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# Automatic Pill Dispenser

**Rutuja.S.Sangade, Gauri.P.Dhumal, Onkar.R.Dhole, Arya.P.Gaikwad, Pranav.A.Dhakate, Onkar.D.Gaikwad, Siddhant.K.Doiphode**
Department of Engineering,
Sciences and Humanities (DESH) Vishwakarma Institute of Technology, Pune, Maharashtra, India

**Abstract- In today's world full of rat race people forget to take care of themselves and their loved ones. And as far it goes for the medicines many geriatrics rely on medications for keeping themselves healthy which is understood as medicines are intended to help us live a longer and healthier life but this also means sorting the medicines according to given time and doses taking the wrong medicines or taking medicines in the wrong way can lead to dangerous consequences. Making mistakes with doses, the number if doses are to be taken and the medicines that are to be included in those doses are some medication problems faced by geriatrics which might lead to unnecessary hospital/doctor visits and may lead to illness or even death. So, it becomes necessary to design an Automatic Pill Dispenser for those geriatrics who take their medications without any supervision. This paper proposes an Automatic Pill Dispenser that dispenses the right pill in the right amount as per the prescribed schedule as well gives reminder to those who are dependent for daily medications.**

**Index Terms- Automatic Pill Dispenser, ESP 32, embedded C, buzzer and LED.**

## I. INTRODUCTION

Automatic pill dispenser is the best and surest way to take care of elderly people. It is a unique and organized solution. When it comes to India's aging population, so there is a fundamental need of proper and organized medication management system. As people age, they are more attached to medicines, prescriptions, regimentation. Hence, there is possibility of mismanaging which leads to dangerous risk. Therefore, to avoid the harm there is a growing need of medical management system. The user friendly designed automatic pill dispenser provides the convenience by providing the pills on time. It is a programmable device which allows the users to schedule the time on gadget as per the doctor's prescription. The dispenser's audio-visual remainder facility enhances the accessibility and make it more ideal solution. This technology is more beneficial for the people having complex regimentation. It is a reliable system not only for the users but also for the carer. It enhances patient adherence and reduces the risk of missed doses. This will improve the quality of life and ultimately upgrade health outcomes.

## II. METHODOLOGY/EXPERIMENTAL

**Characteristics**
Components and software used in project are as follows:
**1. Components**
**ESP-32:** Basic Information – ESP-32 is a small and efficient microcontroller used in many short projects.

**Flowchart**


Figure 1: FLowchart

The main functionality of ESP-32 is its WiFi and Bluetooth capabilities. ESP-32 is an considerably cheap micro controller

as per the other connectivity micro controllers, hence being used in various IOT based projects which needs connectivity.

**Role**
In our project the ESP is being used as the main command house which will provide all necessary instructions for other components to work on properly. The ESP is being coded accordingly upon which it will provide all of its command to other components like servo motor, LCD , Buzzer etc.

**Block Diagram**

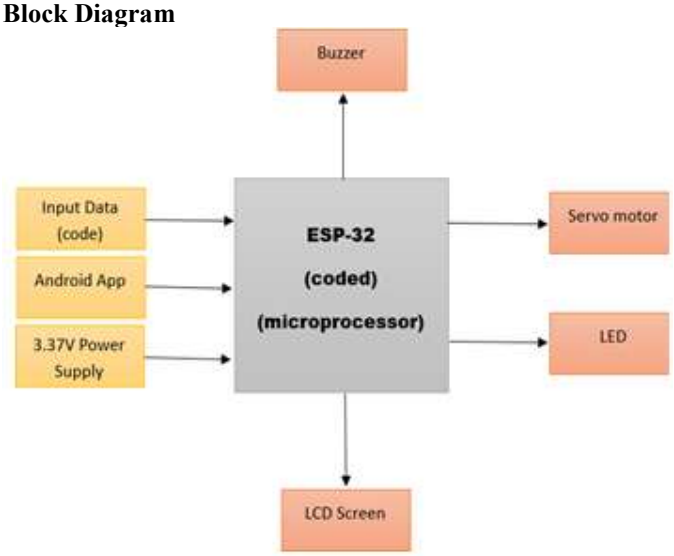



Figure 2: Block Diagram

**Servo Motor**
Servo motors are the code based running motors which provides precise movements based on the input provided in the code. it's a lot customizable which means a user can actually control its movement delay and also its angle of rotation which makes it a lot superior.

**Role**
The utmost role of servo in our project is in dispensing mechanism. It's an important part of our dispensing mechanism which will allow only one tablet at a time to go through. Thus, makes it a necessary component. The function can be carried out by providing certain delay to the servo using ESP-32 so that it works efficiently.

**LCD Display**
The LCD display is an output component which displays certain things based on the input given to it. This is used to show various things upon user's need.

The LCD display has in total 16 pins which are to be connected in order to display something. Its also a code based running component which requires certain codes to display a something.

**Role**
The basic role of LCD display in our project is to continuously display the time over and after the conditions provided in our code are made the display an alert message on the screen for user.

**I2C Converter**
The I2C converter is a component which convert the 16 pins of the LCD display in four pins. that's the basic functioning of I2C converter.

**Role**
The role of I2C converter in our project is utmost same so as to convert the 16 pins of LCD display in just 4 pins which makes the LCD display a lot easier to handle which further reduces the amount of wiring the total circuit.

**Buzzer**
Buzzers are basically a sound generating components which produces sound when an power supply is provided to them.

**Role**
The role of buzzer in our project is to alarm the user or alert the used about the medication that it is ready to be taken .

**Power Supply**
**Basic Information**
The power supply is used to power up necessarily all the components which are being connected

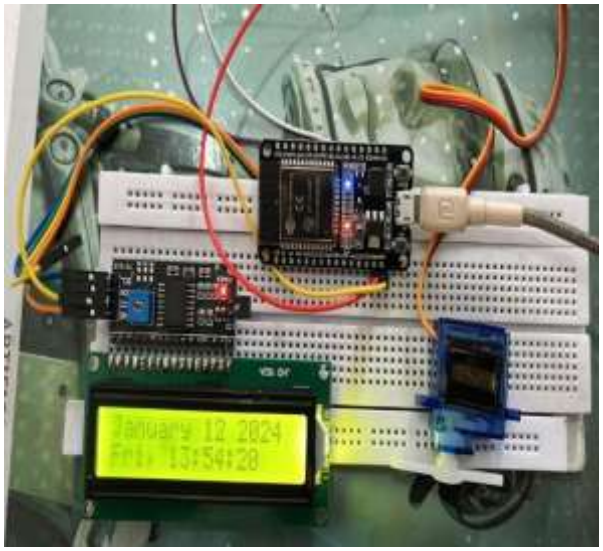
**Role**
Here, we are using a 3.3V rechargeable Lithium-Ion battery to power up our whole circuit. Which can be recharged on having a low battery.

**Jumper Wires**
**Basic Information**
These are the connecting link between all components.

**Role**
Jumper wires serves as a connection between all components so that they work perfectly and they always stay intact with each other.

**The Software used in the Projects**
**Arduino IDE**
This is the software which we used to program our code using Embedded C language. The Arduino IDE uses certain vlibraries to contain and use different type of function that drives different kinds of components . one of them example is Liquid crystal_I2C Library, which contain certain function for printing messages on the screen . Similarly, other libraries are included too to drive other components such as Servo. Other examples of libraries are SERVO library and WIFI library etc.
Synthesis

The basic working of the medicine dispenser is such that the whole circuit is connected to 3.37V power supply which continuously supply the power to whole circuit. The ESP 32 model when gets the power directs it to some certain components. The module in ESP 32 is always connected to a wifi network which helps him gather the real time knowledge. The code in the ESP continuously compares the real time with the time set that is set by the user. As soon as the conditions meet successfully, the ESP commands the SERVO motor and LCD display , servo acts as dispensing mechanism while the LCD displays the message along with the buzzer that is triggered acts as an alarm. This whole process repeats until and unless conditions are met.



## III. RESULTS AND DISCUSSIONS

Some details of pill dispenser: It consists of an ESP-32 WROOM, servo motors, I2C, LCD, LED and buzzer. The dispenser has 3 separate containers with each container having the capacity to hold 30 tablets. A custom mobile app was created using MIT App Inventor for users to schedule the day and time to release pills into each container. The main hardware components including the ESP-32 WROOM, servo motors, containers, etc. were housed in a 3D printed enclosure. The code compares the schedule input from the mobile app to the actual day and time and triggers the servo to release pills at the specified time. The ESP-32 Wroom's in-built real-time clock ensures accurate time. The mobile app provided users with a convenient way to set schedules. The total capacity of up to 30 tablets was sufficient for short-term use cases. Battery power provided portability, although frequent recharging was required. It requires constant internet connectivity. Overall, automated dispensers result in much higher medication adherence than manual tracking. The dispenser proved effective in accurately dispensing multiple pills on a schedule set by the user. The prototype serves as a proof of concept of using electronics and simple daily-use components to create affordable medical devices.

## IV. RELATED WORK DONE

Here are some key research papers related to automatic pill dispensers:

"Automated drug delivery systems: the potential for improved adherence" (2011)

**Authors:** Lindenmeyer A, Hearnshaw H, Vermeire E, Van Royen P, Wens J, Biot Y

**Purpose:** To review available evidence on the effectiveness of automated drug delivery systems to improve medication adherence.

**Key Findings**
Automated systems like electronic reminder devices, pill dispensers, and computerized devices have considerable potential to improve medication adherence. Complex regimens and frequent dosing make adherence especially difficult -automated systems can help by reducing demands on patients. Integration of monitoring/feedback features allows tailored, interactive approaches to promoting proper adherence. Simple reminder alarms and dose packaging aids have good evidence already for improving adherence. High-tech devices still require more randomized controlled trials assessing impact on clinical outcomes. They conclude automated drug delivery represents a promising strategy, especially interactive systems with monitoring, reminders, feedback to promote optimal adherence. But comparative effectiveness research is still needed.

"Design and fabrication of automated pill dispenser" (2016)
Authors: Ray, P.P.

**Purpose:** To design and prototype an automated pill dispensing device using Arduino.

**Methods & Design**
Micro controller-based automated dispenser with compartments for different pills. User authentication via RFID tag. Dispenses pills at preset dispensing alarms/times. SMS notification if pills not taken or dispenser opened incorrectly. Alarm and LCD display for user guidance. Made using Arduino Uno, load cell, RFID reader, GSM module.

**Key Findings**
Able to correctly dispense pills to verified users at the appropriate times. SMS alerts worked to detect missed pills or unauthorized openings. Their automated dispenser system with verification, alarms and SMS alerts has potential to improve medical adherence. Further refinement of the

prototype device needed before real- world implementation. "Usability and acceptability of a mobile app for medication management among older adults with chronic diseases" (2020) Authors: Ghavidel, S. et al.

**Purpose:** To evaluate the usability and acceptability of a medication management mobile app connected to an automated pill dispenser among elderly patients. 41 participants over 65 years with chronic conditions. Used smartphone app connected to automated dispenser for 4 weeks. Assessed metrics - system usability scale (SUS), satisfaction, perceived usefulness, etc after use. High system usability - average SUS score of 86.7 out of 100. 91% were very satisfied/satisfied with using the app. Over 90% found it useful for medication management and adherence. Identified areas of improvement - automation, navigation, tutorials. The automated pill dispenser app showed excellent usability and high satisfaction. Elderly participants were able to use and gain benefit from such an health system. Provides support for this being an acceptable approach to improve medical adherence. The key focus areas across these works include dispenser design, integration of reminders/alert systems, usability for elderly patients, and impact on medication adherence. Let me know if you need any specific full-text papers or have additional questions!

## V. FUTURE SCOPE

Some areas of improvement are needed to make the dispenser more advanced including adding text/email reminders when doses arrive, expanding capacity, refill notifications, developing child safety features, and holding liquid doses . With further development, it could be turned into a marketable product for chronically ill or elderly patients who require multiple medications.

## V. CONCLUSION

It becomes really important to understand the importance of proper medications as for those relaying on family members who have work-hour compulsions and it is difficult for them to keep a constant eye on whether their old parents, ill family members are taking medicines regularly and properly. This automatic pill dispenser uses simple low-cost electronic appliances along with embedded C being used to write a code for ESP 32 using Arduino ID which also include coding for buzzer for right time reminders and also uses real time clock. This device uses 3D printing for external architecture so that the devices becomes light weight and easy to carry. This device also can be good solution to medicine mismanagement as it gives right pill at right time in right amount. To avoid contamination of pills this device can store 15-20 medicines per compartment and this device includes 3 different compartments for different medicines to avoid cross contamination ensuring health safety.

**Acknowledgment**
Completing a project is a rewarding experience but this wouldn't have been possible without the support of our college which has given us the opportunity to create a whole project in the first year of engineering itself and the college faculty who has thoroughly helped us to bring our ideas into existence and also adding more value to our academic journey through their experiences and enthusiasm to help us reach our goals. Our sincere gratitude to Head Of our Department Prof. Dr. C.M. Mahajan and our project guide Mrs. Rutuja.S.Sangade for their guidance and valuable feedback. We are confident that our learning and personal growth has been enriched as a result. Also our special thanks go to our project team members for their dedication and collaboration throughout the project. Each member played a significant role in shaping the outcome.

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