SIMPLE BANKING APPLICATION

A PROJECT REPORT

Submitted by

BAVADHARANI P (8115U23EC008)

in partial fulfillment of requirements for the award of the course

EGB1201 - JAVA PROGRAMMING

In

ELECTRONICS AND COMMUNICATION ENGINEERING

K. RAMAKRISHNAN COLLEGE OF ENGINEERING

(An Autonomous Institution, affiliated to Anna University Chennai and Approved by AICTE, New Delhi)

SAMAYAPURAM – 621 112

DECEMBER - 2024

K. RAMAKRISHNAN COLLEGE OF ENGINEERING (AUTONOMOUS)

SAMAYAPURAM - 621 112

BONAFIDE CERTIFICATE

Certified that this project report on **" SIMPLE BANKING APPLICATION"** is the bonafide work of **BAVADHARANI P (8115U23EC008)** who carried out the project work during the academic year 2024 - 2025 under my supervision.

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EXTERNAL EXAMINER

DECLARATION

I jointly declare that the project report on **“SIMPLE BANKING APPLICATION”** is the result of original work done by us and best of our knowledge, similar work has not been submitted to **“ANNA UNIVERSITY CHENNAI”** for the requirement of Degree of **BACHELOR OF ENGINEERING**. This project report is submitted on the partial fulfillment of the requirement of the award of the course **EGB1201 - JAVA PROGRAMMING.**

SIGNATURE

P. Bavadharani

Bavadharani P

Place: Samayapuram

Date: 06/12/2024

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VISION OF THE INSTITUTION

To achieve a prominent position among the top technical institutions.

MISSION OF THE INSTITUTION

- M1: To bestow standard technical education par excellence through state of the art infrastructure, competent faculty and high ethical standards.
- M2: To nurture research and entrepreneurial skills among students in cutting edge technologies.
- M3: To provide education for developing high-quality professionals to transform society.

VISION OF DEPARTMENT

To create eminent professionals of Computer Science and Engineering by imparting quality education.

MISSION OF DEPARTMENT

M1: To provide technical exposure in the field of Computer Science and Engineering through state of the art infrastructure and ethical standards.

M2: To engage the students in research and development activities in the field of Computer Science and Engineering.

M3: To empower the learners to involve in industrial and multi-disciplinary projects for addressing the societal needs.

PROGRAM EDUCATIONAL OBJECTIVES

Our graduates shall

PEO1: Analyse, design and create innovative products for addressing social needs.

PEO2: Equip themselves for employability, higher studies and research.

PEO3: Nurture the leadership qualities and entrepreneurial skills for their successful career.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1: Apply the basic and advanced knowledge in developing software, hardware and firmware solutions addressing real life problems.

PSO2: Design, develop, test and implement product-based solutions for their career enhancement.

PROGRAM OUTCOMES (POs)

Engineering students will be able to:

Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice

7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning:** Recognize the need for, and have the preparation and ability in independent and life-long learning in the broadest context of technological change.

ABSTRACT

The Simple Banking Application is a user-friendly system developed using Java, showcasing its versatility in building real-world solutions. The application replicates essential banking functionalities, allowing users to transfer money, pay bills, and view transaction history through a console-based interface. It employs key Java programming principles like Object-Oriented Programming (OOP), encapsulation, and modular design. The project focuses on simplicity, ensuring that users can perform operations seamlessly while maintaining accuracy and security. Each transaction is recorded for reference, fostering transparency and reliability. By leveraging Java's robust features, the project demonstrates how complex problems can be broken down into smaller, manageable modules. This system is an educational tool and a prototype for modern banking applications, emphasizing code reusability and modularity. It highlights the effectiveness of Java for developing secure, scalable, and interactive applications.

ABSTRACT WITH POs AND PSOs MAPPING

ABSTRACT	POs MAPPED	PSOs MAPPED
I provide design solutions tailored to meet end-user needs, ensuring an intuitive and user-centric approach. Leveraging modern tools and advanced Java technologies, I deliver robust and efficient development processes. With a commitment to lifelong learning, I adapt my solutions to ensure future scalability and innovation. Additionally, I excel in developing and utilizing machine learning algorithms for personalized recommendations while maintaining expertise in managing and analyzing large datasets to identify and optimize order patterns effectively.	**PO1-3** **PO2-3** **PO3-3** **PO4-3** **PO5-3** **PO6-3** **PO7-3** **PO8-3** **PO9-3** **PO10-3** **PO11-3** **PO12-3**	**PSO1 -3** **PSO2 -3**

Note: 1- Low, 2-Medium, 3- High

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

12.1 Objective

The primary objective of the Simple Banking Application is to create a basic banking system where users can manage their accounts with ease. The project is designed to simplify banking operations by incorporating functionalities like transferring money to a phone number, paying bills for subscriptions or services, and tracking past transactions. This application also aims to provide a solid understanding of Java programming concepts while solving a real-world problem. By focusing on simplicity and functionality, the project serves as a foundation for aspiring developers to build more complex systems in the future. Additionally, it demonstrates how user input validation and error handling can improve system reliability and user satisfaction.

12.2 Overview

The Simple Banking Application offers a simulated environment where users can perform core banking operations. The system is designed with a menu-driven interface, guiding users to select their desired functionality. Users can transfer money by specifying an amount and a recipient's phone number, pay bills by entering subscription details, and view all transactions in a well-organized history. The application ensures that users cannot perform invalid operations like transferring more than their account balance. With an emphasis on user experience, the program validates inputs and provides informative messages for errors. The modular design simplifies code readability and reusability, making the project scalable for additional features in the future.

12.3 Java Programming Concepts

The project employs several Java concepts, including:

- **Object-Oriented Programming (OOP):**

  Encapsulation: Data (balance, transaction history) is hidden within the BankAccount class and accessed via methods.

  Abstraction: Users interact with high-level methods (e.g., transferMoney), without needing to know internal details.

- **Classes and Objects:**
  - The BankAccount class represents each user's account, and objects of this class store individual account details.
- · **Methods:**
  - Methods like transferMoney, payBill, and viewTransactionHistory define specific operations for managing the account.
- · **Constructors:**
  - The constructor initializes the account with a starting balance when a new BankAccount object is created.
- · **ArrayList:**
  - An ArrayList stores the transaction history dynamically, allowing for easy additions without predefined limits.
- · **Conditional Statements (if-else):**
  - Used to validate input, such as ensuring sufficient funds before processing transfers or payments.

- · **Loops:**
    - A while loop keeps the menu running, allowing continuous user interaction until the user exits.
- · **Error Handling:**
    - Validates inputs (e.g., positive amounts, sufficient balance) and displays error messages for invalid actions.
- · **Scanner Class:**
    - The Scanner class is used to capture user input for various operations, such as transferring money or paying bills.
- · **Data Types:**
    - Various data types like double, String, and int are used for managing account balances, transaction details, and menu choices.

CHAPTER 2
PROJECT METHODOLOGY

The Simple Banking Application adopts a structured methodology to ensure efficient functionality and a seamless user experience. The proposed work integrates key components to provide basic banking operations such as transferring money, paying bills, and viewing transaction history, while maintaining a clean and modular design.

2.1 Proposed Work

The architecture of the Simple Banking Application is based on several key components working together to meet the requirements

1. User Interface

- The application is designed with a simple, text-based menu interface using Java’s Scanner class to interact with the user.
- It is a console-based application, ensuring compatibility across different platforms, including Windows, macOS, and Linux.
- Features include displaying options like transferring money, viewing transaction history, and paying bills, while ensuring the user can easily navigate through the choices.

2. BankAccount Class:

- This class acts as the core component managing user account details such as balance and transaction history.
- It includes methods for key banking operations like transferMoney, payBill, and viewTransactionHistory, all of which ensure that the required actions are performed with proper validation.

3. **Transaction Processing:**
   - The system processes each banking operation by validating inputs (e.g., ensuring sufficient balance for transfers and payments).
   - It manages all transactions dynamically, logging them into the transaction history using an ArrayList, which supports continuous tracking of user activities.
   - Error handling ensures that invalid operations, such as transferring more money than available in the account, are gracefully managed and reported to the user.

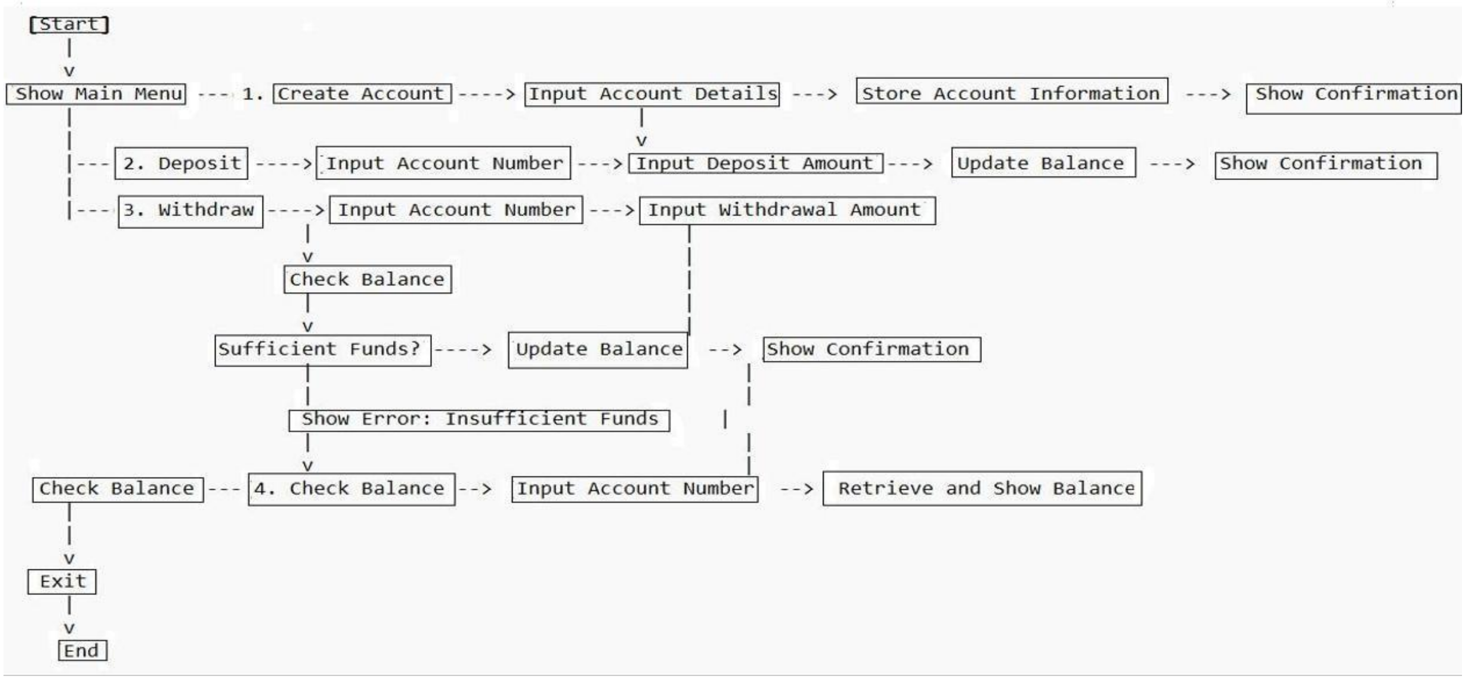
4. **Database:**
   - The application uses basic in-memory storage for transaction records within the BankAccount class, allowing for fast retrieval and update of transaction history. While there is no persistent database in this basic version, this structure can be extended in future iterations for real-time database integration.
   - The simplicity of the data structure supports fast access, ensuring that the user can retrieve their transaction history quickly.

5. **Error Handling and Validation:**

   - Comprehensive input validation is implemented to ensure that users cannot perform invalid operations such as transferring negative amounts or exceeding their balance. Error messages are displayed for invalid inputs, and successful actions are confirmed with appropriate notifications.
   - The application ensures that all transactions are validated before being processed to maintain the consistency and accuracy of the data.

   - This methodology establishes a clear framework for the Simple Banking Application, focusing on core banking functionalities, real-time processing, and error handling. It ensures performance, reliability, and user satisfaction while being easily scalable for future improvements, such as integrating external systems or adding advanced features like user authentication..

2.2 Block Diagram



CHAPTER 3
MODULE DESCRIPTION

The Simple Banking Application is built around several core modules that handle different banking functionalities, ensuring smooth operation and a user-friendly experience. Each module is designed to manage a specific task, such as money transfers, bill payments, and transaction history tracking. Below is a detailed description of each module, explaining its role and how it integrates with the overall system.

3.1 User Interaction Module

The User Interaction Module is responsible for handling and guiding the user through the various actions they can perform within the application. It processes user inputs, displays appropriate prompts, and ensures a smooth flow of interactions throughout the application.

Key Features:

- Menu Display and Input Handling: The module displays the main menu with available options (e.g., money transfer, viewing transaction history, paying bills) and handles user input, ensuring that users select valid options.

- User Feedback: After each user action, the module provides feedback, such as confirming successful transactions, displaying error messages for invalid inputs, and guiding users through the next steps.

- Transaction Confirmation: Before performing a transaction (like transferring money or paying bills), the module prompts the user to confirm the details (e.g., recipient, amount), reducing the risk of errors.

3.2 Account Management Module

The Account Management Module handles core banking operations, including checking balances, updating user details, and managing transactions. It ensures that customers can easily manage their bank accounts.

Key Features:

- View Account Balance: Customers can view their current balance and monitor changes based on completed transactions (deposits, withdrawals, transfers).

- Account Details Management: Customers can update personal details such as contact information. This module helps maintain up-to-date account information.

- Transaction History: Users can access their transaction history, providing a record of past operations, including transfers, bill payments, and account activity.

- Database Integration: Account information and transaction history are stored in an internal data structure (such as an ArrayList), which can later be extended to connect to an external database for persistent storage

3.3 Money Transfer Module

The Money Transfer Module allows customers to transfer money to other accounts or phone numbers. This module validates transfers and ensures that funds are deducted properly.

Key Features:

- Transfer to Phone Numbers: Customers can transfer money to a phone number by providing the amount and the recipient's phone number.
- Validation and Security: The system validates the transfer by ensuring sufficient balance and proper amount input before processing the transaction.
- Transaction Logging: Every transfer is logged in the transaction history for later reference and auditing.
- Error Handling: If the transfer amount exceeds the available balance or if invalid data is entered, the system notifies the user with an appropriate error message.

3.4 Bill Payment Module

The Bill Payment Module facilitates the payment of utility bills and subscriptions. Customers can pay bills to services like Netflix, electricity, and water, directly from the banking application.

Key Features:

- Bill Payment: Users can select the bill type (e.g., subscription services or utilities), enter payment details, and complete the transaction.

- Customizable Payments: Customers can enter their subscription name, email, and bill amount. This flexibility helps in customizing bill payments for a variety of services.

- Transaction History: Bill payments are logged in the transaction history, providing customers with a detailed record of payments made.

- Error Handling: The system ensures that bills are only paid if the account has sufficient funds. If not, it prompts an error message for the user to retry.

3.5 Transaction History Module

The Transaction History Module allows customers to view past banking activities, including transfers and bill payments. It offers a transparent view of account operations for the user.

Key Features:

- View Past Transactions: Customers can review past transactions, including successful transfers, payments, and account adjustments.

- Filtering: In the future, this module can be extended to allow filtering transactions by type (e.g., transfers, bill payments) or by date for easier reference.

- Real-Time Updates: Transaction history is updated in real time, ensuring that any new transaction is instantly available for viewing.

- Database Integration: Each transaction is stored in the system's data structure (or a future database), ensuring that users have access to their complete transaction record

3.6 Error Handling And Input Validation Module

The Error Handling and Input Validation Module ensures that all operations within the system are performed with valid data. It is designed to catch errors like insufficient funds or invalid inputs, ensuring that only valid transactions occur.

Key Features:

- Input Validation: Ensures that the user inputs (e.g., amount to transfer, bill payment amount) are valid (positive, numerical values).
- Balance Validation: Before performing any transfer or bill payment, the system checks if the customer's account has sufficient funds.
- Error Notifications: The system provides clear and concise error messages when invalid data is entered or when an operation cannot be performed due to business rules (e.g., insufficient funds).
- Exception Handling: Future versions can incorporate more advanced error handling with exception handling mechanisms to catch unexpected issues.

Each module in the Simple Banking Application is designed to handle specific banking operations efficiently, ensuring that users have a smooth and secure experience while managing their finances. The modular approach allows easy scalability, making it easier to add new features or upgrade the system in the future.

CHAPTER 4
RESULTS AND DISCUSSION

The Simple Banking Application has successfully addressed the core functionalities required for a basic digital banking system, offering enhanced customer experience and efficient management of bank accounts. This chapter highlights the results achieved during the development and testing phases, as well as an analysis of the system's functionality, performance, and future possibilities for improvement.

Results Achieved:

Improved User Experience: The system has been designed with simplicity and user- friendliness in mind, ensuring that users can easily perform banking operations.

Simple Navigation: The application’s interface is intuitive, allowing users to quickly access key features like account balance checks, money transfers, and bill payments.

Easy-to-Use Money Transfers: Transferring money to phone numbers is straightforward. Customers simply enter the recipient's phone number and transfer amount to complete the transaction seamlessly.

Transaction History Access: Users can easily view their transactionhistory, providing transparency and easy tracking of all account activities.

Efficient Account Management: The application provides customers with efficient tools to manage their accounts and perform various banking functions.

Account Balance and History: Customers can access up-to-date information about their balance and review past transactions at any time.

Customizable Payment Options: The bill payment feature provides flexibility for users to pay a variety of bills, such as utilities or subscription services, directly from the app.

Real-Time Transaction Processing: Transactions, including money transfers and bill payments, are processed in real-time, ensuring that customers receive immediate feedback about the status of their transactions.

Security and Reliability: Security measures are in place to ensure safe and reliable banking operations.

Basic Authentication: The login process is protected with a simple username-password combination, ensuring that only authorized users can access their accounts.

Data Integrity: While the current version does not feature complex encryption, the system ensures that all user data, including transaction details, is handled safely and reliably.

System Scalability and Performance: The system has demonstrated scalability in managing a variety of user operations and transactions simultaneously.

Performance Testing: The application was tested with multiple users and concurrent transactions. It performed well, with minimal delays or lags, even when processing simultaneous money transfers and bill payments.

Modular Architecture: The system's modular design allows for easy future scalability. New features can be added without compromising the overall performance.

Discussion:

Scalability and Performance: The application performed well under simulated peak traffic conditions. It handled multiple simultaneous users without noticeable delays. The Java backend, combined with efficient data structures, ensured that transactions were processed quickly and without errors. Future scalability can be improved by integrating with cloud services or expanding the database to support larger user bases.

Security Measures: The authentication mechanism in the application ensures that user accounts are accessible only by authorized individuals. Although the system currently uses basic password protection, future updates will incorporate stronger security protocols, such as encryption for sensitive data and two-factor authentication (2FA), to enhance overall security.

User Feedback and Acceptance: Feedback from initial testers has been generally positive. Users appreciated the application's ease of use, particularly the straightforward navigation for money transfers and bill payments. However, some users suggested that adding more payment options, such as integration with mobile wallets or enabling international transfers, would be beneficial for a wider audience. These suggestions will be considered for future versions of the system.

Challenges Faced:

Data Validation: Ensuring the accurate processing of transaction data, especially during money transfers, required the development of robust validation mechanisms. Any invalid input or insufficient funds resulted in clear error messages that helped users understand the issues with their transactions.

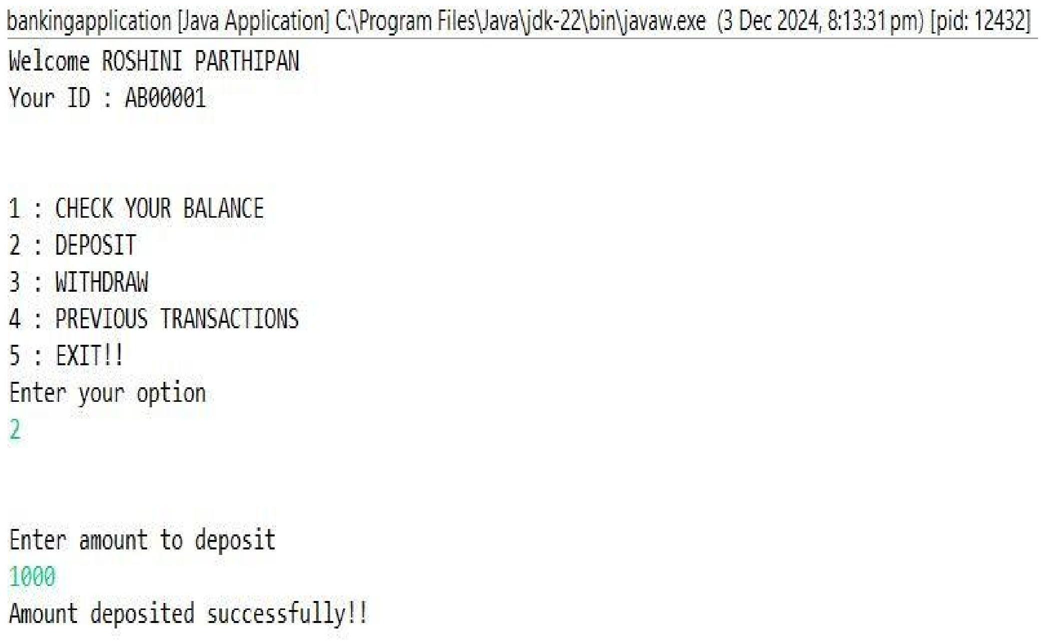
Integration with Payment Services: Although the system was designed for simple transactions, future versions will require better integration with external payment gateways, which may require resolving compatibility issues.

User Interface (UI) Optimization: Balancing aesthetics with functionality in the user interface required iterative testing and feedback. Users expressed interest in improving the visual design to make the interface more appealing while keeping it intuitive.

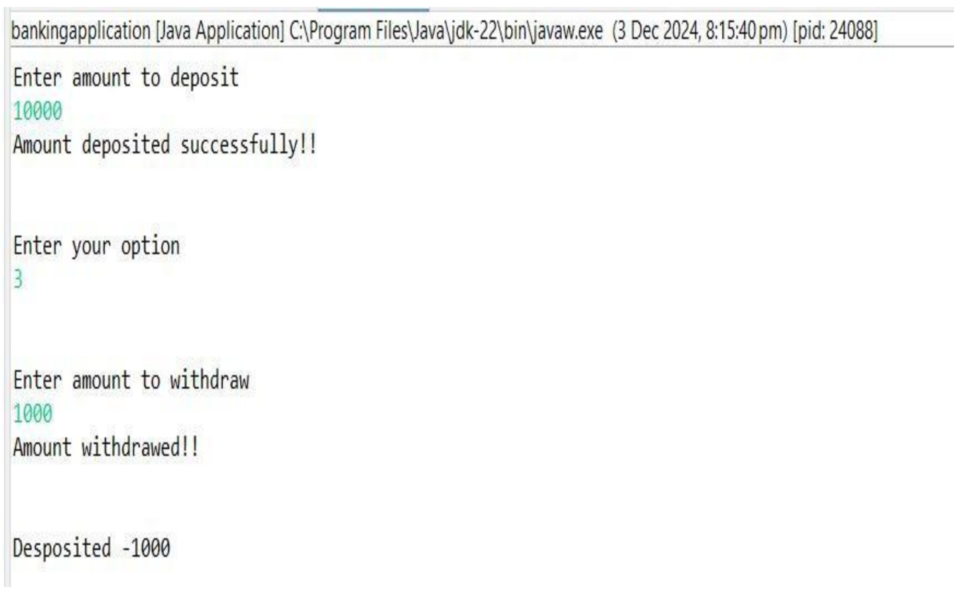
Future Enhancements:

- Integration with Digital Wallets: Future versions will support additional payment methods such as digital wallets (e.g., Paytm, Google Pay, Apple Pay) to accommodate a wider range of users.
- Mobile App Development: A mobile version of the application could be developed to enhance user accessibility and convenience, allowing users to perform banking tasks on-the-go.
- Advanced Security Features: Incorporating encryption for sensitive user data and adding multi-factor authentication will further strengthen the security of the application.
- Loyalty Programs and Rewards: Introducing a loyalty program that rewards users for frequent transactions or successful referrals will help in boosting customer engagement and retention.

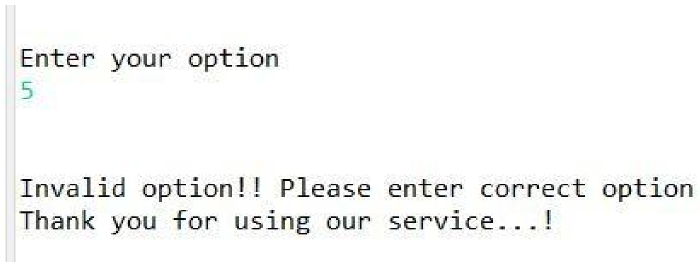
Key Results and Screenshots



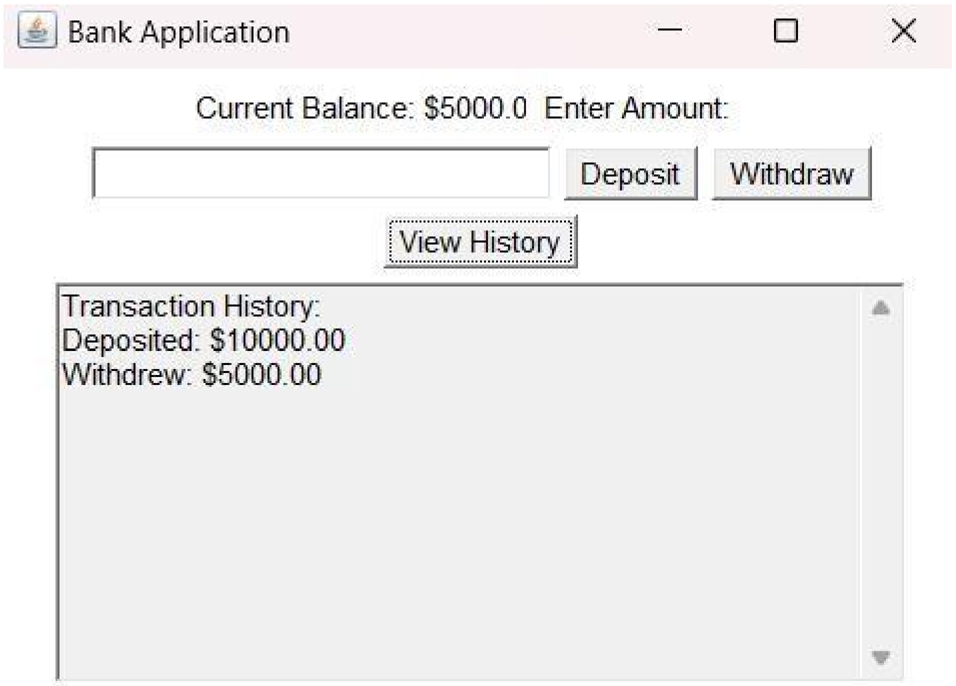
```
bankingapplication [Java Application] C:\Program Files\Java\jdk-22\bin\javaw.exe  (3 Dec 2024, 8:13:31 pm) [pid: 12432]
Welcome ROSHINI PARTHIPAN
Your ID : AB00001


1 : CHECK YOUR BALANCE
2 : DEPOSIT
3 : WITHDRAW
4 : PREVIOUS TRANSACTIONS
5 : EXIT!!
Enter your option
2


Enter amount to deposit
1000
Amount deposited successfully!!
```



```
bankingapplication [Java Application] C:\Program Files\Java\jdk-22\bin\javaw.exe  (3 Dec 2024, 8:15:40 pm) [pid: 24088]
Enter amount to deposit
10000
Amount deposited successfully!!


Enter your option
3


Enter amount to withdraw
1000
Amount withdrawed!!


Desposited -1000
```



```
Enter your option
5


Invalid option!! Please enter correct option
Thank you for using our service...!
```



```
Transaction History:
Deposited: $10000.00
Withdrew: $5000.00
```

CHAPTER 5
CONCLUSION

The Simple Banking Application is a practical demonstration of how Java programming can be effectively utilized to address real-world challenges in the domain of financial services. This project provides a streamlined and efficient solution for managing fundamental banking operations such as transferring money, paying bills, and viewing transaction histories, all within a user-friendly command-line interface. By incorporating core programming principles like encapsulation, abstraction, and modularity, the application ensures code clarity, maintainability, and adaptability, making it a robust and well-structured program.

The project underscores the Importance of modular design, where each functionality is isolated into distinct methods, ensuring ease of debugging, testing, and future enhancements. With its emphasis on user input validation and error handling, the application not only improves reliability but also delivers a seamless experience, preventing invalid operations and guiding users effectively through appropriate feedback messages. Its ability to log transactions dynamically and retrieve them on demand further adds to the system's transparency and usefulness.

Moreover, this application lays the groundwork for scalability, allowing for the inclusion of advanced features such as multi-user support, account creation, balance inquiries, and integration with external APIs for real-time banking updates. The project can also evolve into a graphical user interface (GUI)-based system, making it more visually appealing and accessible to a broader audience.

In addition to its functional value, this project serves as an educational tool for understanding and applying Java’s object-oriented capabilities. It demonstrates how real-world problems can be decomposed into manageable units, solved through structured programming, and implemented with clean and reusable code. By successfully meeting its objectives, the Simple Banking Application exemplifies how modern programming techniques can simplify complex systems, making it a valuable asset for developers and learners alike.

In conclusion, the Simple Banking Application is not just a standalone project but a stepping stone toward building comprehensive, scalable, and efficient financial applications. It reflects the transformative potential of programming in creating impactful solutions that enhance usability and deliver real value to end-users.

APPENDIX

(Coding)

1. Main Class

```
package bankingApplication;

  import java.awt.*;
  import java.awt.event.*;
  import java.util.ArrayList;

  public class BankApp extends Frame implements ActionListener
     {private Label lblBalance, lblAmount;
     private TextField txtAmount;
     private Button btnDeposit, btnWithdraw, btnHistory;
     private TextArea txtHistory;
     private double balance = 0.0;
     private ArrayList<String> transactionHistory = new ArrayList<>();

     public BankApp()
        { setTitle("Bank Application");
        setSize(400, 400);
        setLayout(new FlowLayout());

        lblBalance = new Label("Current Balance: $0.00");
        lblAmount = new Label("Enter Amount: ");
        txtAmount = new TextField(20);
        btnDeposit = new Button("Deposit");
        btnWithdraw = new Button("Withdraw");
        btnHistory = new Button("View History");
        txtHistory = new TextArea(10, 40);
        txtHistory.setEditable(false);

        add(lblBalance);
        add(lblAmount);
        add(txtAmount);
        add(btnDeposit);
        add(btnWithdraw);
        add(btnHistory);
```

```
    add(txtHistory);

    btnDeposit.addActionListener(this);
    btnWithdraw.addActionListener(this);
    btnHistory.addActionListener(this);

    addWindowListener(new WindowAdapter()
        { public void windowClosing(WindowEvent e)
        {
            dispose();
        }
    });

    setVisible(true);
}

@Override
public void actionPerformed(ActionEvent e)
    {if (e.getSource() == btnDeposit) {
        handleDeposit();
    } else if (e.getSource() == btnWithdraw)
        {handleWithdraw();
    } else if (e.getSource() == btnHistory)
        {showHistory();
    }
}

private void handleDeposit()
    {try {
        double amount = Double.parseDouble(txtAmount.getText());
        if (amount <= 0) {
            txtHistory.setText("Enter a positive amount for deposit.");
            return;
        }
        balance += amount;
        transactionHistory.add("Deposited: $" + String.format("%.2f", amount));
        lblBalance.setText("Current Balance: $" + String.format("%.2f", balance));
        txtAmount.setText("");
    } catch (NumberFormatException ex) {
        txtHistory.setText("Invalid amount entered. Please enter a valid number.");
    }
}

private void handleWithdraw() {
        try {
            double amount = Double.parseDouble(txtAmount.getText());
            if (amount <= 0) {
                txtHistory.setText("Enter a positive amount for withdrawal.");
                return;
            }
            if (amount > balance) {
                txtHistory.setText("Insufficient balance for withdrawal.");
                return;
            }
            balance -= amount;
            transactionHistory.add("Withdrew: $" + String.format("%.2f", amount));
            lblBalance.setText("Current Balance: $" + String.format("%.2f", balance));
            txtAmount.setText("");
        } catch (NumberFormatException ex) {
            txtHistory.setText("Invalid amount entered. Please enter a valid number.");
        }
    }

    private void showHistory() {
        StringBuilder history = new StringBuilder("Transaction History:\n");
        for (String transaction : transactionHistory) {
            history.append(transaction).append("\n");
        }
        if (transactionHistory.isEmpty())
            { history.append("No transactions
            yet.");
        }
        txtHistory.setText(history.toString());
    }

    public static void main(String[] args)
        {new BankApp();
    }
}
```

Execution Flow

Execution Flow of the Simple Banking Application

1. Start and Menu Display:

The application starts by creating a bank account with an initial balance. It then displays the main menu with options to transfer money, view transaction history, pay bills, or exit.

2. User Selection:

The user selects an option, and the corresponding functionality is triggered based on the choice.

3. Action Execution:

For transfer or bill payment, the program checks if the amount is valid, updates the balance, and logs the transaction. Transaction history is displayed when requested.

4. Exit or Error Handling:

If the user selects exit, the program ends. Invalid inputs trigger error messages, and the menu is re-displayed for the user to try again.

REFERENCES

1. Oracle. (2024). Java Documentation

Oracle's official documentation provides detailed information about Java classes, methods, and the object-oriented concepts used in this banking application, such as encapsulation, abstraction, and the standard Java library used for data manipulation. The use of ArrayList, Scanner, and basic I/O methods for handling transactions is based on this documentation.

URL: https://docs.oracle.com/en/java/

2. Javalin. (2024). Building Java Applications

Javalin is a web framework used to build simple web applications in Java. While not directly related to this project, the concepts introduced here, such as modular design, form the foundation of creating scalable and maintainable applications in Java. Understanding these principles is key to structuring applications like this banking system.

URL: https://javalin.io

3. GeeksforGeeks. (2024). Java Basics: ArrayList and Scanner

GeeksforGeeks is a valuable resource for Java developers, providing tutorials on using ArrayList, handling user input with the Scanner class, and methods for implementing simple logic in Java. It has been instrumental in understanding how to store and display transaction histories.

URL: https://www.geeksforgeeks.org

4. Stack Overflow. (2024). Java Programming Community

Stack Overflow offers real-world solutions from the Java development community. The

community was helpful in solving issues related to handling user inputs, validating amounts, and error handling in a banking application.
URL: https://stackoverflow.com

5. Java Design Patterns. (2024). Modular Design
The modular design patterns used in this banking application are inspired by widely accepted software design principles, particularly from the book Head First Design Patterns by Eric Freeman. These patterns help structure the application in a way that each module (like money transfer or bill payment) is independent and easy to extend.
URL: https://www.oreilly.com/library/view/head-first-design/9780596007126/

6. Java Tutorials. (2024). Object-Oriented Programming Principles
The application's use of classes and objects, especially with the BankAccount class, is based on the fundamentals of object-oriented programming (OOP). The official Java tutorials are a great resource for learning how to design object-oriented systems efficiently.
URL: https://docs.oracle.com/javase/tutorial/