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# Automatic Medical Dispatcher with Dynamic Tele Monitoring System Using IoT in Rural Areas

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**Abstract**: The AI-Powered Medicine Vending Machine is a smart healthcare solution for dispensing over-the-counter medicines. It integrates AI, cloud platforms, and payment gateways to improve access to medication in places like hospitals, clinics, and public areas. Users interact with an AI chatbot to input symptoms and receive suitable medicine suggestions. Once selected, they can make payments through an integrated gateway. The machine uses a servo motor-driven spiral mechanism for accurate dispensing and displays updates on an LED screen. A cloud-based platform like Firebase monitors inventory, automates reports, and provides real-time analytics. It ensures synchronization between the vending machine and the cloud. The system supports multi-user authentication for admins, operators, and customers, enhancing security and role-based access. In conclusion, the system addresses key challenges like accessibility, inventory management, and secure transactions, while offering AI-based medicine recommendations and a streamlined, user-friendly interface for better healthcare delivery.

**Keyword:** AI Powered, medication, cloud-based platform, healthcare delivery

## I. INTRODUCTION

The Automatic Medical Dispatcher with Dynamic Tele Monitoring System utilises IoT technologies to transform healthcare delivery in rural and distant areas. It employs a smart medicine vending machine to autonomously handle prescriptions, eliminating the need for actual pharmacies. The system monitors inventory, promotes communication, and creates automatic health reports. Its user-friendly interface allows for multilingual options and teleconsultation, hence improving healthcare infrastructure in rural locations.

## II. METHODOLOGY

### A. BLOCK DIAGRAM

The block diagram outlines a dynamic telemonitoring system using IoT in rural areas, collecting patient vitals and sending notifications for deviations. The system intelligently distributes medical aid based on warning severity and location.

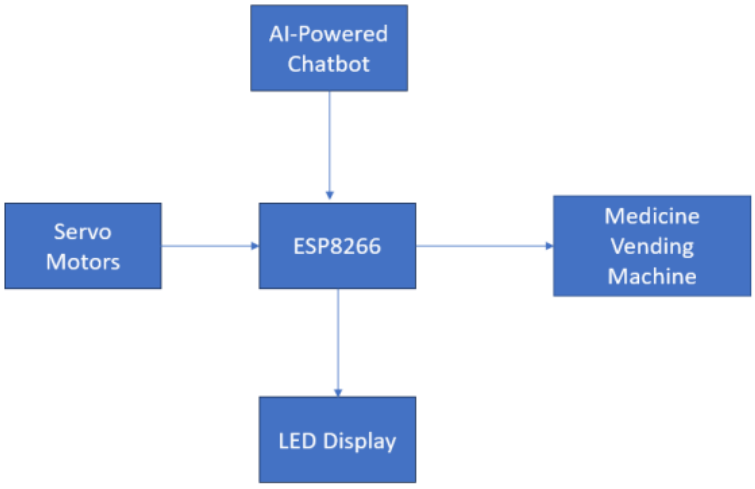


Figure 1 Block diagram

  

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1.*User Interaction and Symptom Input*

Patient Login - Patient login via web-based interface secures access through face scanning technology, ensuring seamless biometric authentication and personalization of services based on medical history and profile.

Symptom Input - The AI-powered chatbot uses guided questions to refine user symptoms, including common conditions like fever, headache, and nausea, after logging in.

2. *AI-Based Medicine Recommendation*

The chatbot uses Dialog flow, a Google Cloud-developed NLU platform, to provide personalized, human-like conversations. It uses Natural Language Processing and machine learning to understand user input, provide dosage, instructions, warnings, and contraindications, and display recommended medications in the patient's dashboard.

How it works?

Dialogflow maps symptom intents to user descriptions, extracting symptom details, and querying the medicine database to provide suggested medications, dosage guidelines, and warnings.

Doctor Consultation via Video Call - Users can consult with certified doctors via a secure video call interface, which is especially useful for complex cases and is accessible through a secure Doctor Login page.

Post-Consultation: Doctor's Recommendation Workflow - After the video chat, the doctor is automatically led to a Recommendation Window on their dashboard. Here, the doctor can review the user's reported symptoms as well as chat notes. Choose relevant pharmaceuticals from the system's medicine database.

3. *Medicine Selection and Payment Process Medicine Selection*

The system allows users to select recommended medicines, display their price, amount, and dosage, and accept secure payment options like credit cards, online systems, and mobile wallets. It also updates inventory, provides receipts, and alerts users of successful payments.

4. *Hardware Integration*

The ESP8266 Wi-Fi module connects cloud-based software to a vending machine's physical components, such as servo motors, LED displays, and status sensors. This configuration provides real-time command execution, live inventory changes, and display synchronisation for transaction status and alarms.

5. *Dispensing Process Automated Dispensing*

The system rotates a spiral by locating the correct slot and sending commands. It features an LED display with real-time messages, a "Thank You" message, and low-stock notifications for maintenance. Firebase Cloud Platform manages user interactions, transactions, inventory changes, and real-time communications, ensuring efficiency, reliability, and expandability.

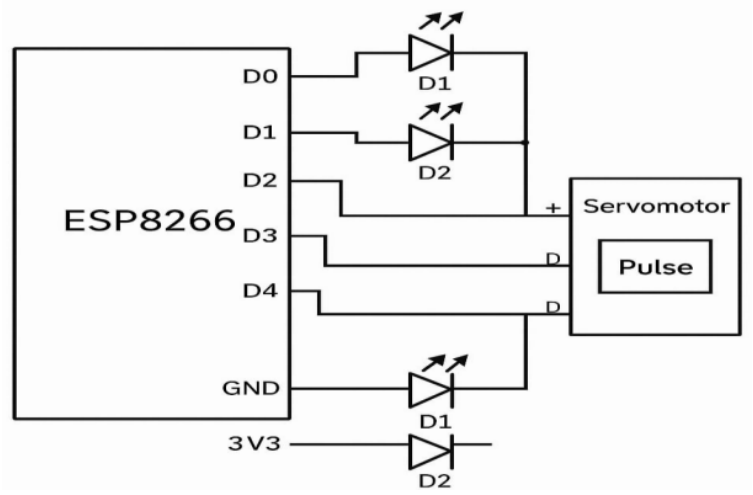


Figure 2 Interface Diagram

## III. HARDWARE DESCRIPTION

The automated medical dispatcher uses an ESP32 microcontroller for data processing and connectivity, a server motor for medication dispensing, a payment gateway interface, and cloud platform integration hardware for seamless data transfer and remote access.

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*3.1 ESP8266 Microcontroller*

The ESP8266 is the central control unit for the vending machine system, providing wireless capabilities to connect to the cloud, process user inputs, control hardware components, and interface with the payment gateway. Its key components include communication with Firebase, control for managing servo motors, LEDs, and payment gateway, and power supply using a 5V or 12V adapter.

Figure 3 ESP8266 Microcontroller

*3.2 Servo Motor*

Micro servo motors are essential for vending machines, controlling the movement of the spiral dispensing system. They are controlled by an ESP8266 microcontroller, providing precise rotation for one medicine at a time. A position sensing device provides feedback, and a control circuit processes the input and feedback signals.

*3.3 Spiral dispensing mechanism*

The spiral dispenser mechanism is a system that holds medicines in position and releases them when a servo motor is activated. It consists of a spiral coil, a rotatable shaft, an electric motor, an item holding area, a dispensing outlet, and a support structure. The spiral coil guides the items, while the shaft rotates the items along the spiral. The mechanism ensures smooth and precise medicine dispensing.

*3.4 Payment Gateway Interface*

This project integrates a card reader with online payment systems like Stripe and Razor pays for secure payments before medicine dispensing. It includes user authentication and authorization, ensuring user identity and necessary permissions. The API Integration Module facilitates seamless communication with the gateway's APIs, ensuring standardized transaction status updates.

*3.5 Display Screen*

The display screen (OLED) displays real-time status updates of medicines, active dispensing actions, and user interaction, including medicine names, stock levels, and messages like "Thank you for your purchase."


Figure 4 Display screen

## IV. SOFTWAER DESCRIPTION

*4.1 Embedded Software (Firmware) for ESP8266 Microcontroller*

The Arduino IDE and ESP8266 libraries are required for the ESP8266 microcontroller, which serves as the backbone of the machine. It connects hardware components and controls their interactions based on user inputs. Key functions include Wi-Fi connectivity, servo motor control, LED indicator control, payment integration, cabinet lock control, and inventory management. Libraries like Wi-Fi, servo, and Firebase are used for internet connection management, motor control, and data synchronization.

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*4.2 AI-Powered Medicine Recommendation System (Chatbot)*

The AI-powered chatbot in the system uses Python for backend development and dialog flow for development. It provides personalized medicine recommendations based on user symptoms. The system uses machine learning models to analyse user input, suggest effective medicines, and provide a chat interface for users to interact and receive recommendations.

*4.3 Cloud Platform (Firebase)*

Firebase is a cloud platform essential for real-time data storage, synchronization, and user management, enabling real-time updates across devices and managing transaction logs.

*4.4 Web Dashboard (Admin & User Interfaces)*

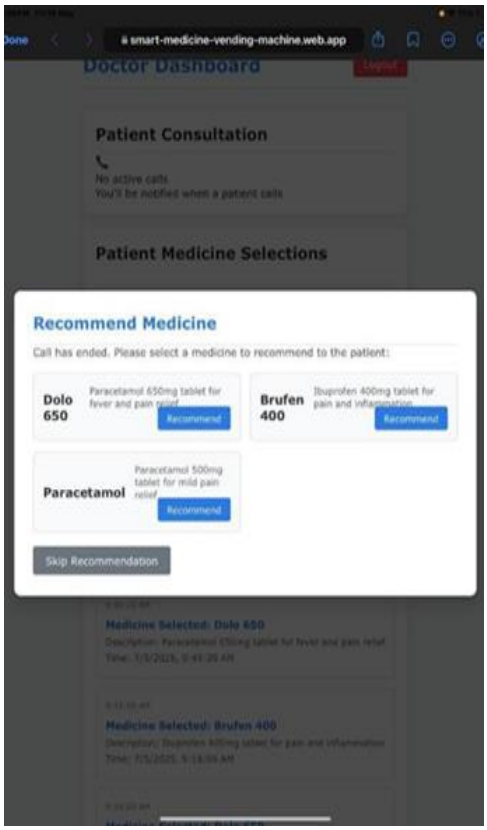
The web dashboard enables admins, operators, and users to interact with the system, view real-time data, and manage inventory using HTML/CSS/JavaScript, React.js, Node.js, and Firebase SDK. The AI chatbot offers customers medicine suggestions, transaction history, payment gateway integration, inventory management, sales analytics, user authentication, and real-time alerts. It allows secure payments via payment APIs, monitors stock levels, and tracks business performance. It also manages user logins and access.

*4.5 Payment Gateway Integration*

The software requires Stripe API or Razor pay API and Node.js or Python for backend payment processing. It integrates payment gateways for secure processing before medicine dispensing. Key components include payment confirmation, status syncing, and security using SSL/TLS encryption.

## V. RESULTS

(a)

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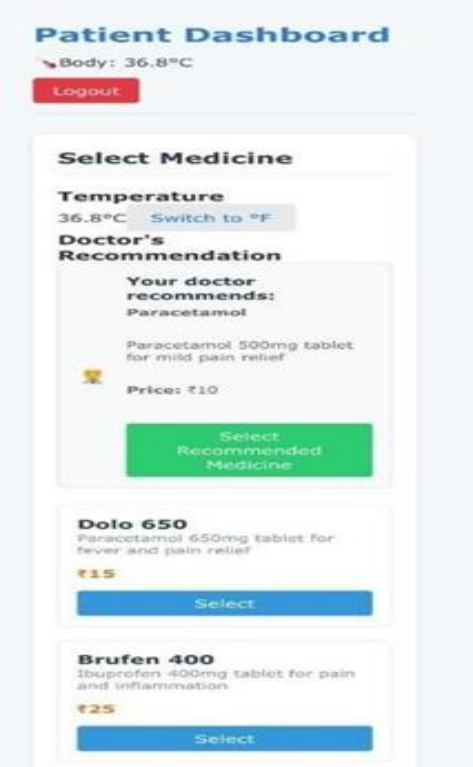


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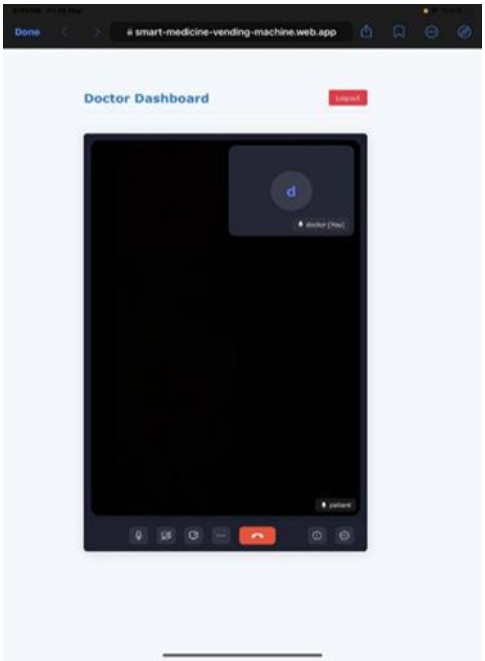


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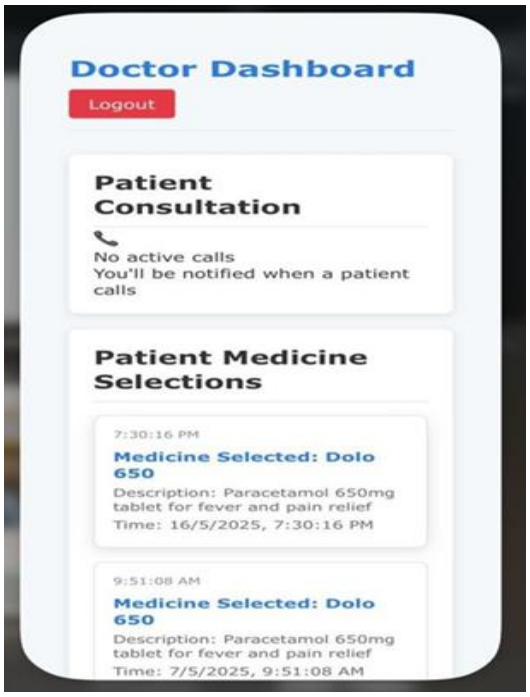


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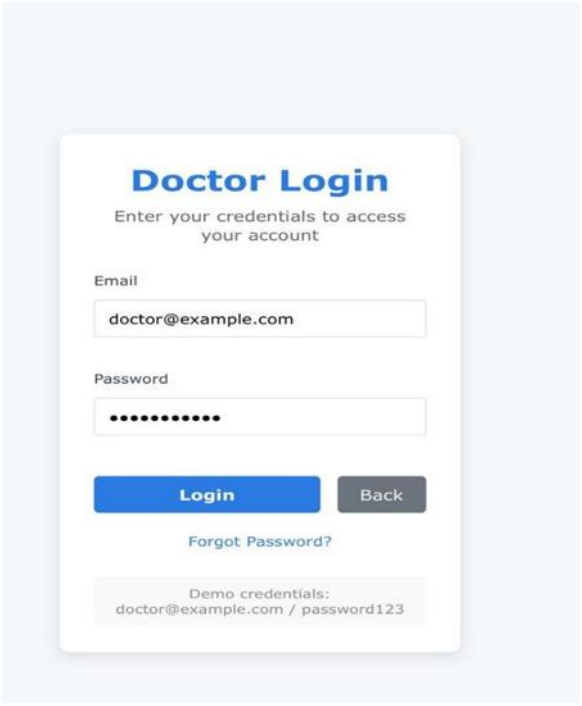


(g)

Figure 5 (a, b, c, d, e, f, g) shows the result part

## VI. APPLICATIONS

1. Self-service Medicine Dispensing

This project aims to create a self-service medicine dispensing machine in healthcare retail environments, allowing patients to access over-the-counter medicines at any time. The machine offers convenience, speed, and 24/7 availability, with AI-powered recommendations reducing wait times. It can also dispense prescribed medicines through QR codes or chatbots, reducing human error and efficiency. The machine also integrates a payment gateway, allowing patients to pay directly through the vending machine, ensuring security and reducing cash handling, enhancing hygiene and operational efficiency.

2. Hospitals and Clinics

Medicine kiosks in hospitals and clinics can provide remote access to essential medications for patients with limited access to healthcare providers. This self-service solution offers faster access and reduces human intervention. Cloud-based inventory management integrates with vending machines, ensuring real-time stock tracking and alerts for low stock. This helps hospitals manage inventory efficiently and reduces the risk of running out of critical medicines in remote areas.

3. Smart Pharmacies and Chain Stores

AI-powered medicine vending machines can enhance pharmacy chain automation by offering a variety of over-the-counter and prescribed medicines. This improves scalability, customer data analytics, and reduces labour costs. The chatbot can recommend over-the-counter medications based on symptoms, enabling self-diagnosis and automated customer support. Personalized medicine recommendations, based on customer data, can increase trust, improve user satisfaction, and increase sales by suggesting complementary products. Overall, AI-powered vending machines can enhance pharmacy services and customer satisfaction.

## VII. ADVANTAGES

1. Enhanced Accessibility and Convenience

The vending machine offers 24/7 availability for essential medicines, providing convenience and time-saving for patients. Its self-service mechanism allows quick, instant dispensed medicine, reducing wait times and improving user experience. The machine can be installed in remote areas, bridging the gap between rural and urban healthcare access. This increases

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access to crucial medication for underserved populations and reduces health equity by providing a convenient solution to rural or isolated areas.

2. Improved Customer Experience

The system uses an AI-powered chatbot to provide personalized medicine recommendations based on users' symptoms, enhancing user engagement. This system reduces waiting times at pharmacies, allowing immediate access to prescribed medication. It also enhances efficiency by reducing the burden on pharmacists and medical professionals. The system also offers enhanced payment flexibility through multiple digital methods, providing convenience and security. This system also enhances the hygiene of transactions.

3. Data Analytics and Reporting

The system generates monthly sales and inventory reports, providing valuable insights into medication sales trends, stock levels, and customer preferences. This improves decision-making, saves time, and offers real-time data access for authorized personnel. This allows for immediate monitoring and prompt intervention in case of issues.

4. Operational Efficiency and Cost Reduction

The machine automates medicine dispensing, reduces errors, and integrates with AI-driven inventory management, resulting in real-time stock updates and optimization, reducing overhead costs, operational costs, and increased profitability for pharmacies and hospitals.

## VIII. LIMITATIONS

1. User Interaction & Symptom Input

Dialogflow faces language and cultural barriers, limited diagnostic accuracy, and reliance on user input quality, potentially misinterpreting symptoms and leading to incorrect recommendations.

2. AI-Based Medicine Recommendation

Dialogflow's reliance on mapped intents may not handle complex cases, and automated medicine suggestions may raise legal and ethical concerns if not reviewed by licensed practitioners.

3. Medicine Selection and Payment Process

Users must have digital literacy to navigate digital interfaces and payment gateways, and some regions may lack access to supported payment systems like UPI/PayPal.

4. Doctor Consultation via Video Call

Poor internet quality can disrupt video consultations, especially in remote areas, and doctor availability may not match patient needs, leading to delays or limited access.

## IX. CONCLUSION

The Automatic Medical Dispatcher with Dynamic Tele Monitoring System Using IoT in Rural Areas project offers numerous advantages, including enhanced accessibility, convenient customer experiences, cost savings for businesses, improved security, and robust data analytics. By automating the medicine dispensing process, integrating advanced AI technologies, and providing valuable insights through cloud-based management systems, this project revolutionizes how medicines are distributed, purchased, and managed in various healthcare and retail environments.

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