

VISVESVARAYA TECHNOLOGICAL UNIVERSITY

Jnana Sangama, Belagavi - 590 018



DATABASE MANAGEMENT SYSTEM MINI-PROJECT ON

“ATM - INTERFACE”

Submitted in partial fulfilment of the requirements for the IV Semester (BCS403)

Bachelor of Engineering

in

COMPUTER SCIENCE AND ENGINEERING

Submitted By

M D ABHINAV KARTHIK 1VK22CS037

LAVANYA K M 1VK22CS036

MAHESHA R V 1VK22CS040

K ARAVIN REDDY 1VK22CS030

Under the Guidance of

Prof. Deepthi T K

Asst. Professor, Department of CSE-VKIT



JANATHA EDUCATION SOCIETY

VIVEKANANDA INSTITUTE OF TECHNOLOGY

Gudimavu, Kumbalgodu(P), Kengeri(H), Bengaluru -560074

2023-2024

ACKNOWLEDGEMENT

An engineer with only theoretical knowledge is not a complete engineer. Practical knowledge is very important to develop and applying engineering skills.

It is my pleasure to be indebted to various people, who directly or indirectly contributed to the development of this work and who influenced my thinking, behavior and acts during the course of my study.

We wholeheartedly express my sincere thanks to Dr. K M Ravi Kumar, our beloved Principal, Vivekananda Institute of Technology for the encouragement and support. I also wish to express our deep sense of gratitude to Dr. Vidya A, Professor and HOD, Department of Computer Science and Engineering for providing us with all facilities necessary for making DBMS mini-project a great success.

We would like to extend a deep sense of gratitude to our guide Mrs. Deepthi T K, Assistant professor, Department of Computer Science and Engineering for providing us with the required guidance and in preparing the report during DBMS mini-project.

Ultimately, we express our deep sense of gratitude to all the faculty members of VKIT for excellent guidance in our mini-project work.

DECLARATION

We, MD ABHINAV KARTHIK (1VK22CS037), LAVANYA K M (1VK22CS036), MAHESHA R V (1VK22CS040) and K ARAVIN REDDY (1VK22CS030) of Fourth Semester, Bachelor of Engineering in the Department of Computer Science and Engineering, Vivekananda Institute of Technology, Bengaluru hereby declare that our DBMS mini-project entitled “ATM - INTERFACE” has been submitted to the institution. We are herewith submitting the report in partial fulfilment for the award of the degree of Bachelor of Engineering in Computer Science and Engineering.

M D ABHINAV KARTHIK	1VK22CS037
LAVANYA K M	1VK22CS036
MAHESHA R V	1VK22CS040
K ARAVIN REDDY	1VK22CS030

ABSTRACT

The ATM Interface System addresses the challenge of developing a secure and user-friendly platform for banking transactions, simulating real-world ATM functionalities. The approach involves creating a full-stack application using Python for backend logic, SQLite for database management, and Tkinter for the graphical user interface. Key features include account creation, balance checking, deposits, withdrawals, and money transfers. The project demonstrates a functional and intuitive interface paired with a robust backend capable of handling various transactions securely. This system significantly enhances understanding of financial systems and provides practical experience in software development and database management. In a broader context, the project serves as a prototype for educational purposes, illustrating essential banking operations and security measures within a controlled environment. It underscores the importance of integrating security and usability in financial applications, contributing to advancements in fintech education and development.

Key Functionalities of the ATM Interface System:

- 1. Account Registration:** Capturing essential details such as user name, address, email, phone number, and generating a unique 4-digit account number.
- 2. User Authentication:** Secure login mechanism requiring account number and password, ensuring that only authorized users can access their accounts.
- 3. Balance Checking:** Allowing users to view their current account balance.
- 4. Deposits:** Enabling users to deposit money into their accounts, updating the balance accordingly.
- 5. Withdrawals:** Allowing users to withdraw money from their accounts, ensuring sufficient balance and updating the records.
- 6. Money Transfers:** Facilitating the transfer of funds between accounts within the system, ensuring accurate and secure transactions.

- 7. Transaction History:** Providing users with a detailed history of their transactions, including deposits, withdrawals, and transfers.
- 8. Password Management:** Allowing users to change their password, enhancing security.
- 9. Logout Functionality:** Ensuring users can securely log out of their accounts to prevent unauthorized access.

The project utilizes SQLite for database creation and management, ensuring data integrity and efficient query processing. The system is designed to be user-friendly with an intuitive interface created using Tkinter, aiming to reduce user complexity and enhance the overall efficiency of financial transactions.

This ATM Interface System project not only addresses the need for a practical and educational banking simulation but also lays the groundwork for future enhancements and applications in real-world financial systems. By integrating essential banking functionalities with a secure and user-friendly design, the project contributes to a deeper understanding of banking operations, security protocols, and database management, ultimately enhancing the educational experience for aspiring software developers and engineers.

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1. INTRODUCTION

With the increasing reliance on digital banking, the need for secure, efficient, and user-friendly financial transaction systems has become more critical than ever. This project aims to address this necessity by developing an ATM Interface System using Database Management System (DBMS) technologies. The system is designed to simulate real-world banking operations, providing a practical platform for understanding and implementing essential banking functions in a controlled environment.

Objective

The primary objective of this mini-project is to design and implement an ATM Interface System that efficiently manages financial transactions and account details. The system aims to:

- 1. Account Management:** Enable secure creation, modification, and deletion of user accounts with unique account numbers and personal details.
- 2. Transaction Processing:** Handle key banking operations such as deposits, withdrawals, and money transfers with real-time balance updates.
- 3. User Authentication:** Implement secure login mechanisms to ensure that only authorized users can access their accounts.
- 4. Transaction History:** Provide users with detailed records of their transactions, including deposits, withdrawals, and transfers.

System Features

Database Management System (BCS403)

- 1. User Authentication:** Secure login for users requiring account number and password to access the system.
- 2. Account Registration:** Module to add new users with unique account numbers, capturing essential personal details.
- 3. Balance Checking:** Real-time display of account balance, allowing users to track their financial status.
- 4. Transaction Processing:** Logic to facilitate deposits, withdrawals, and money transfers while ensuring data integrity.
- 5. Transaction History:** Management of detailed transaction records, accessible to users for review.
- 6. Password Management:** Option for users to change their passwords, enhancing account security.

Technologies Used

- Database:** SQLite, a lightweight SQL-based relational database, is used to store and manage account and transaction data.
- Backend:** Python is employed for server-side scripting to handle the business logic of the system.
- Frontend:** The graphical user interface is developed using Tkinter, a built-in Python module, to create a user-friendly interaction experience.
- Security:** Implement security measures such as authentication and data validation to protect user information and financial transactions.

Benefits

- Enhanced Security:** Ensures that user accounts and transactions are protected through secure authentication and data handling.

- **Efficient Transaction Management:** Streamlines banking operations, enabling users to perform financial transactions quickly and accurately.
- **User-Friendly Interface:** Provides an intuitive and accessible interface, reducing the learning curve for users.
- **Educational Value:** Serves as a practical tool for learning and understanding database management and software development in a financial context.

TOOLS AND LIBRARIES:

1. **Tkinter** - Python's standard GUI (Graphical User Interface) toolkit.
2. **Random** - Python module used for generating random numbers.
3. **SQLite3** - A C-language library that provides a lightweight disk-based database.
4. **Datetime** - Python module used to work with dates and times.
5. **Message Box** - Tkinter module used to display message boxes for interaction.
6. **Python** - The programming language used to develop the application.

Tkinter: Tkinter is Python's standard GUI (Graphical User Interface) toolkit, used to create the visual interface of the application. It provides a variety of widgets such as buttons, labels, and text fields that allow developers to design and implement user-friendly and interactive desktop applications. Tkinter simplifies the process of building a graphical interface by providing a consistent and easy-to-use API.

Random: Random is a Python module used for generating random numbers. It provides various functions to produce random integers, floating-point numbers, and even shuffle sequences. In the ATM application, the random module is used to generate unique account numbers or other elements that require randomness, ensuring variability and security in the application's operations.

SQLite3: SQLite3 is a C-language library that provides a lightweight, disk-based database. It is used within the application to store and manage data locally without requiring a separate server. SQLite3 is integrated directly into the application, making it an ideal choice

for managing user data, transaction histories, and other information in a reliable and efficient manner.

Datetime: Datetime is a Python module used to work with dates and times. It provides classes for manipulating dates, times, and intervals, allowing developers to perform operations such as formatting dates, calculating differences between dates, and managing timestamps. In the ATM application, the datetime module is utilized to record transaction times, manage user sessions, and handle other time-related functionalities.

MessageBox: MessageBox is a module within Tkinter used to display message boxes for user interaction. It provides a simple way to present information, warnings, errors, and confirmation dialogs to the user. In the ATM application, MessageBox is employed to alert users about successful transactions, prompt for confirmations, or notify them of errors, enhancing the overall user experience.

Python: Python is the programming language used to develop the entire application. Known for its simplicity and readability, Python allows developers to write clear and concise code. Its extensive standard library and supportive community make it a versatile and powerful tool for building the backend logic, managing data, and creating the graphical interface of the ATM application.

SPECIFICATION REQUIREMENT:

Functional Requirements

1. User Management:

Frontend Features:

- **User Registration:** The registration page allows users to enter personal information including first name, last name, email, phone number, address, and a password (with confirmation). It provides a registration button to create a new account.
- **Login:** Users can log in by providing their User ID and password. The login page verifies credentials and grants access to authenticated users.

- **Account Menu:** Once logged in, users can access a menu to navigate to various functions like Transfer, Withdraw, Deposit, Check Balance, Change Password, and Logout.
- **Change Password:** Users can change their existing password by providing the old password and entering a new one.

Backend Features:

- **Account Creation:** The backend creates a new user account in the database with a unique User ID, name, PIN, and default initial balance. Additional details such as email, phone number, and address are also stored.
- **Authentication:** Verifies the user's credentials (User ID and PIN) during login and password change operations.
- **Password Management:** Handles password updates securely, ensuring the new password is stored in the database.

2. Bank Management:

Frontend Features:

- **Deposit:** Allows users to deposit funds into their account. Users specify the amount and provide their password for verification.
- **Withdraw:** Users can withdraw funds from their account. The withdrawal process involves entering the amount and password verification.
- **Transfer:** Facilitates transferring funds between accounts. Users input the recipient's User ID, the amount, and their password.
- **Check Balance:** Displays the current balance of the user's account.

Backend Features:

- **Transaction Processing:** Handles deposit, withdrawal, and transfer requests by updating account balances and recording transactions in the database.

- **Transaction History:** Records all transactions including deposits, withdrawals, and transfers in a transactions table, which is useful for auditing and tracking user activities.
- **Balance Management:** Updates and retrieves user balances from the database, ensuring accurate and real-time balance information.
- **Transaction Records:** Maintains a log of all transactions with timestamps, types, and details, providing a clear history of user activities.

Implementation Details:

1. Database Initialization:

- Creates tables for users and transactions, ensuring that data for user accounts and transactions are stored persistently.

2. User Interaction:

- **Registration:** Generates a unique User ID and initializes user accounts with a default balance and user-provided details.
- **Login:** Authenticates users by checking their credentials against the database.
- **Account Operations:** Processes deposits, withdrawals, and transfers by updating user balances and recording each transaction.

3. Security and Validation:

- Ensures that only authenticated users can perform sensitive operations.
- Validates password changes and transaction requests to prevent unauthorized access.

4. Error Handling:

- Provides feedback to users for errors such as incorrect passwords, insufficient funds, or invalid recipient details.

5. User Experience:

- Offers a user-friendly interface with clear navigation and informative messages to enhance usability and accessibility.

This comprehensive approach ensures that both user management and bank management functionalities are effectively implemented, providing a robust and secure ATM interface.

Technical Requirements

1. Libraries and Modules

- **tkinter:** GUI creation.
- **sqlite3:** SQLite database operations.
- **random:** Generating random user IDs.
- **datetime:** Handling timestamps.

2. Database Schema

- **users Table**
 - **user_id (TEXT, PRIMARY KEY):** Unique user ID.
 - **pin (TEXT):** User's PIN.
 - **name (TEXT):** User's name.
 - **balance (REAL):** User's balance.
 - **email (TEXT):** User's email.
 - **phone_number (TEXT):** User's phone number.
 - **address (TEXT):** User's address.
 - **details (TEXT):** Additional user details (comma-separated).
- **transactions Table**
 - **id (INTEGER, PRIMARY KEY, AUTOINCREMENT):** Unique transaction ID.
 - **user_id (TEXT):** ID of the user.
 - **amount (REAL):** Transaction amount.
 - **timestamp (TEXT):** Date and time of the transaction.
 - **type (TEXT):** Type of transaction (e.g., Withdrawal, Deposit, Transfer).

- **recipient_user_id (TEXT, NULL):** Recipient's user ID for transfers.

3. Class Definitions

- **User Class**
 - **Attributes:** user_id, pin, name, balance, email, phone_number, address, details, transactions.
 - **Method:** display_balance().
- **ATM Class**
 - **Initialization:** Sets up database and GUI.
 - **Database Methods:**
 - **_connect_db():** Connects to SQLite database.
 - **_initialize_database():** Creates tables if not existing.
 - **create_account(), update_user_balance(), update_user_password(), get_user_balance(), get_user(), authenticate_user(), record_transaction().**
 - **GUI Methods:**
 - **create_main_menu(), clear_window(), show_register(), show_login(), show_account_menu(), show_transfer(), show_withdraw(), show_deposit(), show_check_balance(), show_change_password().**
 - **Transaction Methods:**
 - **perform_withdrawal(), perform_deposit(), perform_transfer().**

4. Error Handling

- **Validation:** Passwords matching during registration; sufficient balance for transactions.
- **User Feedback:** Error messages and success notifications via messagebox.

5. Functional Requirements

- **Registration:** User sign-up with details and initial balance.
- **Login:** Authenticate with ID and PIN.
- **Account Management:**

- Withdraw, deposit, transfer, check balance, change password.
- Transaction History: Record transactions with timestamps.

6. User Interface

- Design: tkinter for labels, buttons, and entry fields with specified font settings and colors.

QUERIES:

1. Main Menu (create_main_menu)

- Purpose: This is the initial screen users see when they start the application.
- Elements:
 - Title Label: Displays "MD's A.T.M" in a large, dark blue font.
 - Login Button: Takes the user to the login page.
 - Register Button: Takes the user to the registration page.
 - Quit Button: Exits the application.

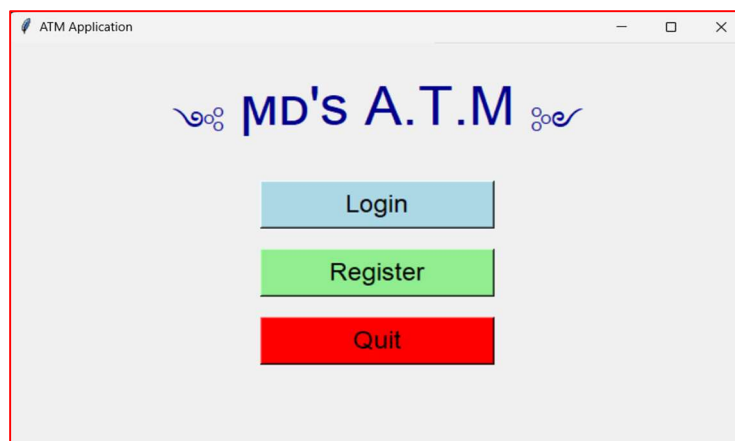


Figure 1 : Main Page

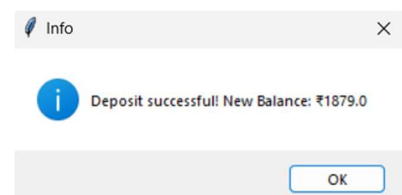


Figure 2 : Message Box

2. Registration Page (show_register)

- Purpose: Allows new users to create an account.
- Elements:
 - Title Label: Displays "Register with MD's A.T.M" and "Your financial Partner" in large fonts.
 - Entry Fields:
 - First Name
 - Last Name
 - Email
 - Phone Number
 - Address
 - Password
 - Confirm Password
 - Register Button: Creates a new account if the passwords match, displays a success message, and returns to the main menu.
 - Back to Menu Button: Returns to the main menu without making changes.

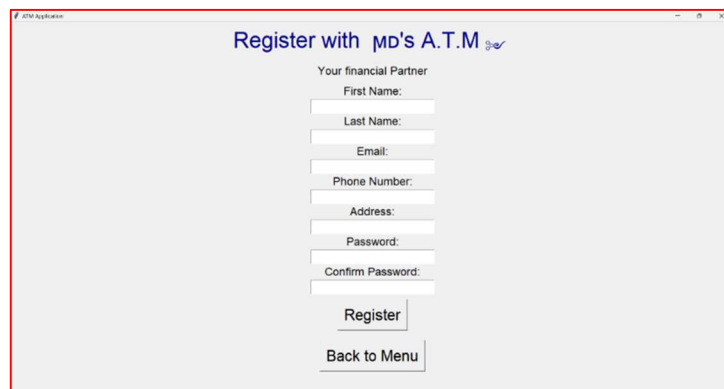
The image shows a web application window titled "Register with MD's A.T.M". Below the title is the subtitle "Your financial Partner". The form contains several input fields: "First Name:", "Last Name:", "Email:", "Phone Number:", "Address:", "Password:", and "Confirm Password:". At the bottom of the form are two buttons: "Register" and "Back to Menu". The entire form is enclosed in a red rectangular border.

Figure 2 : Register Page

3. Login Page (show_login)

- Purpose: Allows users to log into their accounts.
- Elements:
 - Title Label: Displays "Login to MD's A.T.M" in a large font.
 - Entry Fields:
 - User ID
 - Password
 - Login Button: Authenticates the user and takes them to the account menu if successful, or displays an error message.
 - Back to Menu Button: Returns to the main menu.

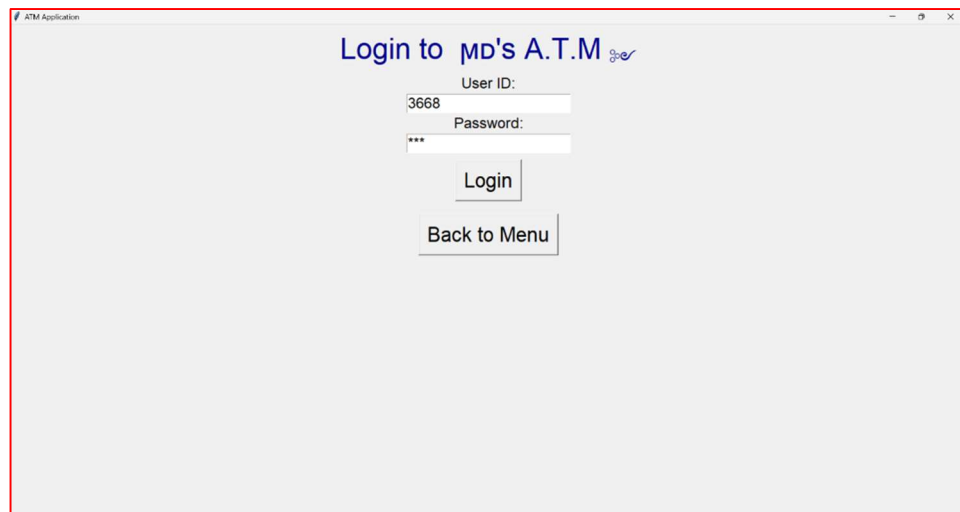


Figure 3 : Login Page

4. Account Menu (show_account_menu)

- Purpose: Provides access to various account functionalities after a user logs in.
- Elements:
 - Title Label: Displays "Navigate Your Finances with Confidence" in a large font.
 - Buttons for Account Functions:
 - Transfer: Takes the user to the transfer page.
 - Withdraw: Takes the user to the withdrawal page.
 - Deposit: Takes the user to the deposit page.
 - Check Balance: Takes the user to the balance check page.
 - Change Password: Takes the user to the change password page.
 - Logout: Logs the user out and returns to the main menu.

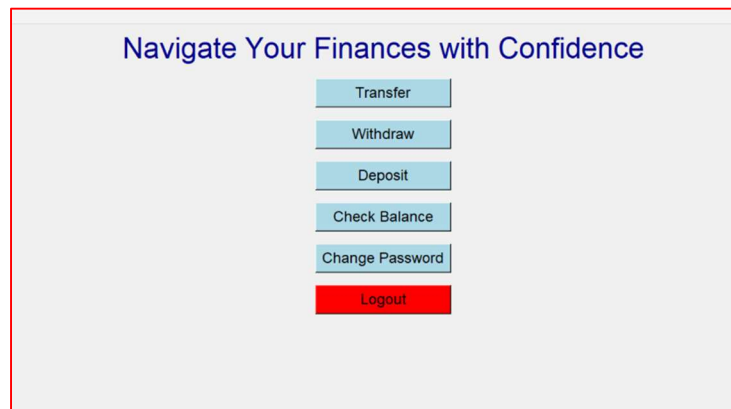
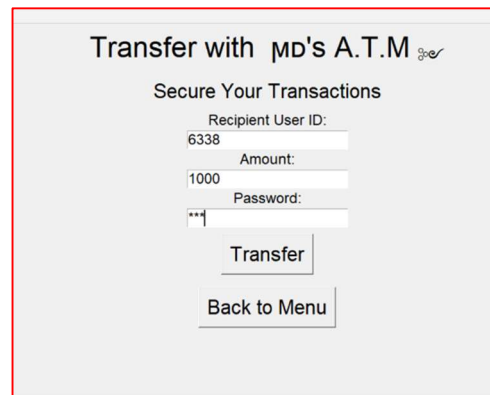


Figure 4 : Dashboard of MD's ATM

5. Transfer Page (show_transfer)

- Purpose: Allows users to transfer money to another account.
- Elements:
 - Title Label: Displays "Transfer with MD's A.T.M" and "Secure Your Transactions" in large fonts.
 - Entry Fields:
 - Recipient User ID
 - Amount
 - Password



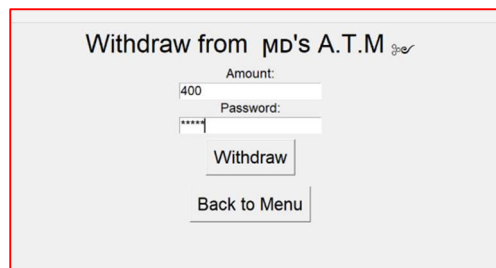
The screenshot shows a web interface for transferring money. At the top, it says "Transfer with MD's A.T.M" with a small logo. Below that, it says "Secure Your Transactions". There are three input fields: "Recipient User ID:" with the value "6338", "Amount:" with the value "1000", and "Password:" with masked characters. Below the input fields are two buttons: "Transfer" and "Back to Menu".

Figure 5 : Transfer Page

- Transfer Button: Performs the transfer if the password is correct, displays the result, and returns to the account menu.
- Back to Menu Button: Returns to the account menu.

6. Withdrawal Page (show_withdraw)

- Purpose: Allows users to withdraw money from their account.
- Elements:
 - Title Label: Displays "Withdraw from MD's A.T.M" in a large font.
 - Entry Fields:
 - Amount
 - Password



The screenshot shows a web interface for withdrawing money. At the top, it says "Withdraw from MD's A.T.M" with a small logo. Below that, there are two input fields: "Amount:" with the value "400" and "Password:" with masked characters. Below the input fields are two buttons: "Withdraw" and "Back to Menu".

Figure 6 : Withdrawal Page

- Withdraw Button: Performs the withdrawal if the password is correct, displays the result, and returns to the account menu.
- Back to Menu Button: Returns to the account menu.

7. Deposit Page (show_deposit)

- Purpose: Allows users to deposit money into their account.
- Elements:
 - Title Label: Displays "Elevate Your Money Management with MD's A.T.M" in a large font.
 - Entry Fields:
 - Amount
 - Password
 - Deposit Button: Performs the deposit if the password is correct, displays the result, and returns to the account menu.
 - Back to Menu Button: Returns to the account menu.

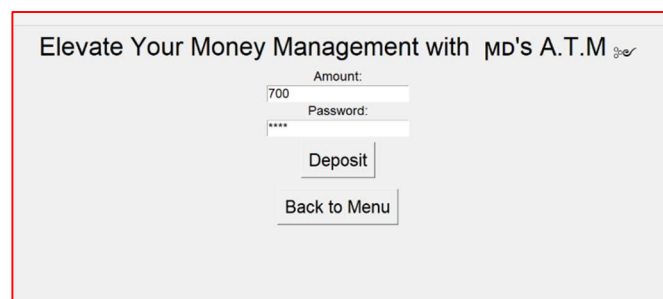
The screenshot shows a web interface for a deposit page. At the top, there is a title "Elevate Your Money Management with MD's A.T.M" followed by a small logo. Below the title, there are two input fields: "Amount:" with the value "700" and "Password:" with the value "****". Below these fields are two buttons: "Deposit" and "Back to Menu". The entire interface is enclosed in a red rectangular border.

Figure 7 : Deposit Page

8. Check Balance Page (show_check_balance)

- Purpose: Allows users to check their current balance.
- Elements:

- Title Label: Displays "Track Your Financial Position with MD's A.T.M" in a large font.
- Balance Display: Shows the current balance of the user.
- Back to Menu Button: Returns to the account menu.

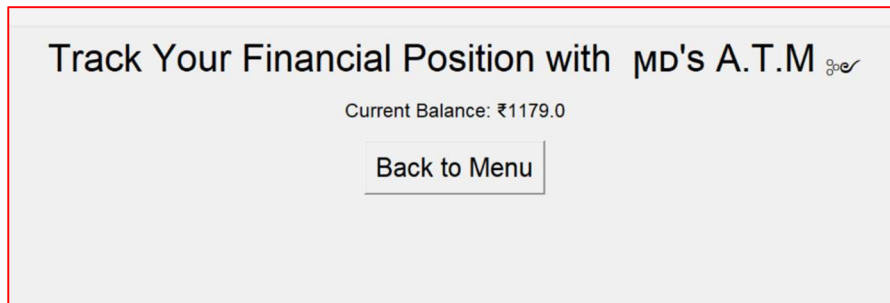
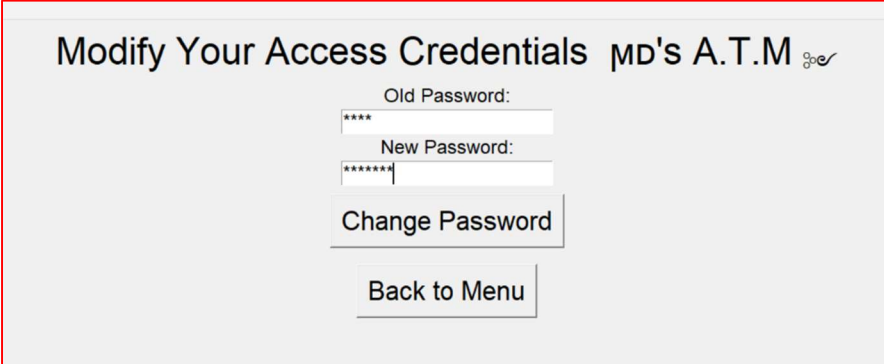


Figure 8 : Balance Page

9. Change Password Page (show_change_password)

- Purpose: Allows users to change their password.
- Elements:
 - Title Label: Displays "Modify Your Access Credentials with MD's A.T.M" in a large font.
 - Entry Fields:
 - Old Password
 - New Password
 - Change Password Button: Updates the password if the old password is correct, displays a success message, and returns to the account menu.
 - Back to Menu Button: Returns to the account menu.



Modify Your Access Credentials MD's A.T.M

Old Password:

New Password:

Change Password

Back to Menu

Figure 9 : Change Pass Key

Common Functionalities

- **Database Operations:** The code includes methods for connecting to and interacting with an SQLite database. This includes creating tables, inserting data, updating records, and querying information.
- **Transaction Recording:** Every financial transaction (withdrawal, deposit, transfer) is recorded in a transactions table with a timestamp, type, and optional recipient user ID.

This structure provides a comprehensive ATM simulation, allowing users to manage their accounts, perform transactions, and modify their details through a GUI.

RELATIONSHIP

Patient and Allotment

- **One-to-Many relationship:** One patient can have multiple allotment records (if re-admitted), but each allotment is for one patient.

Bed and Allotment

- **One-to-Many relationship:** One bed can have multiple allotment records over time, but each allotment is for one bed at a time.

Hospital and Bed

- **One-to-Many relationship:** One hospital can have multiple beds.

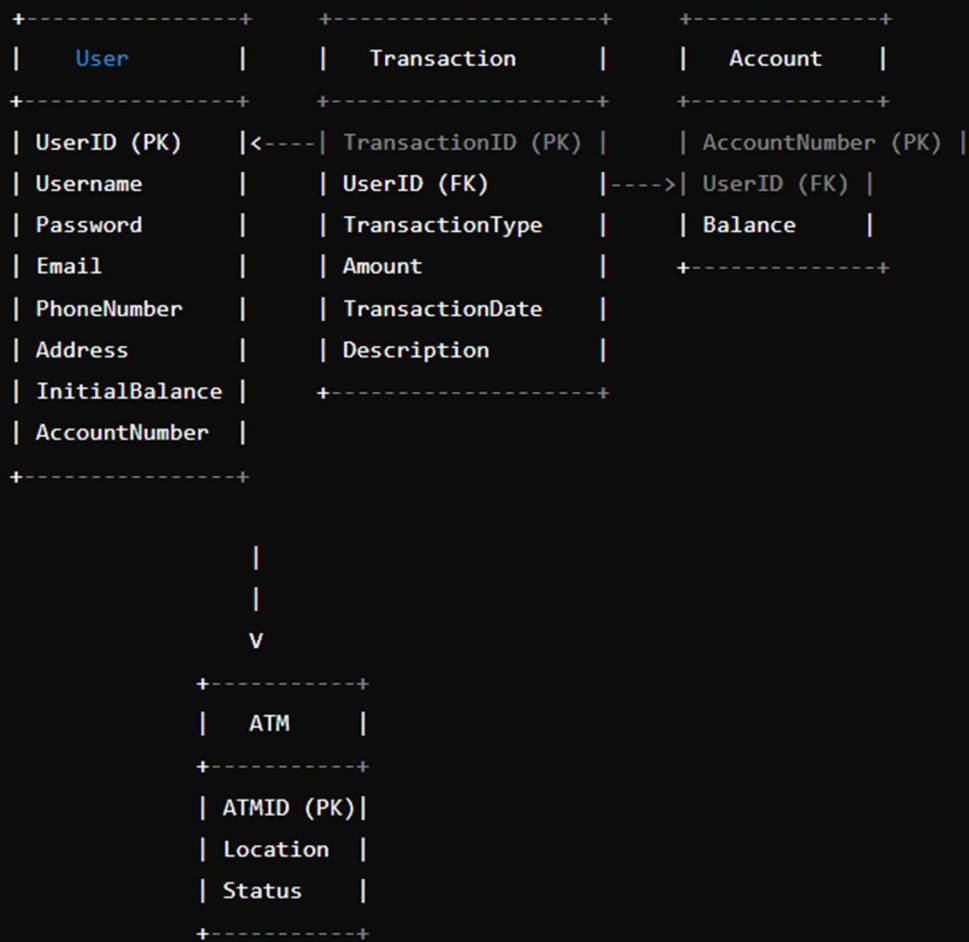
Hospital and Staff

- **One-to-Many relationship:** One hospital can have multiple staff members.

Staff and User

- **One-to-One relationship:** One staff member has one user account.

ER DIAGRAM :



SCHEMA :

1. Users Table Schema

Column	Data Type	Constraints	Description
user_id	TEXT	PRIMARY KEY	Unique identifier for each user.
pin	TEXT	NOT NULL	User's PIN.
name	TEXT	NOT NULL	User's full name.
balance	REAL	NOT NULL	User's account balance.
email	TEXT		User's email address.
phone_number	TEXT		User's phone number.
address	TEXT		User's address.
details	TEXT		Additional personal details (comma-separated).

2. Transactions Table Schema

Column	Data Type	Constraints	Description
id	INTEGER	PRIMARY KEY	Unique identifier for each transaction.
user_id	TEXT	NOT NULL	Foreign key linking to users.user_id.
amount	REAL	NOT NULL	Amount of the transaction.
timestamp	TEXT	NOT NULL	Date and time of the transaction.
type	TEXT	NOT NULL	Type of transaction (e.g., Deposit, Withdrawal).
recipient_user_id	TEXT		Foreign key linking to users.user_id (optional, for transfers).

RESULT:

The provided Python script is a Tkinter-based ATM application with a SQLite database backend. It includes user registration, login, and account management features. Users can register with personal details and a password, which is stored in the database along with their balance. The application allows users to perform transactions like withdrawals, deposits, and transfers, all requiring password verification. The script handles user authentication, balance updates, and transaction recording, displaying relevant messages through pop-ups. The main menu includes options to login, register, or quit, with additional features accessible after login.

Future scope:

1. Enhanced Security:

- **Encryption:** Implement encryption for storing user PINs and sensitive data to improve security.
- **Two-Factor Authentication (2FA):** Add 2FA for additional login security.

2. User Interface Improvements:

- **Responsive Design:** Enhance the UI for better usability on different screen sizes.
- **Dark Mode:** Introduce a dark mode option for user preference.

3. Additional Features:

- **Account Types:** Support multiple account types (e.g., savings, checking) with different functionalities.
- **Transaction History:** Provide a detailed transaction history view with filtering options.
- **Account Statements:** Allow users to generate and download account statements in various formats (e.g., PDF).

4. Error Handling and Validation:

- **Input Validation:** Add more robust input validation to prevent incorrect or malicious inputs.
- **Error Logging:** Implement logging of errors and transactions for troubleshooting and auditing.

5. User Experience Enhancements:

- **Notifications:** Send email or SMS notifications for transactions and account activities.
- **Accessibility:** Improve accessibility features for users with disabilities.

6. Integration with External Systems:

- **Bank Integration:** Integrate with real banking systems for more realistic simulation.
- **Payment Systems:** Support for integrating with payment gateways for deposits and withdrawals.

7. Scalability and Performance:

- **Database Optimization:** Optimize database performance for handling larger volumes of data.
- **Scalability:** Prepare the application for scaling to support more users and transactions.

8. Mobile Compatibility:

- **Mobile App:** Develop a mobile version of the application for iOS and Android platforms.

These enhancements can significantly improve the functionality, security, and user experience of the ATM application.

CONCLUSION:

The ATM application provides a robust starting point for simulating essential banking functions, including user registration, balance management, and transaction handling. Currently, it allows users to create accounts, log in, check balances, and perform basic transactions like deposits, withdrawals, and transfers. This foundational setup demonstrates core functionalities and provides a user-friendly interface for managing personal finances. The simplicity and effectiveness of these features make the application a valuable tool for understanding the fundamental operations of an ATM system.

Looking to the future, there are significant opportunities to enhance the application's capabilities. Integrating advanced security measures, such as multi-factor authentication, encryption of sensitive data, and secure PIN handling, could greatly improve the application's safety and reliability. Additionally, enhancing the user interface with modern design principles, responsive layouts, and intuitive navigation could improve user experience and accessibility. Expanding the application to include detailed transaction histories, account statements, and personalized financial insights would provide users with a more comprehensive view of their financial activities.

Moreover, adapting the application for mobile devices and integrating it with external systems, such as online banking platforms or payment gateways, could broaden its usability and appeal. Implementing features like real-time transaction alerts, budget tracking, and support for multiple currencies could make the application more versatile and aligned with contemporary banking needs. By pursuing these advancements, the ATM application could evolve into a more sophisticated financial management tool, meeting the needs of a wider audience and staying relevant in the ever-evolving landscape of digital banking.