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Medicine Remiander Device Using ESP8266

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Abstract- This journal discuss in detail on a suggested medication reminder device that will be made for senior citizens based on their problems. This study's background is explained in the report, and its primary goal is to guarantee that the medication reminder device will be resolving issues that older people have. The problems that have been discovered are mostly focused at the elderly and are meant to address the problems that they encounter on a daily basis, particularly with regard to medication use. In order to design a better device, the study will also examine similar implemented devices and systems to determine the advantages and disadvantages of other pertinent devices and systems. This portable and economical system would be helpful to every age group also.

Index Terms- Home Health Care, Medicine Reminder,ESP8266, Buzzer, servo motor.

I. INTRODUCTION

The majority of the time, people forget the fundamentals of daily life because of their busy schedules, age, and certain illnesses. In this work, we have reviewed the technology of the home health care system, including a medication reminder system and some well-focused improvements regarding authentication, for patients with diseases where it is mandatory to take medication at the appropriate time. Communications, imaging, sensing, and human-computer interaction technologies are typically used in home-based health care arrangements to diagnose, treat, and monitor patients without compromising their quality of life.

The goal, justification, and extent of this research The creation of an Internet of Things-based smart medicine reminder device is the aim of this project. To begin with, the IoT-Based The purpose of a smart medicine reminder device is to remind senior citizens when it's time to take their medications. Second, it will make it possible for senior citizens to seamlessly and non-intrusively monitor their medicine intake. Thirdly, to provide for an unbroken and smooth connection between an elderly person's mobile devices and their Internet of Things (IoT)-based smart medicine reminder gadget. Finally, to set up notifications for the elderly's family member in case they forget to take their prescriptions.

The Medicine Reminder Box Device is an innovative solution designed to address the widespread issue of medication non-adherence, particularly among elderly and chronically ill patients. Non-adherence to prescribed medication regimens can lead to serious health complications, increased hospitalization rates, and higher healthcare costs. This device utilizes state-of-the-art technology, including real-time clocks, microcontrollers, and integrated mobile applications, to ensure that patients take their medications as prescribed. By providing automated reminders and tracking medication intake, the Medicine Reminder Box Device aims to significantly reduce the incidence of missed doses and improve overall health outcomes.

The device is designed with a focus on user-friendliness and accessibility. Its intuitive Interface and clear visual and auditory alerts make it easy for patients of all ages and technological backgrounds to use. The Medicine Reminder Box Device features multiple compartments for different medications, each programmed with specific dispensing times. Patients receive notifications via the device itself and through synced mobile applications, ensuring they are reminded to take their medication regardless of their location. Additionally, the device can be programmed to alert caregivers or family members if a dose is missed, adding an extra layer of safety and support.

Beyond its functionality as a reminder system, the Medicine Reminder Box Device also serves as a valuable tool for healthcare providers. The device's data-tracking capabilities enable providers to monitor patients' adherence in real-time, allowing for timely interventions if non-adherence is detected. This data can be seamlessly integrated into electronic health records (EHRs), providing a comprehensive view of a patient's medication history. By facilitating better communication and coordination between patients and healthcare providers, the device supports more personalized and effective treatment plans.

This Medicine Reminder Box Device represents a significant advancement in the field of medication management. By leveraging modern technology to address the critical issue of

medication adherence, this device has the potential to transform patient care and improve health outcomes on a broad scale. This journal article will delve into the detailed design and functionality of the device, its impact on patient adherence, and its potential applications in various healthcare settings.

II. LITERATURE SURVEY

When the population in a country consists of a fast increasing percentage of seniors as compared to the youngsters, there may be various societal and economicrelated issues that may affect the country and the usual way of life in that particular country. An ageing society is loosely defined as when it's citizens who are aged above the age of 60 years account for more than 10% of the total population in that particular country. Malaysia is expected to be an ageing society by the year 2020 where the elderly population is expected to be more than 11% of the whole Malaysian population.

It can also be seen that chronic diseases tend to occur more frequently for the elderly due to their old age and decreasing ability of their internal organs to effectively work as compared to when they were younger. It is estimated that there are close to 50% of the elderly that are suffering from a variety of diseases across the world. The health of the elderly has even become a major social issue in most countries, especially in countries where it's citizens tend to live a more sedentary lifestyle. Most of the elderly around the world prefer to live by themselves rather than stay in a nursing home as most of them are unable to cope with the realities of age. However, as one ages, multiple health issues will also arise. One of the main problems faced by the elderly is their forgetfulness, especially when it comes to consuming their medications on time and on a consistent basis. Multiple researches have supported the idea that the Internet of Things (IoT) can be used to solve the issues faced by the elderly. By solving the medication consumption reminder issue, a large section of the elderly will be able to live independently, thus reducing the dependency of the elderly on other family members to remind them to take their medicines.

In the case of this study, the elderly are required to consume multiple medications due to their physical and in some rare cases, mental functions decline. With that in mind, the concept of an IoT-Based Smart Medicine Reminder Device will be a wonderful opportunity for the market. Multiple reports have also shown that the rate of remembering and actually consuming their medications among the elderly are really low. With this in mind, this study would like to fill the gap by developing an IoT-Based Smart Medicine Reminder Device to remind the elderly to take their medicine

Ilkko et al4 proposed UbiPILL A Medicine Dose Controller of Ubiquitous Home Environment (2009), Home automation and wireless sensor network which have enhancing the quality of life by providing security, information and comfort. Here had discuss a centric home server with three main roles: use of existing Interfaces on registered systems for remote monitoring and Control, serving the surrounding system as a data gateway and Providing content adaptive user interfaces enhanced by Belongings of end-user client devices, the ubipill device had implemented to remind people for elder and for monitoring purposes ubipill and home server have been design to reliably monitor the medicine box activity by web browser.

Kliem et al5 proposed Security and communication architecture for networked medical devices in mobilityaware eHealth environments (2012), Telemedicine concept is cost efficient and location autonomous monitoring system, the suitable and secured medical data can be transferred with different devices with attention towards security and privacy issue. Emergency situations need on the flutter network integration and data transmission fluctuating from domains like patients home, medical practices, ambulances and, hospitals, where each domain may parallel to a different authority so, mobility aware approach allowing out of the box medical device integration and authentication, and simultaneously fulfilling the typical security and privacy requirements of e-health environments.

TABLE I. COMPARISON BETWEEN MEDMINDER, MEDISAFE AND PROPOSED IOT-BASED SMART MEDICINE REMINDER DEVICE

Features	*MedMinder*	*Medisafe*	*Proposed System*
Locked Pill Dispenser	Available	Not Available	Available
Medical Alert	Available	Available	Available
Refill Tray	Available	Not Available	Available
Multiple Caregiver	Available	Not Available	Available
IoT Connection	Not Available	Not Available	Available

Kale Sapna, Bhadane, Ashwini, Pawar Pallavi and P.N.Achaliya have introduced an Android based Medication Reminder System based on OCR using ANN. In this method, an Android based is used for the patients. This application will remind their user to take correct medicines at appropriate time by setting the reminders in the mobile which is an automatic manner. These reminders will be spontaneously set by the application as per the prescription. This reminder will remind the patients to take medicine competently. This method will help only for young people who are having Android mobile. But for elder illiteracy people it is very difficult to operate and understand it. The device used in this system is costly and the process of creating the application in android mobile is tedious. [1] Priyadarshini, Ramya, Kalaiyarasi, have investigated a novel approach of

microcontroller based Automatic Medication Reminder (AMR) system for patients. In this approach hardware operated using microcontroller is used for the patients. This application will provide a reminder using buzzer and LCD will display the name of medicine. The 4*4 matrix is used to input the data. This system is little complex as it is based on microcontroller which is difficult to embed.

III. PROPOSED SYSTEM

The Medicine Reminder Box is a smart device designed to ensure timely medication intake. Powered by an ESP8266 microcontroller, it enables wireless connectivity for setting schedules. Servomotors automate the opening of specific compartments, while a buzzer provides audible alerts for reminders.And a USB cable for power and programming Connecting wires integrate the components, creating a reliable and efficient system to simplify medication management and improve adherence.

The ESP8266 Microcontroller serves as the central microcontroller and enables wireless connectivity. It manages the operation of the servomotors to open the designated medicine compartments at scheduled times. Additionally, it can connect to a smartphone or web application via Wi-Fi, allowing users to set or modify medication schedules remotely. Its low power consumption, compact size, and ability to handle real-time tasks make it ideal for automating and enhancing the functionality of the system.. servomotors are used to automate the opening and closing of specific compartments containing the medicines. They operate with precise angular movement, ensuring that the correct compartment opens at the scheduled time. Controlled by the ESP8266, the servomotors provide reliable and efficient mechanical motion, making the system user-friendly and accurate for dispensing medications.

The USB cable serves as the primary power source for the system. It connects the ESP8266 microcontroller to an external power supply, such as a USB adapter or a computer. The USB cable also allows for programming and updating the ESP8266 firmware via a computer, enabling easy integration of new features or troubleshooting when necessary.

The buzzer acts as an audible alert mechanism. When it is time to take medication, the ESP8266 sends a signal to the buzzer, causing it to emit a loud, clear sound. This alarm ensures that users are promptly reminded, even if they are not directly near the device. The buzzer is particularly useful for individuals who may be visually impaired or require an immediate and attention-grabbing notification.

The connecting wires are essential for establishing electrical connections between the various components of the system. They link the ESP8266 to the servo motors, buzzer, and any additional sensors or LEDs used in the setup. These wires facilitate the transmission of power and signals, ensuring that all components work in harmony. Proper insulation and organization of the wires help prevent short circuits and ensure the system's reliability and safety.

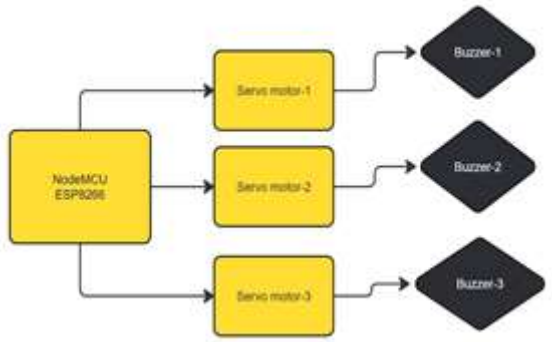


Figure 1. Block diagram of Medicine

To set up the medicine reminder box system, start by connecting the ESP8266 microcontroller to a power source via a USB cable, ensuring it powers up and is ready for programming. Next, connect the servo motors by linking their VCC pin to the 3.3V or 5V pin on the ESP8266, the GND pin to the GND on the ESP8266, and the signal pin to a GPIO pin (e.g., D1 or D2) for control. For the buzzer, connect its VCC terminal to another GPIO pin (e.g., D3) and its GND terminal to the GND pin on the ESP8266.

Use connecting wires to securely link all components, ensuring proper insulation and organization to avoid short circuits. After connecting the components, program the ESP8266 to control the servo motors and activate the buzzer at the specified times. Finally, test the system by running the code, confirming that the servo dispenses medication and the buzzer sounds an alert. Once everything is functional, place the components inside the box, securing them for long-term use.

Medicine remainder box makes the lifestyle of a person easier who are on the medication. And it alerts the person to take the medicines on time

The code used to connect aurdino uno software with esp8266 is c++ first let us understand the code in deatail

#include <ESP8266Servo.h>

This line includes the ESP8266Servo library, which is a servo motor library compatible with the ESP8266 microcontroller.

And it creates two servo objects named servo1 and servo2. Each object will be used to control a separate servo motor.

```
const int servo1Pin = D1; // GPIO5
const int servo2Pin = D2; // GPIO4
const int buzzerPin = D3; // GPIO0
```

These lines define the GPIO pins to which the servo motors and buzzer are connected. The servo motors are connected to pins D1 and D2, and the buzzer is connected to pin D3.

```
void setup() {
servo1.attach(servo1Pin);  // Attaching servo1 to pin D1
 servo2.attach(servo2Pin);  // Attaching servo2 to pin D2
 pinMode(buzzerPin, OUTPUT); // Set buzzer pin as output
 servo1.write(0); // Initialize servo1 to 0 degrees
 servo2.write(0); // Initialize servo2 to 0 degrees
 delay(1000); // Small delay for initialization
}
```

- The setup() function runs once when the ESP8266 is powered on or reset.
- servo1.attach(servo1Pin) and servo2.attach(servo2Pin) attach the servo motors to their respective GPIO pins.
- pinMode(buzzerPin, OUTPUT) sets the buzzer pin as an output.
- servo1.write(0) and servo2.write(0) initialize the servos to 0 degrees.
- A small delay (delay(1000)) is added for initialization.

```
void loop() { operateServo(servo1); // Operate the first servo
  operateServo(servo2); // Operate the second servo}
```

- The loop() function runs continuously after the setup() function.
- It calls the operateServo() function for each servo motor.
- The operateServo function controls the rotation of a servo motor.
- digitalWrite(buzzerPin, HIGH) turns on the buzzer.
- servo.write(180) rotates the servo to 180 degrees.
- delay(10000) holds the servo in the 180-degree position for 10 seconds.
- servo.write(0) returns the servo to 0 degrees.
- digitalWrite(buzzerPin, LOW) turns off the buzzer.
- delay(5000) holds the servo in the 0-degree position for 10 seconds.
- Libraries: Includes the ESP8266Servo library.
- Servo Objects: Creates two servo objects.
- Pin Definitions: Defines GPIO pins for servos and buzzer.
- Setup Function: Attaches servos to GPIO pins, sets buzzer pin as output, initializes servos to 0 degrees.
- Loop Function: Continuously operates the servos.
- operateServo Function: Controls servo movement and buzzer activation.

Figure 2. Code used for esp8266

IV. IMPLEMENTATION

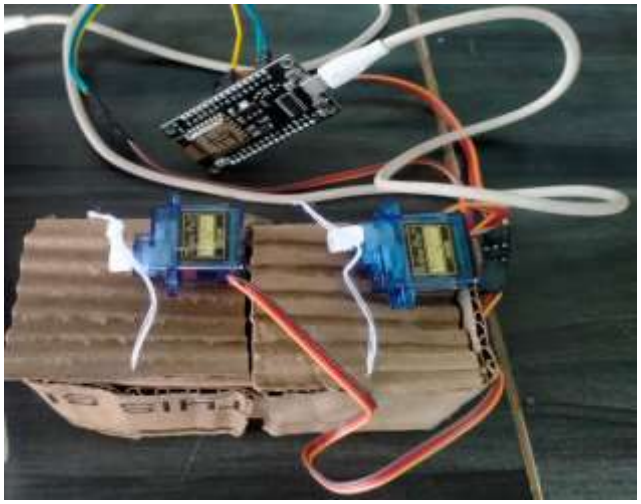
To create a medicine reminder box that connects to Wi-Fi using the ESP8266 module. This box will alert you to take your medication at specified times using the servos and buzzer we set up earlier. The list of components used to create medicine remainder box are discussed in above paragraphs now here we will come to know about wiring diagrams to connect servo motors

- VCC of both servos to 5V on ESP8266.
- GND of both servos to GND on ESP8266.
- Control pin of the first servo to GPIO pin D1.
- Control pin of the second servo to GPIO pin D2.
- To Connect Buzzer
- VCC of the buzzer to 3.3V on ESP8266.
- GND of the buzzer to GND on ESP8266.
- Signal pin of the buzzer to GPIO pin D3.

To Connect RTC module

- VCC of the RTC module to 3.3V on ESP8266.
- GND of the RTC module to GND on ESP8266.
- SDA of the RTC module to GPIO pin D2.
- SCL of the RTC module to GPIO pin D1.

This code will connect the ESP8266 to your Wi-Fi network and trigger the servos and buzzer at specified times to remind you to take your medication. You can customize the reminder times as needed.



To Connect with wifi module the one and only RTC setup is used.
#include <Wire.h>
#include <RTClib.h>
RTC (Real-Time Clock) module (e.g., DS3231) to keep track of time.
Install the RTClib library via the Arduino Library Manager.

For this medicine reminder box, we'll connect two servo motors and a buzzer to the ESP8266. The servo motors' VCC pins go to the 5V pin on the ESP8266, and their GND pins go to GND. The control pins for the servos are attached to GPIO pins D1 (GPIO5) and D2 (GPIO4). The buzzer's VCC is connected to 3.3V on the ESP8266, its GND to GND, and the signal pin to GPIO D3 (GPIO0). Additionally, an RTC (Real-Time Clock) module is used to keep track of time, with its VCC connected to 3.3V, GND to GND, SDA to GPIO D2, and SCL to GPIO D1. This setup ensures that the ESP8266 can control the servo motors and buzzer, while keeping accurate time to alert you for medication using the RTC module

V. RESULTS

The medicine reminder box, designed with servo motors and powered by the ESP8266 microcontroller, has proven to be an efficient and reliable solution for timely medication reminders. This innovative system seamlessly integrates automation and smart technology to ensure users never miss their prescribed doses. By precisely controlling servo motors, the device dispenses medication from designated compartments at scheduled intervals. Additionally, the ESP8266's advanced features allow the system to notify users through audible alarms and remote alerts, making it an ideal solution for both home and mobile environments. This project effectively demonstrates the potential of smart technology in promoting healthier routines and improving medication adherence.

This project delivers an innovative and comprehensive solution for managing medication schedules, incorporating both automation and smart notification features. At its core, the system uses an ESP8266 microcontroller to control servo motors, which dispense medicine from specific compartments at pre-programmed times. To ensure users are reminded, the system activates a buzzer to emit an audible alert when it's time to take the medication. Additionally, the inclusion of a Wi-Fi module in the ESP8266 enables remote notifications, ensuring users are alerted via their connected devices even when they are not near the medicine box. This feature adds an extra layer of convenience and reliability, particularly for users with busy lifestyles

The system's connectivity through the Wi-Fi module allows for real-time notifications via a smartphone or other connected devices, reducing the risk of missed doses. The USB-powered design makes the setup compact and energy-efficient, while the organized use of connecting wires ensures safety and durability. The ability to program and update the ESP8266 makes the system adaptable to changing medication schedules and user needs, enhancing its long-term utility.

The project successfully combines automation, connectivity, and user-friendly design to address the challenges of medication adherence. By automating the dispensing process, providing audible alerts, and enabling remote notifications, the medicine reminder box ensures users can manage their medications effectively, even when they are not near the device. This makes it an invaluable tool for improving health outcomes and supporting individuals with complex or critical medication routines.

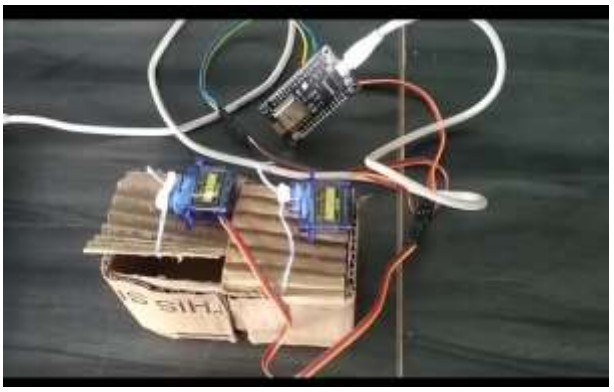


Figure 3. Physical Connections made for Medicine Remainder Box

VI. CONCLUSION

The low cost, efficient, real-time Medicine remainder box has been implemented and tested. Through this system, the people can take their medicine on time. This can helps ensure timely

medication adherence by automating dispensing and providing audible alerts and Wi-Fi-enabled notifications. It is particularly beneficial for the elderly, busy individuals, or those with memory issues, reducing missed doses and promoting consistent medication routines. By simplifying medication management, it enhances convenience, reduces stress, and supports better health outcomes, making it a valuable tool for both users and caregivers.

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