TRIBHUVAN UNIVERSITY

INSTITUTE OF SCIENCE AND TECHNOLOGY

A PROJECT PROPOSAL ON

The Medical Prescription System(MediGo)

To

Department Of CSIT

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In partial fulfillment of the requirements for the degree of Bachelor's of Science in Computer Science and Information Technology

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ABSTRACT

The medical prescription system(MediGo) is an integrated healthcare platform designed to streamline the process of prescription handling and medicine accessibility for patients. The system allows users to book appointments with doctors, upload prescription images, and automatically extract medicine details using Optical Character Recognition (OCR) technology. Once the prescription is processed, The medical prescription system(MediGo) provides users with comprehensive information about the prescribed medicines, including usage, and side effects. The system further enhances convenience by suggesting nearby pharmacies that are likely to stock the medicines and providing the shortest navigation route using Maps API. By digitizing prescriptions and facilitating access to medicine information and location services, The medical prescription system(MediGo) reduces patient confusion, minimizes manual errors, and promotes timely medication adherence. The platform is accessible from any internet-enabled device and offers a secure, efficient, and user-friendly experience, ultimately contributing to improved healthcare delivery and patient outcomes.

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LIST OF ABBREVIATIONS

API	Application Programming Interface
HIPAA	Health Insurance Portability and Accountability Act
OCR	Optical Character Recognition
EPS	Electronic Prescription System / Electronic Prescription Service
NHS	National Health Service
IHI	Institute of Healthcare Improvement
UAT	User Acceptance Testing
HTML	Hypertext Markup Language
CSS	Cascading Style Sheet
SQL	Structured Query Language
NoSQL	Not Only SQL
DB	Database
openFDA	Open Food and Drug Administration

CHAPTER 1

INTRODUCTION

1.1 Background

The traditional method of handling medical prescriptions has long relied on handwritten notes and manual processes, which often result in miscommunication, illegible handwriting, and delays in treatment. Patients frequently encounter difficulties in understanding prescription details, locating the prescribed medicines, and identifying nearby pharmacies. These challenges are particularly evident in regions where access to digital healthcare infrastructure is limited or fragmented.

With the increasing adoption of digital health technologies, there is a growing demand for systems that can improve prescription management, ensure the accuracy of medicine information, and enhance communication between healthcare providers, patients, and pharmacies. Advances in Optical Character Recognition (OCR), web application development, and location-based services have made it possible to digitize handwritten prescriptions and guide users in real time.

MediGo was conceptualized to solve these issues by creating a comprehensive, web-based solution that enables users to manage their prescriptions digitally. The system integrates essential features such as appointment booking, prescription image upload, medicine extraction and explanation, nearby pharmacy suggestions, and shortest-route navigation using Maps. By doing so, MediGo not only simplifies the process of accessing medication but also aims to reduce human error, improve medication adherence, and contribute to a more efficient healthcare experience.

1.2 Problem Statement

In traditional healthcare settings, patients often face multiple challenges after receiving a medical prescription, such as difficulty in managing paper prescriptions, lack of clarity about prescribed medicines, and trouble locating nearby pharmacies that stock the required medication. These issues lead to delays in treatment, confusion regarding medication usage, and inconvenience in accessing healthcare services.

There is currently no unified digital solution that seamlessly connects appointment booking, prescription management, medicine information retrieval, and real-time pharmacy navigation in a single platform. Additionally, patients who receive handwritten prescriptions often struggle to understand them due to illegible handwriting or unfamiliar medical terminology.

1.3 Objectives

The primary objectives of our project are:

> To develop efficient web application where the user can book an appointment, digitalize prescription and can locate nearby pharmacy with A* algorithm.

1.4 Scope and Limitations

1.4.1 Scope

The scope of this project includes the following:

1. **Streamlined Prescription Management:** The medical prescription system(MediGo) enables patients to upload and manage medical prescriptions digitally, eliminating the need for physical copies and reducing errors associated with manual entry and illegible handwriting.

2. **Enhanced Medicine Accessibility:** By extracting medicine details from prescriptions and providing comprehensive information about usage, and side effects, the system empowers users to understand and follow their medication more accurately.

3. **Real-Time Pharmacy Navigation:** The integration with Google Maps allows users to locate nearby pharmacies and navigate the shortest route, improving convenience and reducing delays in accessing prescribed medicines.

4. **Improved Patient-Doctor Communication:** The platform facilitates appointment booking and prescription sharing between patients and healthcare providers, contributing to more organized and efficient healthcare delivery.

1.4.2 Limitations

1. **OCR Accuracy Issues:** The medical prescription system(MediGo) relies on OCR to extract medicine details from uploaded prescription images. However, handwritten prescriptions-especially those with poor handwriting or low image quality-can lead to inaccurate recognition of medical terms and abbreviations.

2. **Medicine Database Dependency:** The system's ability to provide accurate medicine information is directly tied to the quality and completeness of the underlying medicine database or third-party API. Local, generic, or rare medicines may not be recognized or correctly matched.

3. **Internet Dependency:** The medical prescription system requires a stable internet connection for key operations such as image uploads, Maps integration, API access, and appointment scheduling. Users in low-connectivity areas may experience reduced functionality.

4. **Doctor Participation Dependency:** The effectiveness of the system depends on active doctor involvement, including timely appointment availability and the provision of digital prescriptions. Limited participation could hinder the platform's reliability.

CHAPTER 2

Background Study and Literature Review

2.1 Background Study

2.1.1 Prescription:

A medical prescription is a formal instruction from a healthcare provider to a pharmacist, outlining medications required for treatment. Traditionally handwritten, prescriptions are now being digitized to reduce interpretation errors and increase accessibility [1].

2.1.2 Optical Character Recognition (OCR):

OCR is a technology that converts different types of documents—such as scanned images, PDFs, or photos—into machine-readable and editable text. In MediGo, OCR is employed to extract medicine names and dosage information from uploaded prescription images. Its accuracy depends heavily on handwriting clarity and image quality [2].

2.1.3 Geolocation and Navigation APIs

Geolocation APIs help determine a user's location using GPS or network information, while navigation APIs (e.g., Google Maps API) compute optimal routes and directions. These are crucial for locating nearby pharmacies and guiding users to them [3].

2.1.4 Electronic Prescription Systems

Electronic Prescription Services (EPS), like the one implemented by the NHS in England, allow healthcare providers to send prescriptions directly to pharmacies electronically. This eliminates the need for physical paper prescriptions, thereby improving efficiency and reducing prescription errors [4].

2.1.5 Patient-Centric Healthcare

Patient-centric systems focus on delivering care that is respectful of, and responsive to, individual patient preferences and needs. MediGo embodies this by offering features like prescription digitization, nearby pharmacy suggestions, and doctor appointment booking, all in one unified interface [5].

2.2 Data Collection

2.2.1 OpenFDA

The dataset used in The medical prescription system(MediGo) for medicine-related information is sourced from OpenFDA, a public and reliable API maintained by the U.S. Food and Drug Administration. It provides structured data on drugs, including their ingredients, dosage, side effects, and warnings. By using OpenFDA, the system ensures that the information displayed to users is accurate and up-to-date. This enhances the credibility of the application and supports safe medication practices. Additionally, it allows the system to scale easily with access to verified medical data.

2.2.2 Kaggle

To bring real-world context into our project, we sourced a publicly available dataset from Kaggle, a widely trusted platform in the data science community. The dataset we selected focuses on medicines and drug information, making it a perfect fit for the goals of our system. It contains detailed entries about various drugs—including their names, ingredients, dosage forms, manufacturers, purposes, and even potential side effects and precautions.

What drew us to this dataset was not just the volume of information it offered, but how well-organized and relevant it was for the kind of application we were building. Since our system revolves around managing prescriptions, suggesting drug alternatives, and helping users find nearby pharmacies, having access to this kind of structured data allowed us to simulate a realistic environment.

With the dataset integrated into our backend (using MongoDB in our case), we were able to test and refine features like medicine search, prescription validation, and information display with real drug entries. This not only helped us build a more robust system but also made the entire development process feel more grounded in real-world healthcare needs.

2.3 Similar Projects

2.3.1 EPS (Electronic Prescription Service)

The Electronic Prescription Service (EPS) is a digital system implemented by the NHS in England to streamline the prescribing and dispensing of medications. It enables prescribers to send prescriptions electronically to a dispenser, such as a pharmacy, nominated by the patient. This system is designed to make the prescribing and dispensing process more efficient and convenient for both patients and healthcare professionals. EPS reduces the reliance on paper prescriptions, minimizes errors associated with manual handwriting, and provides a more secure way of managing prescriptions. It also allows patients to collect their medication from any pharmacy, improving accessibility. However, EPS is primarily intended for healthcare providers and pharmacies within the NHS system and lacks features like medicine tracking, prescription uploads, or real-time pharmacy navigation. The system is focused on the clinical workflow and does not provide a holistic solution for patients seeking medicine information or ease of access to nearby pharmacies outside the NHS framework.

2.3.2 Epocrates:

Epocrates is a mobile application widely used by healthcare professionals to access drug information, check for potential drug interactions, and consult clinical guidelines. It offers a comprehensive medical knowledge base that aids healthcare providers in making informed clinical decisions. Epocrates is an excellent resource for prescription guidance, drug reference, and clinical support, but it is primarily designed for use by doctors, pharmacists, and other healthcare providers. As such, it does not provide features for patients such as prescription uploads, medicine tracking, or real-time pharmacy navigation. Epocrates' focus remains on clinical decision support rather than complete prescription management or user-friendly access to medications for patients.

2.4 Legal and Regulatory Considerations

1. **Privacy Protection and Secondary Use of Health Data:**

   Problems

   The medical prescription system(MediGo)handles sensitive health-related information such as scanned prescriptions, pharmacy details, and user health records. The secondary use of this data—for improving recommendation algorithms, analytics, or future research—raises serious privacy concerns. Unauthorized access or improper use of health data could compromise user trust and potentially violate privacy norms. [1]

   Strategies and Solutions

   To ensure privacy protection and responsible secondary use of health data, The medical prescription system(MediGo) implements several strategies. Role-based access control limits data access based on user roles, while sensitive health information is de-identified and aggregated for research or analytics to protect user identity. All data transmissions and storage are encrypted using secure protocols.

Clinical and research environments are logically separated, and the platform follows the principle of minimum necessary disclosure. Future enhancements may include privacy-preserving AI techniques like federated learning to analyze data without compromising user privacy. These strategies help The medical prescription system(MediGo) align with legal frameworks like HIPAA and foster user trust.

2. **HIPAA Privacy Rule:**

   Provisions Relevant to Public Health Practice

   While **The medical prescription system(MediGo)** is currently an academic project and not a commercial healthcare product, it aims to follow internationally recognized data protection norms such as the Health Insurance Portability and Accountability Act (HIPAA).

   Key Points:

   - **Protection of PHI:** All personally identifiable health data (e.g., names, prescription details, appointment history) is treated as Protected Health Information (PHI) and secured accordingly. [2]
   - **Consent for Disclosure:** User consent is required before any PHI is shared with external systems, except in anonymized format for analytical purposes.
   - **Public Health Exceptions:** In future real-world deployments, MediGo could support public health use cases such as sharing aggregated, anonymized data with health authorities or researchers.

CHAPTER 3

Methodology

3.1 Requirement Analysis

3.1.1 Functional Requirements

Functional Requirement describes what the system should do , what specific behaviors system should follow, functions, or operations of the system.These requirements outline what the system should do:

1. **User and Appointment Management:** This system should allow users to register and log in with proper authentication and role-based access control to ensure secure usage of system. Similarly, users must be able to book new appointment , rescheduling appointments, and cancel them if needed [3].
2. **Prescription Upload and Processing:** The system should enable users to upload prescription images. Once uploaded, the system must process these prescriptions using Optical Character Recognition (OCR) to automatically extract medicine names from the image. In cases where OCR results are inaccurate or incomplete, users should be provided with an option to manually review and correct the extracted information to ensure data accuracy [2].
3. **Medicine Information System:** The system should display comprehensive details for each medicine, including dosage instructions, usage guidelines, potential side effects, and important warnings [4].
4. **Doctor Features:** Doctors should be able to view a complete list of patients along with their respective appointment details for efficient consultation management. Additionally, the system should allow doctors to upload digital prescriptions or approve automatically generated prescriptions after review, ensuring accuracy and professionalism in patient treatment [5].

5. **Pharmacy and Navigations:** The system should allow users to locate nearby pharmacies . It should display the distance to each pharmacy, helping users find the most convenient options. Additionally, the system should integrate with Maps to provide users with the shortest route to their selected pharmacy for a seamless navigation experience [6].

3.1.2 Non-Functional Requirements

Non-functional requirements define the overall qualities and attributes that the system must possess:

1. **Security:** The users personal data including password, user details and medical reports must be encrypted and JWT authentication or OAuth authentication needs to be done [7].
2. **Performance:** The system must be able to respond to OCR and lookup requests quickly to provide a fast and efficient user experience. Quick response times are essential for maintaining user engagement with the system [2].
3. **Scalability:** The system must be designed with scalability in mind, allowing it to easily adapt to increasing numbers of users, prescriptions, and data.
4. **Reliability:** The system must be designed to ensure high reliability throughout its entire life cycle. This means that the system should be stable and consistently available, minimizing downtime and ensuring that users can access the system whenever needed [8].
5. **Maintainability:** System is designed such a way that it will be easy adapt new changes.

3.2 Software Methodology

Agile Scrum is a way of working on projects by breaking them into small, manageable chunks called sprints (usually 1–2 weeks long). Instead of building everything at once, the team works on a few features at a time, gets feedback quickly, and makes improvements as they go. Everyone meets daily for short check-ins (called standups) to stay in sync. It's like building something step-by-step while constantly checking to make sure it's on the right track.

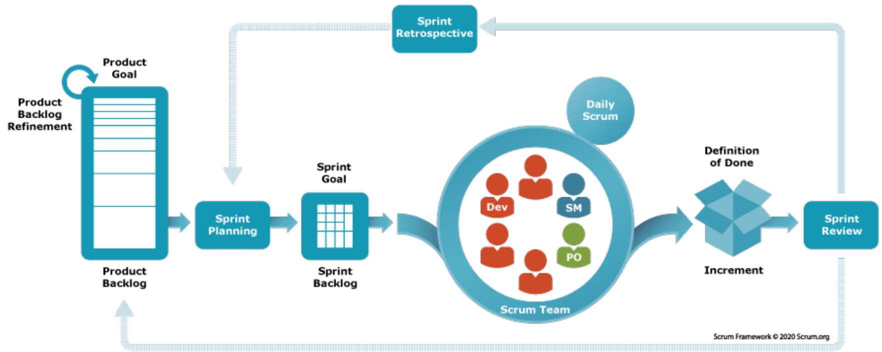

Figure 3.1: Scrum-based Agile methodology[1]

For the development of the MediGo (medical prescription system), the Agile methodology—specifically the Scrum framework—will be adopted. This approach is ideal for projects like MediGo, where the system includes several evolving features such as OCR processing, user authentication, and map-based pharmacy search. Agile supports iterative development through short, time-boxed sprints (typically 1–2 weeks), enabling the team to deliver functional modules such as login, appointments, and prescription handling incrementally. User stories will help define requirements from the perspective of doctors, patients, and pharmacists (e.g., "As a doctor, I want to upload a prescription so it can be read automatically"). Frequent feedback from stakeholders will guide the project, while daily standups, sprint backlogs, and retrospectives will promote collaboration, track progress, and continuously improve the development process. By using Agile, MediGo ensures flexibility, rapid delivery, and alignment with real user needs [3].

3.3 Feasibility Study

The feasibility study for the project was conducted based on 3 parameters and they evaluate its practicality across technical, schedule, and operational dimensions.

3.3.1 Technical Feasibility

The technical feasibility of The medical prescription system(MediGo) is high, given the availability of robust web technologies and tools. The frontend of the web app will be developed using React.js, providing a responsive and user-friendly interface. The backend will be powered by Node.js and Express.js, which are proven technologies for building scalable web applications. For OCR (Optical Character Recognition), Tesseract.js or Google Vision API will be used to extract prescription data from uploaded images [2]. The Google Maps API will be integrated for pharmacy location and navigation services [6]. Additionally, MongoDB will be used for storing user data, prescription details, and pharmacy information.

The key technical challenges include ensuring high OCR accuracy for handwritten prescriptions, handling data privacy concerns, and ensuring reliable location-based services. These challenges can be addressed through continuous model training, advanced encryption protocols (e.g., AES encryption), and optimization strategies for prescription recognition [7].

3.3.2 Operational Feasibility

Operational feasibility is high, as The medical prescription system(MediGo) aligns well with current trends in digital healthcare and patient-centric services [3]. The web app will provide an intuitive and user-friendly platform for patients to upload prescriptions, receive medication details, and access nearby pharmacies. Additionally, the integration with pharmacies and the ability to book appointments makes it a comprehensive solution for medication management and accessibility.

The system will be scalable and can be deployed on web platforms, ensuring that it can handle a growing user base efficiently. While the system can be deployed on cloud infrastructure, periodic updates will be necessary to ensure the accuracy of the medicine database and pharmacy locations.

Ethical and legal considerations, such as HIPAA compliance for patient data and privacy protection, will be integrated during development [7]. Moreover, operational challenges such as pharmacy integration (real-time inventory tracking) and ensuring that pharmacies update their stock regularly will need attention.

3.3.3 Economic Feasibility

The economic feasibility of The medical prescription system(MediGo) is favorable as it leverages existing web technologies and cloud infrastructure to keep costs low. The project will be developed within the available resources and skillsets of the development team, minimizing the need for significant investment in additional hardware or software. Cloud services like AWS or Google Cloud can be used to host the backend, offering scalable pricing models to support growth without significant upfront costs.

Additionally, the system will rely on free or open-source tools for OCR (Tesseract.js), which eliminates licensing costs [2]. While additional development costs may arise for integrating pharmacies and ensuring robust data privacy measures, these costs are manageable within the project budget. The system's initial version can be developed and deployed using existing infrastructure, making it a cost-effective project in the short term.

3.3.4 Schedule Feasibility

The feasibility of the project schedule is moderate with an estimated 3–4 months' duration to complete. The longest tasks include data collection, preprocessing, and model development, and 2–4 weeks for preparing data and 8 weeks or less for model training depending on dataset size. Real-time optimization and testing may require a further 4–6 weeks. Though technically the project is possible to complete within this time frame, model fine-tuning, validation, and bringing it to real-time are tasks that can influence development time.

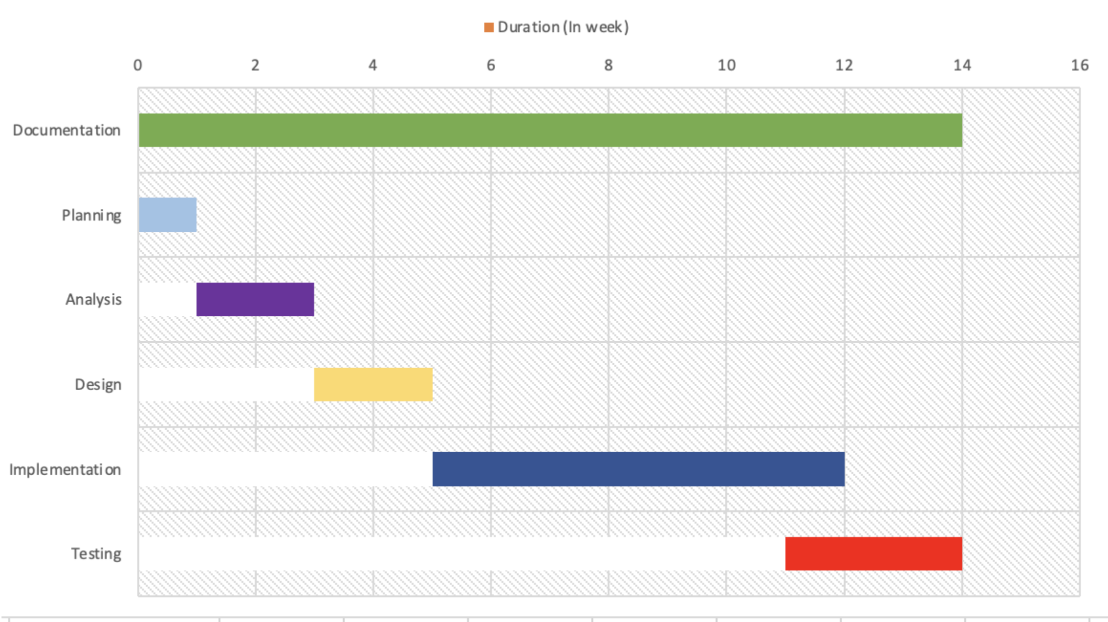

Figure 3.2: Gantt Chart of Project Schedule

3.4 Technology Used

3.4.1 Backend Development

The backend will be built using Node.js, providing a robust and efficient JavaScript runtime environment. To structure the application's API and manage incoming requests, Express.js, a minimalist and flexible framework, will be utilized. This combination enables the development of a scalable and high-performance backend, ensuring smooth integration with the frontend and optimal response times for the entire system.

3.4.2 Database

MongoDB is utilized as the NoSQL database to store various unstructured data components of the system, such as user interaction logs, prescription details, and pharmacy information. It offers flexibility in handling dynamic and schema-less data, providing a scalable and efficient solution for managing large volumes of data while ensuring high performance and availability throughout the application's lifecycle.

3.4.3 Frontend Development

All of these technologies are combined to create a clean, responsive, and user-friendly interface. React serves as the core library for building the user interface, enabling the creation of reusable components and efficient rendering of dynamic content. HTML provides the structural foundation, CSS is used to style the layout, and JavaScript powers interactivity such as form submissions, navigation, and file uploads. Additionally, Tailwind CSS can be integrated to ensure the design remains consistent across various screen sizes.

3.4.4 Testing

To ensure the application's reliability and performance, a comprehensive testing strategy will be implemented. Unit and integration tests will be written using Jest, allowing verification of both individual code modules and the interaction between components. For testing API endpoints and backend functionality, Supertest will be used alongside Jest to simulate HTTP requests and validate responses. Additionally, Postman will support extensive API testing by checking endpoint behavior, response times, and error handling under various conditions. To further enhance quality, user acceptance testing (UAT) will be carried out to collect real-user feedback on usability and overall functionality. This layered testing approach ensures a robust, scalable, and user-friendly application.

3.4.5 Version Control and Project Management

We use Git to keep track of changes in our code so that everyone on the team can work together without overwriting each other's work. Our code is stored on GitHub, which makes it easy for us to share updates, manage tasks, and collaborate. We use features like branches and pull requests to organize our work and make sure everything runs smoothly during development.

CHAPTER 4

System Design

4.1 Flow Chart

A flowchart is a visual diagram that outlines the steps involved in a process or task in a clear and organized manner. It uses different shapes to represent various actions or decisions, and arrows to indicate the sequence in which these steps occur.

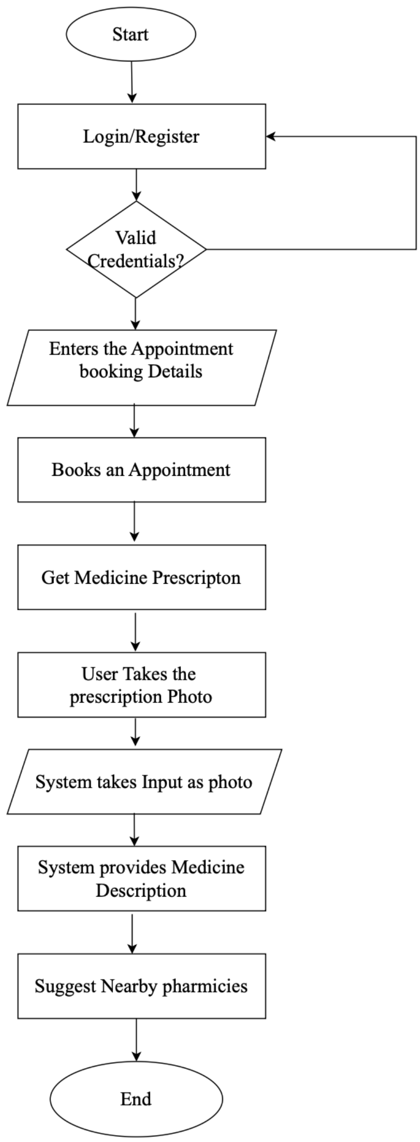

Figure 4.1: Flowchart of The Medical Prescription System(MediGo)

4.2 Block Diagram

A block diagram is a simple drawing that shows how the main parts of a system or process are connected and work together.

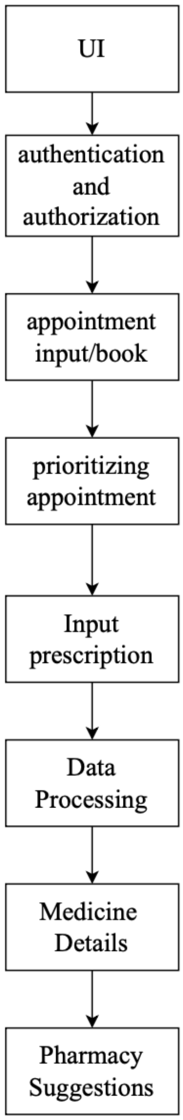

Figure 4.2: Block Diagram of The Medical Prescription System(MediGo)

CHAPTER 5

Expected Outcome

This system is designed to make healthcare easier and more convenient for both patients and doctors. Patients can quickly book, reschedule, or cancel appointments, and doctors can manage their schedules more efficiently. If someone has a handwritten or printed prescription, they can upload a photo of it, and the system will read and convert it into digital text using OCR (optical character recognition). This saves time and helps avoid mistakes that happen with manual entry.

The system can also recognize the names of medicines from the prescription image, which is helpful when the handwriting is hard to read. Once the prescription is processed, users get complete information about their medicines—like how to take them, possible side effects, and precautions—so they can use them safely.

If users need to buy medicine, the system finds nearby pharmacies using their GPS location and even shows the fastest route to get there using map integration. All prescriptions, appointments, and medicines are saved in a digital history, so patients can look back anytime, and doctors can use this information to provide better follow-up care. The best part is that the system is flexible and can grow with new features in the future.

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