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Rabbit Model of Smart Medicine Dispenser

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***Abstract*— In this study, a smart medication dispenser prototype is displayed. Health-related problems are a growing problem in today's culture, and it sometimes seems like everyone is dealing with several illnesses at once. Depending on your age, the heart or the brain may be involved in the problem. This method's main objective is to make it simpler for patients, particularly the elderly, to take their prescription medications on time and without having to worry about forgetting a dosage. Additionally, it lessens the chance of unintentionally overdosing or underdosing. The proper administration of medications can stop serious issues including sickness, mortality, and a delayed recovery. It protects the user from administering the wrong drug at the wrong time. It is capable of dispensing the medication at specified intervals and at the required dosages.**

I. INTRODUCTION

At the moment, health has surpassed all other considerations. Articles describing how people's health is deteriorating as a result of not taking their prescriptions as directed are abundant in several periodicals and magazines. It is not uncommon for people to prioritise sticking to a diet above remembering to take their prescriptions as prescribed, but given their advanced age, this is understandable for senior people. Because of how busy life has gotten, it is now hard for a person to spare even a minute to care for themselves, therefore forgetting to take their meds has become typical. It is estimated that between 40% and 75% of elderly individuals do not take their prescribed drugs on time and in the prescribed amount. In the mistaken belief that taking more medication than is necessary may speed up healing, adverse effects could occur. Another issue that comes up regularly is forgetting to take your prescriptions at the appropriate times. A recent poll of senior citizens found that more than half of them take five or more tablets every day and struggle to take their medications as prescribed. The major goal of the SMD system is to make it easier for patients, particularly elderly, to take their prescriptions on schedule and without the risk of forgetting to take a dose. Additionally, it can lower the chance of unintentional over- or underdosing. Such issues might be resolved by the smart medication dispenser (SMD), which would notify and remind patients to take the proper dose at the right time. Thanks to this device, elderly people will be less reliant on family members or other carers to remember to take their medications on time. Only the essential drugs will be administered at the relevant times while the condition is being continuously monitored.

II. RELATED WORKS

Pill boxes are widely used by patients as a reminder to take their medications as directed. The pill box with a plaid

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foundation is the most popular design. It is used to store prescription medications that must be taken daily, once per week, or four times per week in pill boxes. A pill dispenser also aids in the regular administration of drugs. The names of the Philips medicine delivery service, the tamper-proof automatic medication dispenser from E-Pill, the E-Pill electronic dispenser, the GMS MED-E-LERT automatic pill dispenser, and others.
Recently, numerous researchers have altered the pill box in various ways. MedTracker, a smart pillbox, for instance, can monitor when patients take their meds. The matrix barcode printed on the prescription bag is then used by the suggested smart pill box to provide reminder and confirmation features. Currently, a pill dispenser cannot send a pop-up notification to a patient's smartphone to remind them to take their medication. We employ currently accessible technologies to alert the patient via smartphone because the drug dispenser lacks an alarm. When the app on a smartphone is opened, an alarm notice appears.

III. Requirements

- ESP8266 NodeMCU 12E
- RTC DS3231
- Servo motor MG90
- Buzzer
- LCD display
- 16x2 LCD I2c Module
- Blynk Platform
- Arduino IDE

IV. Implementation

This project includes both hardware and software implementations because it is an embedded system. The NodeMCU, 16x2 I2C Module, 16x2 LCD, DS3231, RTC Module, and 5V 2A Power Supply are the components used in the hardware implementation. Here, an I2C connection is made between the real-time clock module and the ESP8266 NodeMCU 12-E. The digital pin of the NodeMCU was linked to the MG90 servo motor (DA, SCL, VCC, GROUND). The NodeMCU uses pulse width modulation to drive the servo motor..
The servo motor may rotate between 0 and 180 degrees by adjusting the duty cycle of the pulse width modulation signal. A 5V/2A power supply powers each and every component. Because this module controls the display, the 16x2 LCD module and 16x2 I2C module were paired together. NodeMCU may now control the Display due to an I2C module. SDA, SCL, VCC, and GROUND pins of the I2C module are used for communication.
To connect to the Blynk server, the NodeMCU module connects to an outside Wi-Fi network. The Blynk server starts communication with the ESP8266 when it connects to a Wi-Fi network, and updates the settings. The Blynk server obtains the user-supplied parameters and alters them before passing them on to the Medication Dispenser device. The patient's medication consumption timings and intervals have just been input by the user. The NodeMCU ESP8266 12-E module will save the value.

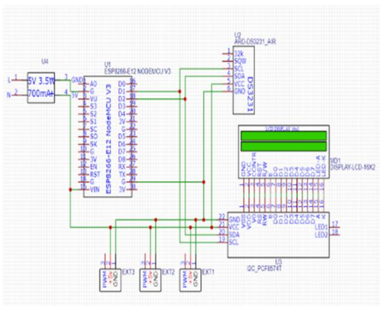

Fig 4.1 Circuit Diagram

The Real Time Clock module sends exact time and date information to the Microcontroller. The real-time clock module compares the user-provided time to the current time after it has been stored in the MCU. When the user input time and the current time coincide, the MCU creates a PWN signal that instructs the servo motor to rotate at a 45-degree angle. The user may view the machine's status on the 12c module, which is placed on the opposite side of the LCD module. The other modules use less current—less than 100 mA—than the servo motor, which may draw up to 2 A depending on the load. The Real Time Clock module is powered by an internal battery as well as an external power supply. Even when the external power is turned off, the RTC module DS3231 IC continues to run on its internal battery power source

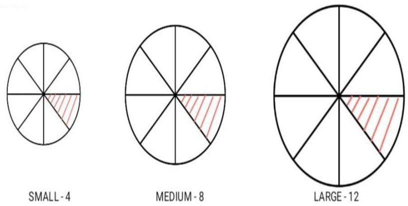

Fig 4.2 Various disc size

Three different sorts of layouts, each with a different tablet loading capacity, will be used to build a circular disc. According to the design, the circular disc is divided into several compartments, each of which may hold a maximum of four tablets. We are using the little tablet disc, which holds four tablets, the middle tablet disc, which holds eight tablets, and the big tablet disc, which holds twelve pills. The open source Blynk IOT platform is used to link the NodeMCU 12E ESP8266 module to the external WiFi so that it may be managed and controlled. As soon as WiFi is turned on, the NodeMCU 12E module will try to connect to the Blynk cloud server. The mobile application will connect to the same Blynk server, which will then update in response to user inputs. Using the blynk server, the device updates the blynk server. The user of the app may define the modes of action, the duration between doses, and the dosage periods in the morning, afternoon, and evening. The loading of the tablets is controlled by the app through rotating the servo motor with disc of 45 degree of rotation.

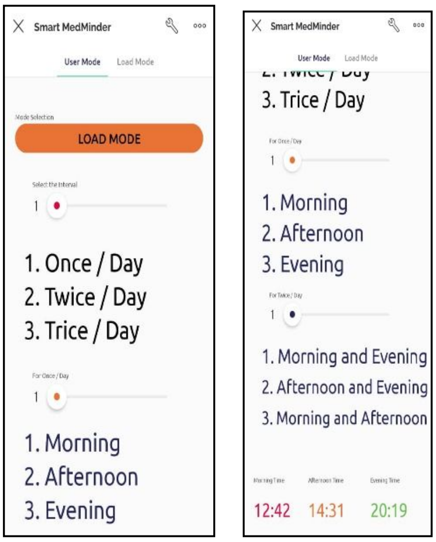

Fig 4.3 App Interface

V. Flowchart

We initially scan the QR code on the table strip to see if the expiration date is less than or equal to three months from the real expiration date. It will be obvious if the medication has run its course. If the tablet hasn't already expired, the procedure then moves on to the next stage of verification, which entails searching for the tablet name in the database. The dose is checked in the database once the name has been confirmed; if the two don't match, the dosage is shown incorrectly. Once all the requirements are met, we can load the tablets

The device's main advantage is that it only loads tablets when a doctor's prescription tablet is already included in the database and is validated by QR code. After scanning the data from the tablet and the database are compared. After all, three requirements have been met, the device allows loading of the tablets.

Before validating that the doctor was the previous doctor, the application requests the doctor's login information. If yes, the database displays all previous prescriptions; otherwise, all databases are cleared. The database is updated when a copy of the doctor's prescription has been obtained. On pairing the device with the doctor app, the device in the background checks for the previous doctor and the current doctor database.

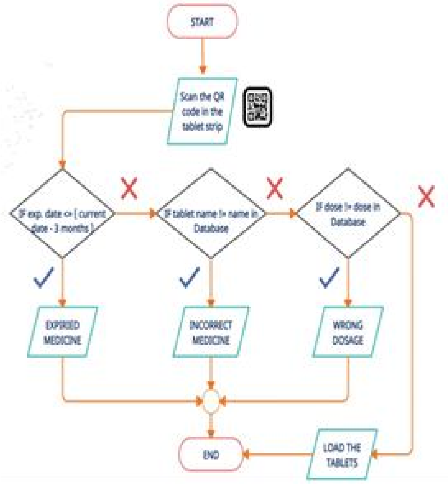

Fig 5.1 QR Code Working Principle

Fig 5.2 Single Local Database

Where the device checks for the previous and current database, if the doctors are same then, the old local database data are retrieved and displayed in the app. If not, then the old local database is cleared and the fresh database is updated. We use same database for both app and device integration. Since the local database is used with integrated to the device where the external memory is used as the local database which improves the security of the device.

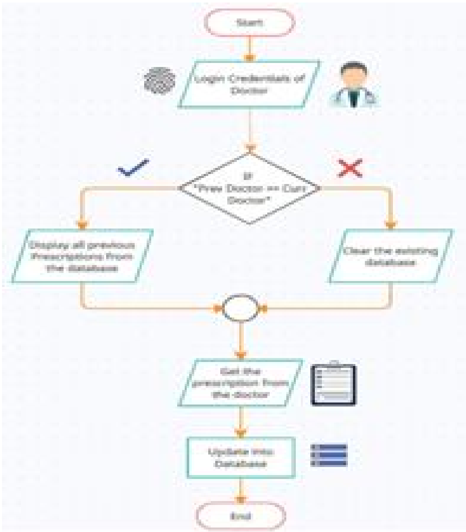

Fig 5.3 Database Backend Working

VI. Outcome

The device is constructed from Mica board and foam sheet. The design of the mica board was built off the rabbit model. During the design phase, the foam board disc is divided into eight pieces. The round disc, which features input and output ports as well as perforations for inserting and extracting tablets, is enclosed in a PVC tube

Each step of the process is displayed on the LCD display for the Rabbit style of implementation. For demonstration reasons, it is supplied by an external 5V 2A power source. Our goal is to produce designs that have inbuilt lithium batteries and can function for a full week without a power source. The use of PET plastic as an operating material will stop tablet contamination at the next stage of deployment.

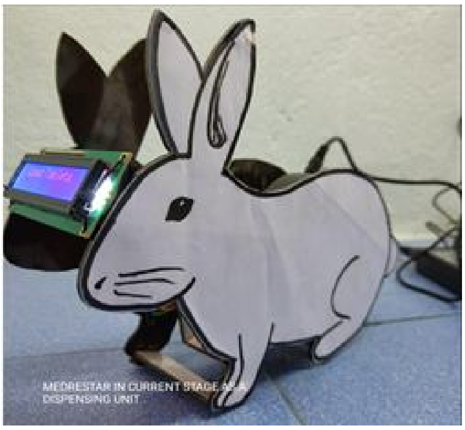

Fig 6.1 Hardware of First Prototype

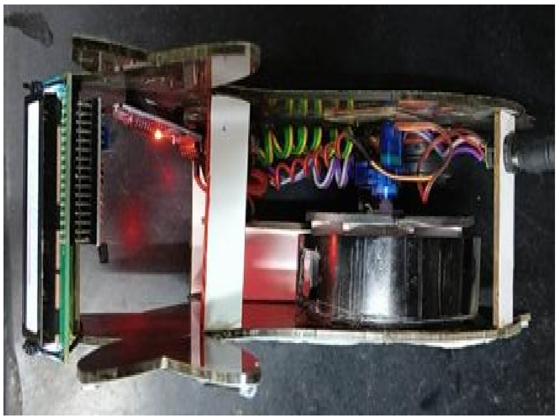

Fig 6.2 Top View of Prototype

VII. Conclusion And Future Scope

In the future we have planned to implement the QR CODE System with the medicine dispenser. With the help of the QR code system, we can make sure that the correct medicine is being added to the medicine dispenser. Also, even if the correct medicine is being loaded correctly, the composition or the ingredients of the medicine also should not change. By using QR code system, we can ensure that the correct medicine along with the correct composition of the medicine is being added to the dispenser. In the traditional types of the dispenser, we must add the medicines one by one, but we have planned to design the system such that the system itself can cut the stripes of medicines. This makes the dispenser handy to use. The medicine dispenser we have constructed is made from mica board, foam sheet and PVC pipe as it is just a prototype. In future we will be using PET plastic when the system is constructed completely. Moreover, the system will be made portable so that it can be carried anywhere we want. Existing system work on power supply, we will make the system as battery powered with optimized power consumption. The system is composed of various things as where it makes the process of dispensing the medicine with the app and user input. The system of medicine dispenser composed of making the system with the network where it makes the real time monitoring and dispensing the tablet for the system. The medicine dispenser makes the use of the input where the devices are planned to be improved with the network where it makes the high security with the method of local database in the system. The security action in the device where it makes high secure communication with the database and the cloud network. The future implementation of the device have been planned with the Artificial Intelligence and Machine Learning operation where it learns the user medicine dispensing time and dispenses the medicine according to the user medicine needed time. The machine learning operation with the device makes the verification of the tablet with the expiry date, dosage and manufacturing industry details with the doctor prescription. Since, the device has been working with the various operation in further development of the system.

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