

A project

HOSPITAL MANAGEMENT SYSTEM



CSE 200: Software Development Project II

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Abstract

The Hospital Management System (HMS) is a desktop-based software application developed to automate and streamline the core administrative and clinical operations of a hospital. Traditional hospital systems often rely on manual or semi-digital processes, which are time-consuming, error-prone, and inefficient. This project aims to provide a centralized platform for managing patients, medical staff, medicine inventory, and billing operations efficiently.

The system is developed using Python with the CustomTkinter framework for an interactive graphical user interface and SQLite as the backend database for secure and lightweight data management. The HMS supports functionalities such as patient registration, staff management, medicine inventory control, prescription handling, and automated billing. Role-based usage supports doctors, nurses, and pharmacists to perform their respective tasks effectively.

The project follows a Hybrid Software Development Life Cycle (SDLC) model, combining structured planning with iterative development. This ensures reliability, scalability, and maintainability of the system. The Hospital Management System enhances operational efficiency, reduces paperwork, minimizes human error, and ensures accurate record-keeping, making it suitable for small to medium-sized healthcare facilities.

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Chapter 1

INTRODUCTION

1.1 Problem Specification

Hospitals handle large volumes of sensitive data related to patients, staff, medicines, and billing. In many healthcare facilities, these records are maintained manually or using fragmented digital systems, leading to inefficiencies such as data redundancy, loss of information, delayed services, and human errors. Managing prescriptions and medicine inventory manually can also cause stock mismatches and billing inaccuracies.

These challenges highlight the need for an integrated Hospital Management System that can automate daily hospital operations, ensure accurate data storage, and provide fast access to information for doctors, nurses, and pharmacists. This project was initiated to address these issues by developing a reliable and user-friendly software solution.

1.2 Objectives

The main objectives of the Hospital Management System are:

- To automate patient registration and record management
- To manage hospital staff information efficiently
- To maintain an accurate medicine inventory
- To generate prescriptions and billing records automatically
- To reduce paperwork and manual errors
- To provide a secure and user-friendly desktop application

1.3 Scope

The scope of this project includes patient management, staff management, medicine inventory control, and billing with prescription handling. The system is designed as a desktop application suitable for Windows and Linux platforms. It is intended for use by doctors, nurses, and pharmacists within a hospital environment. Advanced features such as online appointment booking, cloud storage, and mobile access are outside the current scope but can be implemented in future versions.

1.4 Organization of Project Report

This report is organized into six chapters. Chapter 1 introduces the project and its objectives. Chapter 2 discusses the background and existing systems. Chapter 3 describes system analysis and design aspects. Chapter 4 explains the implementation details. Chapter 5 provides a user manual for operating the system. Chapter 6 concludes the report with limitations and future enhancements.

Chapter 2

BACKGROUND

2.1 Existing System Analysis

Existing hospital management systems are either fully manual or partially computerized. Manual systems rely on paper records, which are prone to loss and errors. Semi-digital systems often use separate software for billing, inventory, and patient records, resulting in data inconsistency. These systems lack integration, real-time updates, and efficient reporting mechanisms.

2.2 Supporting Literatures

This project utilizes concepts from software engineering, database management systems, and human-computer interaction. Python programming principles, relational database design, and GUI development techniques were applied. SQLite was chosen for its simplicity and efficiency, while CustomTkinter was used to create a modern and responsive user interface.

Chapter 3

SYSTEM ANALYSIS & DESIGN

3.1 Technology & Tools

- Programming Language: Python 3
- GUI Framework: CustomTkinter
- Database: SQLite
- Development Environment: VS Code / PyCharm
- Platform: Windows and Linux

3.2 Model & Diagram

3.2.1 SDLC Model (Hybrid)

The Hybrid SDLC model combines the structured planning of the Waterfall model with the flexibility of Agile development. This approach allows requirement analysis and system design to be planned in advance while enabling iterative development and testing during implementation.

3.2.2 System Architecture

The system follows a layered architecture consisting of a presentation layer (GUI), application logic layer (Python functions), and database layer (SQLite). Each module interacts with the database through secure queries, ensuring data integrity.

3.2.3 Use Case Diagram

The primary users of the system are Doctors, Nurses, and Pharmacists. Each user can manage patients, view records, handle prescriptions, and access inventory based on their role.

3.2.4 Context Level Diagram

The HMS acts as a central system that interacts with users and the database. Users provide input data, and the system processes and stores information securely.

3.2.5 Data Flow Diagram

Data flows from user input to processing modules and then to the database. Output is displayed through reports, tables, and billing information.

3.2.6 Database Schema

The database consists of four main tables: Patients, Staff, Inventory, and Prescriptions. Each table is linked using primary and foreign keys to maintain relational integrity.

3.2.7 Algorithms / Flowchart

The system follows structured algorithms for login authentication, CRUD operations, stock verification, billing calculation, and transaction management.

Chapter 4

IMPLEMENTATION

IMPLEMENTATION

4.1 Interface / Front-End Design

The front-end is designed using CustomTkinter to provide a clean, modern, and user-friendly interface. The system uses tab-based navigation for patient management, inventory, staff management, and billing.

4.2 Back-End Development

SQLite is used as the backend database. Python handles all CRUD operations, validations, and transaction management. Context managers ensure safe database connections.

4.3 Modules

- Login Module
- Patient Management Module
- Medicine Inventory Module
- Staff Management Module
- Billing and Prescription Module

Chapter 5

USER MANUAL

USER MANUAL

5.1 System Requirements

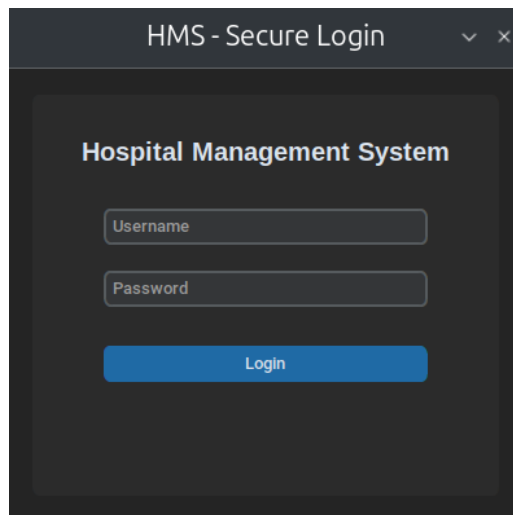
5.1.1 Hardware Requirements

- Minimum 4 GB RAM
- Intel i3 or equivalent processor
- 200 MB free disk space

5.1.2 Software Requirements

- Windows or Linux OS
- Python 3.x
- SQLite

5.2 User Interfaces



HMS - Secure Login

Hospital Management System

Username

Password

Login

Log In

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HMS Dashboard - Management System

Patient ManagementMedicine InventoryStaff ManagementBilling & Prescriptions

Patient Details

Search Patients...

ID

Name

Age

Disease

Add Patient

Update

Delete

Clear

ID	Name	Age	Disease
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Patient Management

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HMS Dashboard - Management System

Patient ManagementMedicine InventoryStaff ManagementBilling & Prescriptions

Staff Details

Search Staff by ID, Name, or Role...

Staff ID

Name

Role

Doctor

Department

Add Staff

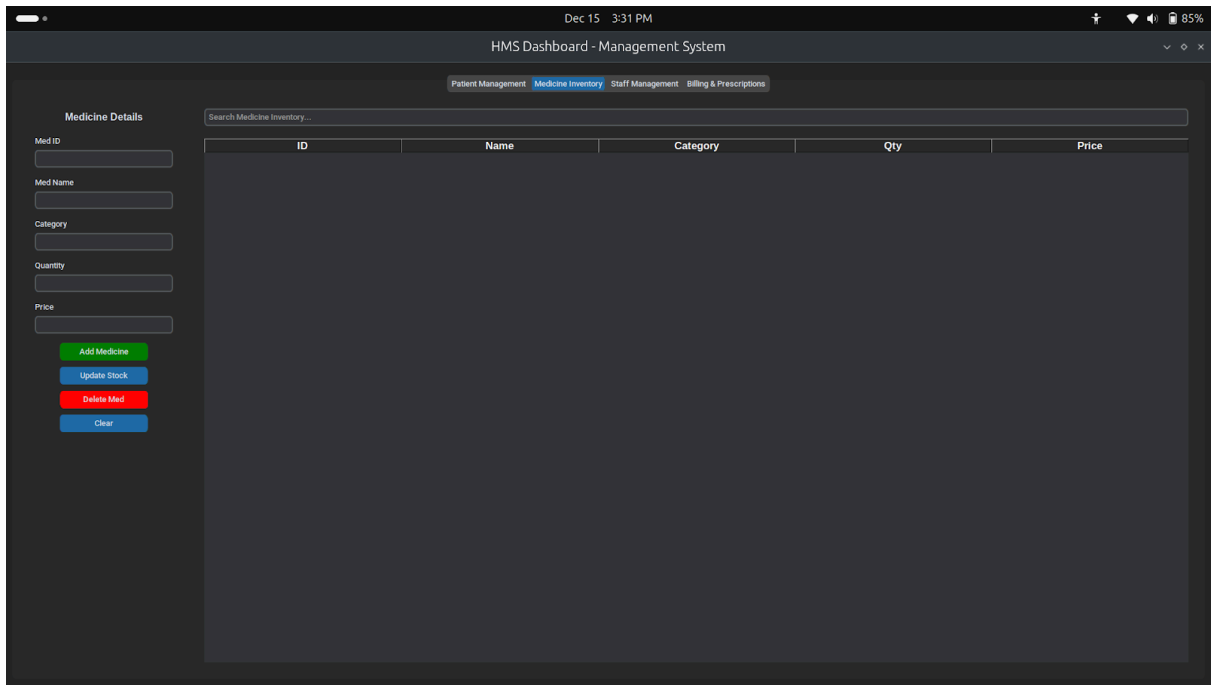
Update Staff

Delete Staff

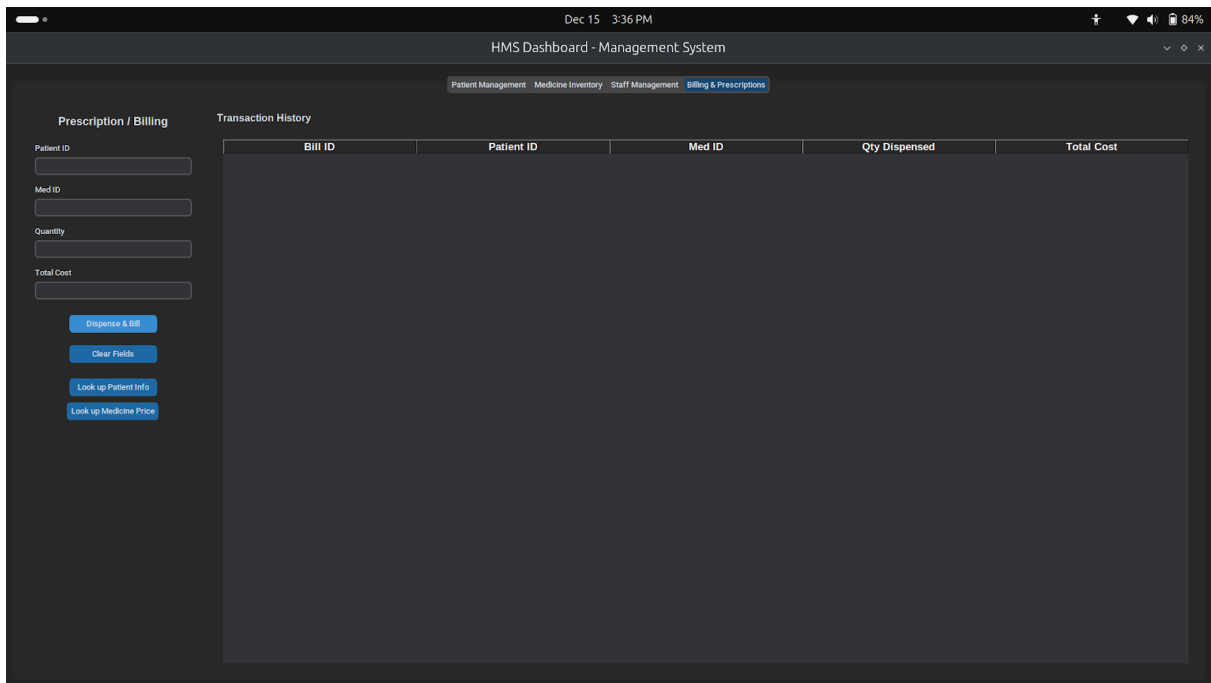
Clear

ID	Name	Role	Department
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Staff Management



Medicine Inventory



Billing & Prescription

The system provides separate panels for managing patients, staff, medicines, and billing. Login credentials are required to access the dashboard.

Chapter 6

CONCLUSION

6.1 Conclusion

The Hospital Management System successfully automates essential hospital operations, improving efficiency and accuracy. The system demonstrates effective use of Python, GUI design, and database management concepts.

6.2 Limitations

- Limited to desktop platforms
- No online or cloud-based access
- Single-user authentication

6.3 Future Works

- Online appointment system
- Multi-user role-based authentication
- Cloud database integration
- Mobile application support

References

1. Lucidchart. "What Is a Data Flow Diagram."
2. InterviewBit. "System Architecture Design."
3. SQLite Documentation.
4. Python Official Documentation.

Appendix A

Source code of the Hospital Management System is included as an appendix.