





Project Work Synopsis

Project Proposal Reference No.	: 46S_BE_1436
Title of the Project work	: Design & Implementation of a Smart Pill Delivery System
College	: Mangalore Institute of Technology & Engineering
Department	: Mechatronics Engineering
Name of the Students & contact information	: <p>Name: CHETHAN D SHETTIGAR USN No.: 4MT19MT014 Email id: chethanshettigar303@gmail.com Mobile No: 9900638303</p>  <p>Name: DARIN DSOUZA USN No.: 4MT19MT015 Email id: darindsouza18@gmail.com Mobile No.: 8296591090</p>  <p>Name: DHRUVA JADHAV USN No.: 4MT19MT017 Email id: dhruvajadhav64@gmail.com Mobile No.: 9606402132</p>  <p>Name: KEDAR MALLYA USN No.: 4MT19MT025 Email id: kedarmallya123@gmail.com Mobile No.: 8105535864</p> 
Guide Name & Contact	: Ms. Nishmitha Email id: nishmithad@mite.ac.in Contact No.: 7975526896
Keywords	: Monitoring System, Stepper motor & ESP Module

Introduction:

A Pill dispensing & delivery system employs cutting-edge technology that improves medication management and patient adherence. This ground-breaking system combines cutting-edge technology and clever features into a small, user-friendly package. It makes it possible to precisely dispense medications in accordance with recommended schedules, ensuring timely and accurate dosing. Electronic reminders, alarms, and notifications can be included in the smart pill box that reminds patients take their medications. It can also be linked to cellphones or other devices, giving healthcare professionals or caretakers the ability to remotely monitor drug adherence and offer immediate assistance. The smart pill delivery system encourages medication compliance and enhances therapeutic results while empowering people to take charge of their health.

Objectives of the proposed work

1. Development of Pill Dispensing mechanism.
2. Analysis of Input data after it gets stored on the Database.
3. Identification of Pill/Pill Box using QR Code.
4. Generation of Alerts to the User and/or Caretaker.

Methodology:

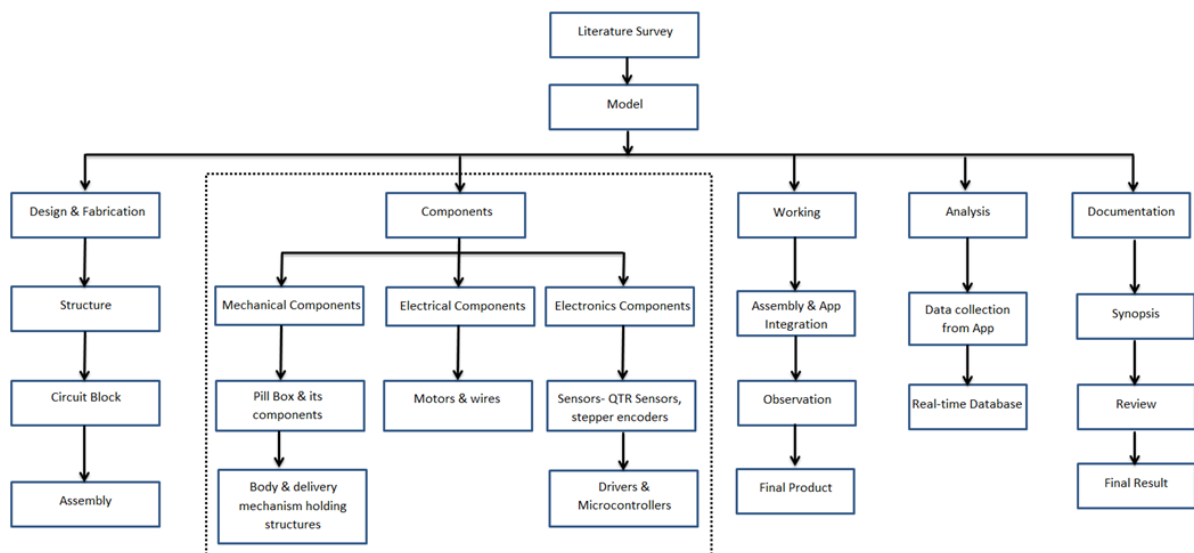


Fig- Roadmap

Following the roadmap shown, the entire construction was carried out. The process began with designing the structure & circuits. Components were procured in the next stage, which includes electrical, electronic and mechanical components. A real-time database was set-up with Firebase. The conceptual design was realized using SolidWorks. The components were procured through offline & online vendors. The app was built using MiT App Inventor 2. The design was finalized and 3D printed. The electronic components, drivers & microcontrollers, were tested for operability. Once all necessary components were procured, the pill dispensing system was assembled. The facial recognition system was realized using Raspberry Pi. The delivery mechanism was realized using a line following mechanism, controlled by an ESP module. The operability of the two systems were tested and the two were integrated. The prototype was then integrated with the database to automate the entire operation.

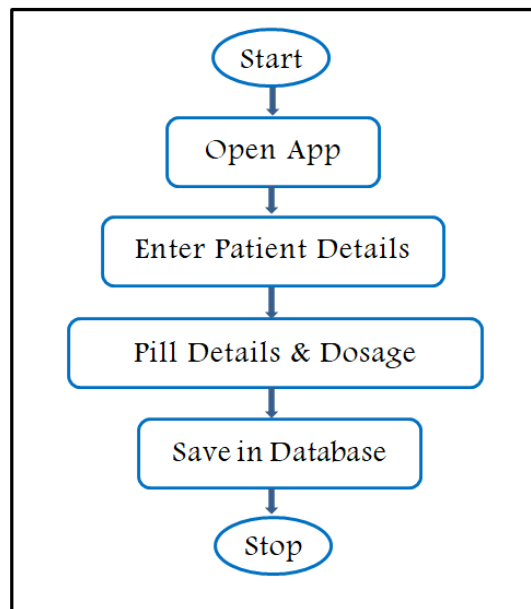


Fig- App Working

The dispensing and delivery mechanisms make up the entire system, which is monitored and controlled in real-time by the app and database. The app takes in the patient details & prescription and stores in the database. The user then has to scan the QR code on each pill box and place it on the load cell, which records the pill number in the database. The pill box is identified using a ESP32 CAM and alerts are sent if number of pills fall below a certain threshold. Once this is set, the pill boxes must be placed in their particular slots. This set-up is placed on a line in a room where the patient rests. At the prescribed time, the delivery mechanism starts its line following mechanism and tries to detect the patient using facial recognition.

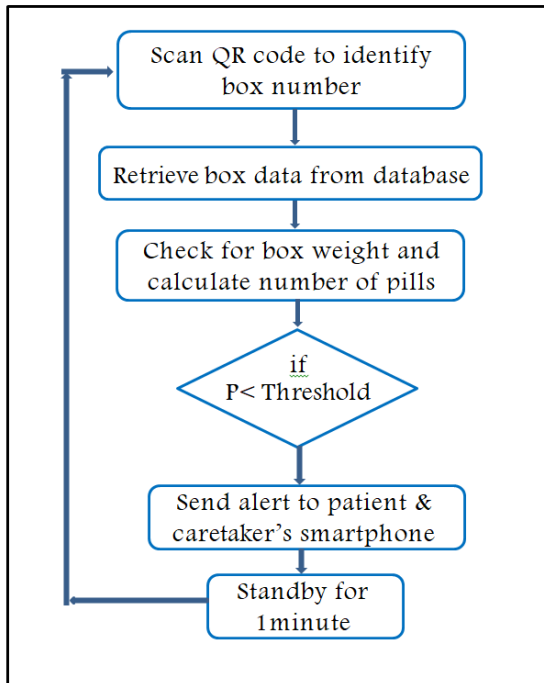


Fig- Pill Box Identification & pill calculation

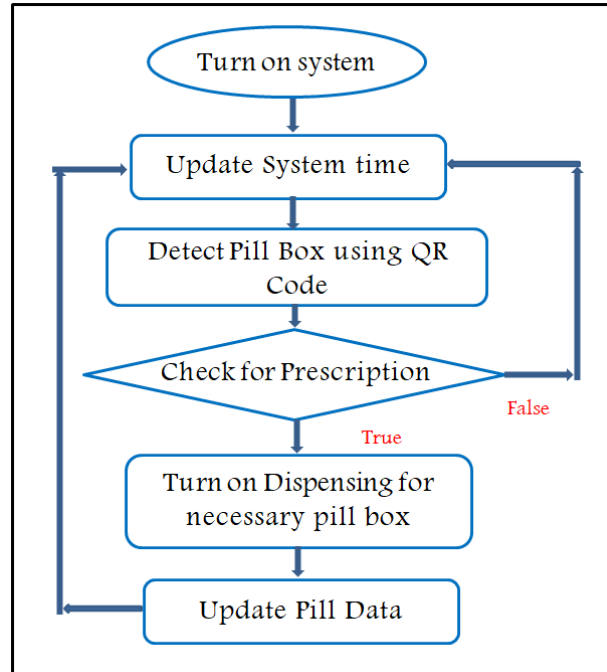


Fig- Dispensing Mechanism

Once the patient has been detected, the line following is stopped and dispensing mechanism kicks into action. It recognises the Pill box and starts the dispensing operation based on the prescription. Then pill data is updated on the database, which is reflected in the app. The delivery system then continues its path until it reaches the home position.

Results & Conclusion:

The Pill Dispensing Mechanism can deliver pills in accordance with the prescribed dosage. Using a line-following mechanism and a facial recognition system, the model is tested for the accuracy of the delivery system. The microcontrollers monitor the entire process and the app is tested for functionality. The facial recognition system is trained on data sets to easily detect faces. The operation of the delivery mechanism has also been tested.

Innovation:

A system that can perform both dispensing & delivery is incorporated. Pill dispensing and delivery systems that are independent are not very effective. A line following mechanism to realize delivery operation which is controlled by the database is an innovative feature included in the delivery mechanism.



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Scope for Future Work:

- Detecting the patient through wearable sensors, his/her position can be determined. A straight line path can be traversed by the delivery system, with the help of a ROS system.
- Better accuracy in patient identification through AI & ML based algorithms can be achieved. The system can be scaled up to serve a large number of patients.
- A more user-friendly interface can be designed to make the prescription entry process more simple and interactive.