cue to users. Additionally, the inclusion of a speaker ensures that voice alerts accompany these visual cues, further enhancing user awareness and prompting timely medication adherence.

Complementing the hardware, the software component of the Smart Medi Box introduces a mobile application with a myriad of features designed to streamline the medication management process. Users can easily set personalized reminders for each medication container, tailored to different times and days. The application facilitates an overview of the entire medication regimen, allowing users to track their dosage adherence comprehensively. Furthermore, users can store and access prescriptions provided by healthcare professionals, fostering seamless communication between patients and their medical practitioners. Beyond medication management, the app serves as a holistic healthcare companion, enabling users to set

reminders for doctor's appointments and store vital medical information.

In essence, the Smart Medi Box represents a technological leap forward in addressing the widespread challenges associated with medication adherence. By seamlessly integrating hardware and software components, this innovative solution strives to enhance the overall well-being of individuals, ensuring that medication management becomes a more accessible, user-friendly, and reliable aspect of daily healthcare routines.

2. Literature Survey

This research paper addresses the critical issue of medication non-adherence, particularly prevalent among the elderly due to memory loss and the general population's busy schedules. In response, the proposed solution involves the development of a smart medicine box equipped with advanced features. The system not only ensures regular medication intake but also incorporates health monitoring functionalities such as tracking the patient's heart rate and temperature. Additionally, it includes emergency alerts for the patient and SMS notifications to caregivers and doctors. Leveraging IoT technology, the patient's health data, including heart rate and temperature, is transmitted to the cloud for remote review by healthcare professionals. The primary advantage lies in storing comprehensive patient information, enabling individuals to be informed about their evolving health conditions. This innovative approach addresses a significant healthcare challenge and has the potential to enhance patient care and treatment effectiveness.[1]

This paper presents an innovative approach to home-centric medical assistance through the development of an IoT-based smart medicine box, named iMedBox. The system integrates various technologies to enhance patient care by addressing issues such as medicine dosage errors. A smart band worn by the patient continuously monitors vital signs, including body temperature, blood pressure, ECG, and heart rate, transmitting this data to the iMedBox. The device analyzes the information to predict abnormalities and displays relevant statistics on an LCD screen. The iMedBox performs three key functions: reminding patients of medication schedules, monitoring vital signs, and issuing warnings in case of anomalies. In the event of a critical emergency, the system notifies both the doctor and

family members, creating a virtual hospital experience. The paper emphasizes the user-friendly design of the iMedBox, ensuring accessibility for elderly patients. Ongoing research on biosensors aims to improve effectiveness and reduce size, addressing potential space constraints and minimizing user disturbances. Overall, the iMedBox represents a significant advancement in home-based medical aid through IoT technology.[2]

This research focuses on the development of a smart medicine box aimed at aiding elderly individuals or hospitalized patients in adhering to prescribed medication schedules. The device features twenty-one airtight compartments for storing medication, allowing the attendant or nurse to create a weekly plan by distributing medication across the compartments for three doses per day. The system offers flexibility for the caregiver to manually set medication times or upload a text file on an SD card specifying the timing for each compartment. Integrated with a real-time clock, the device triggers a sound and LED blink when it matches the scheduled time, conveying information about the medication quantity and whether it should be taken before or after a meal. By ensuring medication safety, accurate dosages, and preventing potential misuse, this smart medicine box contributes to the well-being of elderly individuals, providing a comprehensive solution for medication management.[3]

This research project focuses on the design and development of medicine reminders and dispensing machines within the healthcare system, particularly crucial in the current pandemic situation. With the aim of minimizing human contact between healthcare providers and patients, the project introduces a machine capable of dispensing pharmaceutical doses for a complete month. This innovation is intended to safeguard the lives of healthcare workers administering medications, ensuring there is no risk of virus transmission. The machine not only facilitates timely and monitored medication intake but also enhances patient adherence to prescribed dosages. Additionally, the project emphasizes the role of regular meals and exercise routines in promoting overall health and better adherence to medication schedules. This initiative represents a significant advancement in healthcare technology, addressing the challenges posed by the pandemic and contributing to the safety and well-being of both patients and healthcare professionals.[4]

This paper introduces a comprehensive healthcare platform designed to address patients' needs holistically, encompassing individualized medicine, physiological parameter measurement, on-site diagnostics, and remote doctor communication. The proposed initiative aims to revolutionize the understanding of patient health through three integral components: a) an open framework featuring a smart medicine box with enhanced communication and interchangeability to incorporate Internet of Things (IoT) devices and services; b) a real-time capable smart medicines box facilitated by biomaterials, ensuring seamless communication; and c) an adaptive and user-friendly sensor device equipped with an alert system for patients. The system seamlessly integrates IoT devices, providing a cohesive and innovative approach to healthcare. This platform holds promise for personalized and efficient healthcare delivery, catering to various aspects of patient well-being and advancing the capabilities of modern medical systems.[5]

This paper introduces the Intelligent Medicine Box, a cost-effective healthcare product utilizing an IoT-powered medication box and an Android application. The Android app facilitates the initiation of new medications, storage of treatment details, and maintenance of a comprehensive medicine history. It also serves as a user-friendly platform for scheduling doctor appointments seamlessly. The application includes an inbuilt prescription feature, particularly valuable during pandemics. Users can customize treatment plans as needed. The IoT-enabled medicine box sends timely alerts, utilizing audio and illuminated container numbers, ensuring foolproof medication adherence and preventing errors. This innovative solution addresses the healthcare sector's needs effectively, potentially alleviating caregiver burdens.[6]

This paper proposes an innovative healthcare solution that aligns with the current trend of transitioning routine medical checks and healthcare services from hospitals to home environments. The suggested healthcare IoT platform integrates an intelligent medicine box equipped with sensors for health monitoring and diagnosis, enhancing patient-doctor communication through a wireless connectivity-enabled android application. The intelligent medicine box ensures medication adherence by providing timely alerts to patients and facilitating real-time updates about medications through the connected smartphone application. Additionally, the system

generates alarms for medication reminders and sends SMS alerts to predefined guardians if any abnormal vital signs are detected. This model contributes to the evolving landscape of home-based healthcare, leveraging IoT technology to improve patient care and facilitate remote monitoring.[7]

This study investigates the adoption and potential impact of IoT (Internet of Things) in the healthcare sector, where its implementation is relatively slower compared to other fields. The proposed smart healthcare system centers around an intelligent medicine box equipped with sensors and connected to a server for regular health monitoring. This IoT-enabled medicine box, with wireless internet connectivity, facilitates continuous healthcare for patients and establishes seamless communication between doctors and patients without physical meetings. The system ensures that patients take the right medication at the right time, incorporating email notifications for medication reminders. A server, hosted on a laptop, stores comprehensive information about doctors and patients, including prescriptions and appointment dates. Both doctors and patients have unique IDs and passwords for secure access to the server. Patient medication and temperature data are stored on the server for the convenience of healthcare providers, enabling doctors to modify prescriptions if needed, with corresponding notifications sent via email. The system empowers doctors to take immediate action in emergency situations. This research contributes to the ongoing efforts to enhance healthcare efficiency and reduce costs through the integration of IoT technologies.[8]
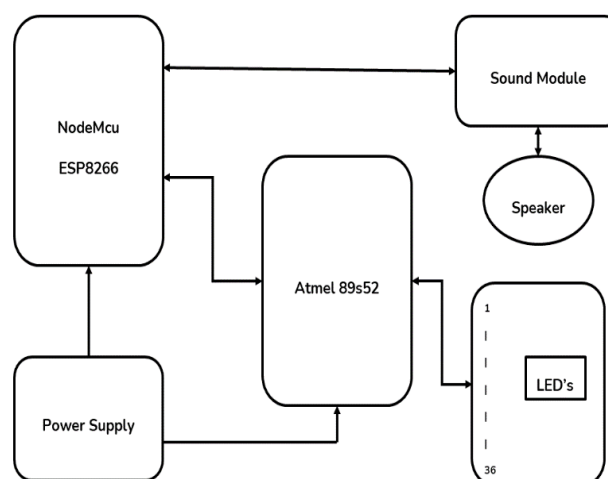
3. Proposed System.

Fig. Block Diagram

All the connectivity between the electronics boards and components is as shown below in the Fig. block diagram.

In this system, first we create a schedule using a mobile application, and then we connect with NodeMcu ESP8266 and put that schedule on that device. In this, there are 36 indicators and 3 voice files, which are for 28 regular doses per day, 4 for special-purpose medicines, 2 for liquid medicines, and 2 for insulin for diabetes patients. The three voice files for three different medicines alerts. Weekly schedule run by RTC of NodeMcu ESP8266. When medicine time comes as per schedule, it turns on the led that was allotted for that time and at the same time, a voice message is also given. When the user takes medicine and presses the switch, it means he has taken the medicine. The power supply provides power to all the electronic circuits.

4. Conclusion

In response to the prevalent issue of medication mismanagement among older individuals, particularly within families, this research paper proposes a comprehensive solution embodied in the development of the Smart Medi Box. Medication non-adherence, a critical concern exacerbated by the complexity of medication schedules, is addressed through the integration of smart technology into a multifaceted device. Motivated by the staggering statistic that 160 million Indians rely on daily medications, the Smart Medi Box combines hardware and software components to revolutionize medication adherence. The hardware component features a compact box with LED indicators and a speaker, providing visual and audio cues for accurate dosage scheduling. Complementing this, the software component introduces a mobile application enabling personalized reminders, dosage tracking, prescription storage, and overall healthcare management. The literature survey reinforces the significance of this initiative by highlighting related research efforts such as IoT-based medicine boxes with health monitoring features, intelligent medicine boxes for the elderly, and systems addressing medication adherence during pandemics. These studies collectively underscore the urgent need for innovative solutions in healthcare technology, and the Smart Medi Box emerges as a promising advancement in this domain. With its potential to enhance overall well-being,

mitigate risks associated with incorrect medication usage, and improve adherence for those managing chronic illnesses, the Smart Medi Box stands at the forefront of healthcare innovation, offering a user-friendly and accessible approach to medication management.

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