AIRLINE RESERVATION SYSTEM

A PROJECT REPORT

CSA0918 - Programming in Java for Industry Applications

Submitted by

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(192224105)

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Of

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SAVEETHA SCHOOL OF ENGINEERING SAVEETHA NAGAR, THANDALAM, SIMATS, CHENNAI – 602105.

JUNE 2024.

BONAFIDE CERTIFICATE

This is to certify that the project report entitled “Airline Reservation System” submitted by “T. Mani sai Lokesh (192224105)”, to Saveetha School of Engineering, Saveetha Institute of Medical and Technical Sciences, Chennai, is a record of bonafide work carried out by him/her under my guidance. The project fulfils the requirements as per the regulations of this institution and in my appraisal meets the required standards for submission.

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Abstract

The Airline Reservation System (ARS) is a comprehensive software solution designed to streamline the process of booking flights, managing reservations, and viewing passenger information. Implemented using Java Swing, the ARS provides an intuitive graphical user interface that enhances the user experience for both customers and airline staff. Key features of the system include a secure login mechanism, a robust flight search module, a seamless booking process, and an efficient way to manage passenger details.

The login dialog ensures that only authorized users can access the system, maintaining the integrity and security of sensitive data. The flight search panel allows users to quickly and accurately find available flights based on their preferences and requirements. The booking panel guides users through the process of reserving seats, capturing essential passenger information and handling payment transactions. Finally, the passenger information panel enables staff to view and manage details of all passengers efficiently.

The ARS leverages the power of Java Swing to create a responsive and user-friendly interface, making the system both reliable and easy to navigate. This project aims to demonstrate the practical application of Java in developing a real-world, user-centric application while addressing the specific needs of the airline industry.

An airline reservation system is a digital platform that simplifies the process of booking flights, managing reservations, and issuing tickets. It allows passengers to easily search for available flights, compare prices, and reserve seats in real-time. By integrating with the airline's inventory system, it provides up-to-date information on flight schedules, seat availability, and fare options. The system also facilitates secure payment processing, ensuring a seamless booking experience for customers. In addition, passengers receive automatic notifications for booking confirmations, flight status updates, and changes in their itinerary.

From the airline's perspective, the reservation system improves operational efficiency by automating key tasks like ticket issuance, cancellations, and rebooking. It supports features such as managing booking dates, handling customer data, and providing insights into passenger preferences. Airlines can also use the system to optimize flight capacity and track booking trends, helping them adjust pricing strategies and improve customer satisfaction. The system may also incorporate loyalty programs, special services, and seat selection, making it a comprehensive tool for enhancing both customer experience and airline operations.

Keywords: Airline Reservation System, Java Swing, Flight Booking, Passenger Information Management, Secure Login.

Introduction

In today's fast-paced world, the airline industry plays a crucial role in connecting people and places across the globe. Efficiently managing the complex processes of flight reservations, bookings, and passenger information is essential for both airlines and their customers. The Airline Reservation System (ARS) is designed to address these needs by providing a comprehensive, user-friendly software solution.

The ARS leverages Java Swing to create an intuitive graphical user interface, ensuring a seamless experience for users. It encompasses various modules that facilitate secure login, efficient flight search, smooth booking processes, and effective management of passenger details. This system aims to streamline airline operations and enhance customer satisfaction by making the reservation process straightforward and efficient.

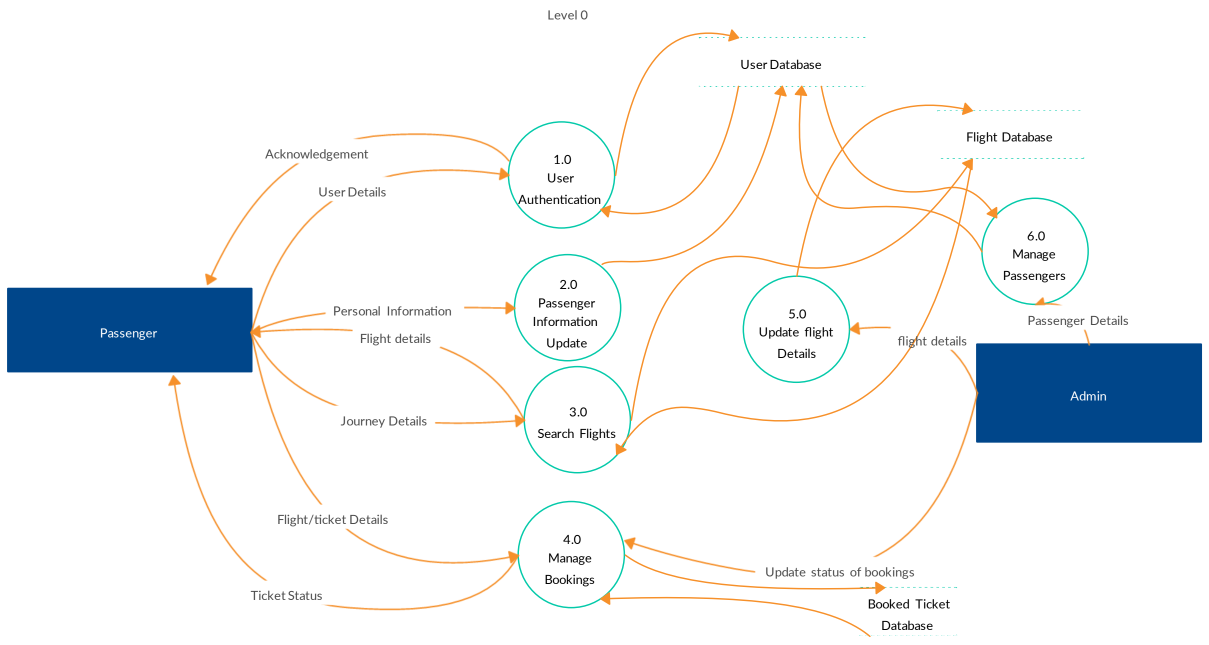
The introduction of such a system offers significant benefits, including improved accuracy in bookings, reduced administrative overhead, and enhanced data security. By automating key processes and providing real-time access to flight information, the ARS not only meets the immediate needs of users but also lays the groundwork for future scalability and adaptability in the ever-evolving airline industry.

This project demonstrates the practical application of Java in creating a real-world, user-centric application, showcasing the capabilities of modern software development techniques in addressing the specific challenges faced by the airline industry.

An airline reservation system is a vital tool for the modern aviation industry, designed to facilitate the booking and management of flights for both passengers and airlines. This system allows travelers to search for available flights, compare fares, choose their preferred seats, and make payments online, all in real-time. By integrating with the airline’s database, it ensures the most up-to-date information on flight schedules, ticket availability, and prices, providing a seamless and convenient user experience. Moreover, it simplifies the reservation process by allowing customers to easily manage their bookings, receive notifications, and access their flight details.

For airlines, the reservation system is essential for streamlining operations and improving efficiency. It automates key tasks such as ticket issuance, flight changes, and cancellations, reducing manual errors and speeding up processes. The system also helps airlines manage passenger data, optimize seat utilization, and gain insights into booking patterns, which can be used to make informed decisions on pricing and capacity management. Additionally, it enhances customer service by offering personalized features, such as frequent flyer programs, special requests, and other value-added services, ultimately leading to improved customer satisfaction and operational success.

ARCHITECTURE DIAGRAM



Explanation of Components

User Interface (Web/Mobile Application):

This is the front-end part of the system where users interact. It allows customers to search for flights, book tickets, manage reservations, and process payments. The user interface is designed for ease of use and accessibility across different devices.

Application Server:

The application server hosts the business logic of the airline reservation system. It processes user requests from the front end, communicates with other services, and returns responses to the user interface. It handles user authentication and ensures secure access to the system.

Reservation Service:

This service is responsible for managing all aspects of reservations, including creating new bookings, modifying existing reservations, and handling cancellations. It interacts with the flight inventory and database to check availability and update records accordingly.

Flight Inventory:

The flight inventory service manages all information related to available flights, including schedules, seat availability, and flight details. It ensures that the reservation service can retrieve up-to-date information when users make a booking.

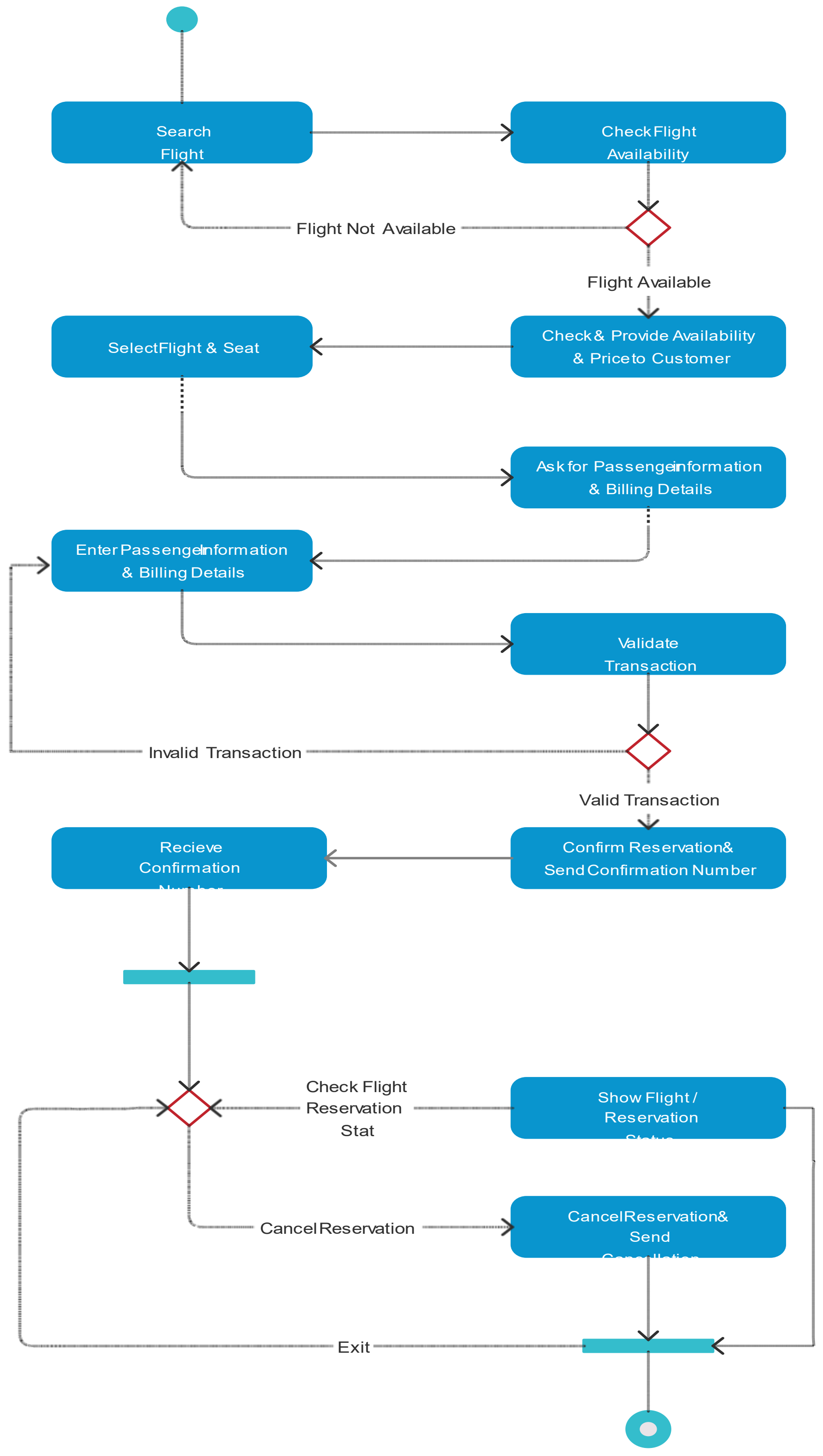
Payment Gateway:

This component is responsible for processing payments and transactions securely. It handles payment methods, refunds, and transaction verification. The payment gateway interacts with **banks or payment service providers to complete financial transactions.**

Database:

The database stores all essential data for the airline reservation system, including user profiles, reservation records, flight information, and payment details. It ensures data persistence and integrity across the system.

FLOW CHART


Search Flight
Check Flight Availability
Flight Not Available
Flight Available
Select Flight & Seat
Check & Provide Availability & Price to Customer
Ask for Passenger Information & Billing Details
Enter Passenger Information & Billing Details
Validate Transaction
Invalid Transaction
Valid Transaction
Recieve Confirmation
Confirm Reservation & Send Confirmation Number
Check Flight Reservation Stat
Show Flight / Reservation
Cancel Reservation
Cancel Reservation & Send
Exit

User Interface (Web/Mobile Application):

Start of the flow: This is where users interact with the system, whether through a website or a mobile app. Users can search for flights, select dates, choose seats, and enter personal information.

Next step: The user requests (like flight search or booking) are sent to the Application Server.

Application Server:

Function: The application server is the core system that handles business logic. It processes requests from the user interface and manages communications between different services like reservation, payment, and flight inventory.

Next step: Based on the user request, the application server directs the data to:

Reservation Service (for bookings, cancellations, or modifications)

Flight Inventory (to check flight schedules and availability)

Payment Gateway (to handle transactions)

Reservation Service:

Function: Manages the creation of new bookings, cancellation of existing reservations, and modification of flight details. It updates the Database with this information.

Next step: The reservation details are passed to the Flight Inventory to update the availability and the Database for record-keeping.

Flight Inventory:

Function: This service manages the details of available flights, seats, schedules, and other flight-related data. It checks availability when a user is trying to book a flight and updates the inventory when a booking or cancellation is made.

Next step: Sends confirmation of availability back to the Reservation Service and updates the Database accordingly.

Payment Gateway:

Function: When the user makes a booking, this service processes the payment. It validates the payment information, processes the transaction, and handles refunds if necessary.

Next step: Once the transaction is successful, it updates the Database with payment details and confirms the booking by passing the data back to the Application Server.

Database:

Function: Stores all critical data for the system, including user information, reservations, flight schedules, and payment details. It ensures that all operations have persistent data available.

Interaction: The database is accessed by multiple components (Reservation Service, Flight Inventory, Payment Gateway) to retrieve and store data.

USECASE DIAGRAM

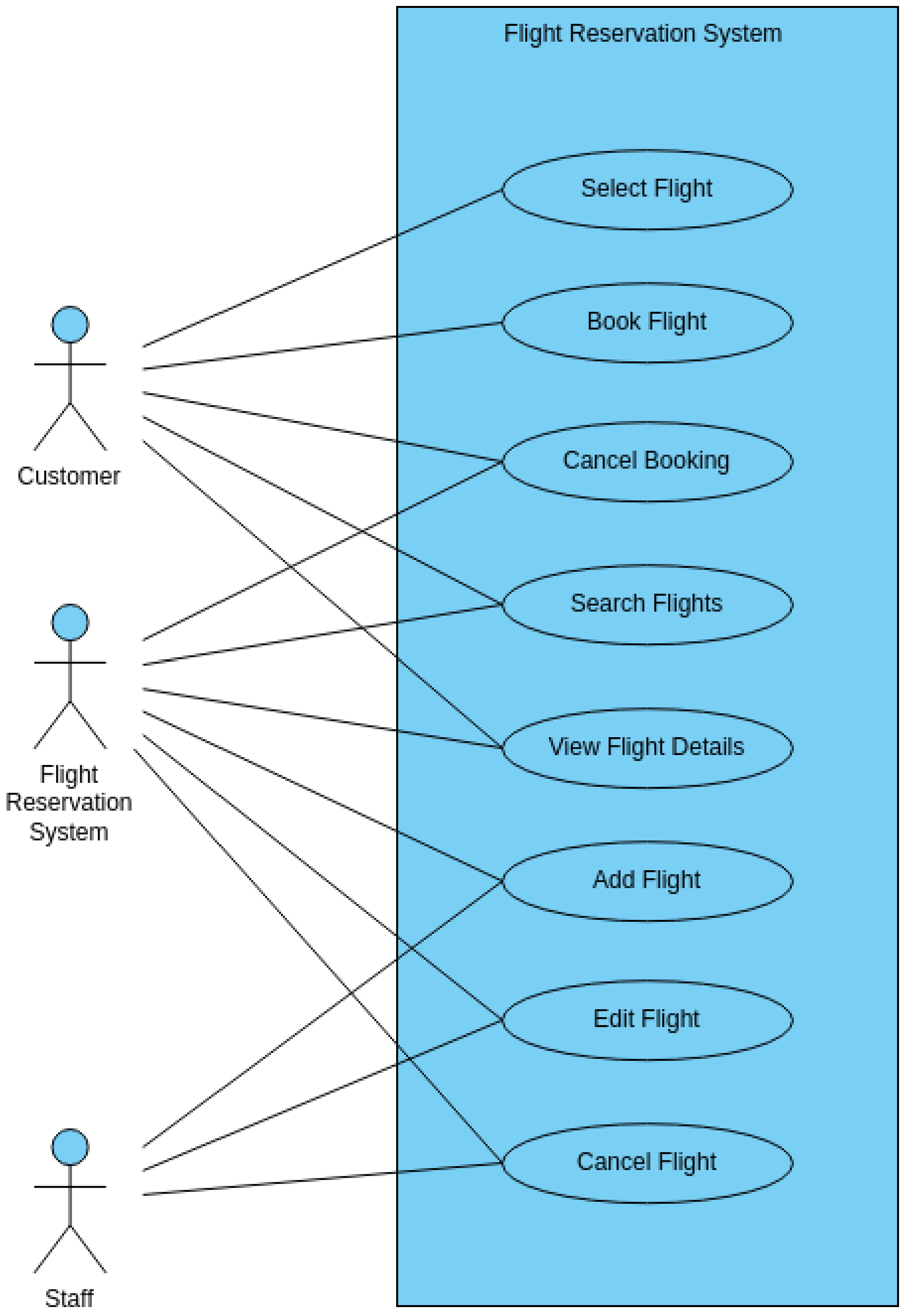


Fig 1: Use Case Diagram for Airline Reservation System.

Fig 1: In this Use Case diagram represents outlines the main use cases and actors involved in the Airline Reservation System. Each use case represents a specific action or functionality that the system provides to users or staff, contributing to the overall functionality and usability of the system.

CODE IMPLEMENTATION

```
import java.awt.*;

import java.awt.event.*;

import java.util.*;

import javax.swing.*;


class Deepak extends JFrame implements ActionListener {

    private JLabel nameLabel, sourceLabel, destLabel, dateLabel, numPassengersLabel, mobileLabel,
ticketPreviewLabel, seatLabel;

    private JTextField nameField, numPassengersField, mobileField, seatField;

    private JComboBox<String> sourceCombo, destCombo, dayCombo, monthCombo, yearCombo;

    private JButton submitButton, exitButton, okButton, resetButton;

    private JCheckBox returnCheckBox;

    private JTextArea ticketTextArea;


    private LinkedHashMap<String, Integer> sourceMap = new LinkedHashMap<>();

    private LinkedHashMap<String, Integer> destMap = new LinkedHashMap<>();


    private String[] days = new String[31];

    private String[] months = {"January", "February", "March", "April", "May", "June", "July", "August",
"September", "October", "November", "December"};

    private String[] years = new String[50];


    private static final Set<String> MONTHS_WITH_31_DAYS = new
HashSet<>(Arrays.asList("January", "March", "May", "July", "August", "October", "December"));


    public Deepak() {

        setTitle("Airline Ticket Reservation");

        setSize(1200, 600);

        setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);

        setLayout(null);

        getContentPane().setBackground(Color.LIGHT_GRAY);

        setExtendedState(JFrame.MAXIMIZED_BOTH);
        // Populate source and destination maps
        initializeLocationMaps();

        // Title label
        addTitleLabel();

        // Ticket preview components
        addTicketPreviewComponents();

        // Input fields and labels
        addInputFieldsAndLabels();

        setVisible(true);
    }

    private void initializeLocationMaps() {
        sourceMap.put("New Delhi", 1750);
        sourceMap.put("Mumbai", 1600);
        sourceMap.put("Chennai", 1800);
        sourceMap.put("Vijayawada", 1750);
        sourceMap.put("Bengaluru", 1450);
        sourceMap.put("Hyderabad", 1500);

        destMap.put("New Delhi", 1750);
        destMap.put("Mumbai", 1600);
        destMap.put("Chennai", 1800);
        destMap.put("Vijayawada", 1750);
        destMap.put("Bengaluru", 1450);
        destMap.put("Hyderabad", 1500);
    }
```

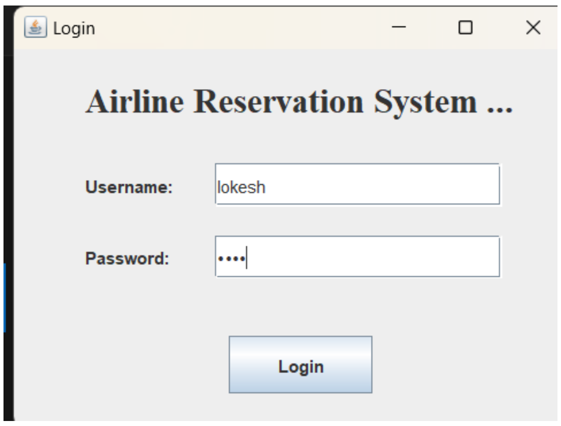
```
    private void addTitleLabel() {
        JLabel titleLabel = new JLabel("Airline Ticket Reservation");
        titleLabel.setFont(new Font("Serif", Font.BOLD, 60));
        titleLabel.setForeground(Color.BLACK);
        titleLabel.setBounds(100, 10, 800, 100);
        add(titleLabel);
    }

    private void addTicketPreviewComponents() {
        ticketPreviewLabel = new JLabel("Ticket Preview");
        ticketPreviewLabel.setFont(new Font("Serif", Font.BOLD, 36));
        ticketPreviewLabel.setBounds(850, 30, 300, 50);
        add(ticketPreviewLabel);

        ticketTextArea = new JTextArea();
        ticketTextArea.setEditable(false);
        ticketTextArea.setFont(new Font("Serif", Font.PLAIN, 20));
        JScrollPane scrollPane = new JScrollPane(ticketTextArea);
        scrollPane.setBounds(850, 100, 300, 400);
        add(scrollPane);
    }

    private void addInputFieldsAndLabels() {
        addLabelAndField("Passenger Name:", 120, nameField = new JTextField());
                addLabelAndComboBox("Source:", 170, sourceCombo = new
JComboBox<>(sourceMap.keySet().toArray(new String[0])));
                addLabelAndComboBox("Destination:", 220, destCombo = new
JComboBox<>(destMap.keySet().toArray(new String[0])));
        addLabelAndField("Mobile Number:", 270, mobileField = new JTextField());

        addLabelAndDateComboBoxes();

        addLabelAndField("Number of Passengers:", 370, numPassengersField = new JTextField());
        returnCheckBox = new JCheckBox("Return Journey");
        returnCheckBox.setFont(new Font("Serif", Font.PLAIN, 20));
        returnCheckBox.setBounds(20, 420, 300, 30);
        add(returnCheckBox);

        addLabelAndField("Seat Number:", 470, seatField = new JTextField());

        addButtons();
    }

    private void addLabelAndField(String labelText, int yPos, JTextField textField) {
        JLabel label = new JLabel(labelText);
        label.setFont(new Font("Serif", Font.PLAIN, 20));
        label.setBounds(20, yPos, 200, 30);
        add(label);

        textField.setFont(new Font("Serif", Font.PLAIN, 20));
        textField.setBounds(250, yPos, 300, 30);
        add(textField);
    }

    private void addLabelAndComboBox(String labelText, int yPos, JComboBox<String> comboBox)
{
        JLabel label = new JLabel(labelText);
        label.setFont(new Font("Serif", Font.PLAIN, 20));
        label.setBounds(20, yPos, 200, 30);
        add(label);

        comboBox.setFont(new Font("Serif", Font.PLAIN, 20));
        comboBox.setBounds(250, yPos, 300, 30);
        add(comboBox);
    }
```

```
private void addLabelAndDateComboBoxes() {
    dateLabel = new JLabel("Travel Date:");
    dateLabel.setFont(new Font("Serif", Font.PLAIN, 20));
    dateLabel.setBounds(20, 320, 200, 30);
    add(dateLabel);

    for (int i = 0; i < 31; i++) {
        days[i] = Integer.toString(i + 1);
    }
    dayCombo = new JComboBox<>(days);
    dayCombo.setFont(new Font("Serif", Font.PLAIN, 20));
    dayCombo.setBounds(250, 320, 60, 30);
    add(dayCombo);

    monthCombo = new JComboBox<>(months);
    monthCombo.setFont(new Font("Serif", Font.PLAIN, 20));
    monthCombo.setBounds(320, 320, 120, 30);
    monthCombo.addActionListener(this);
    add(monthCombo);

    Calendar now = Calendar.getInstance();
    int year = now.get(Calendar.YEAR);
    for (int i = 0; i < 50; i++) {
        years[i] = Integer.toString(year + i);
    }
    yearCombo = new JComboBox<>(years);
    yearCombo.setFont(new Font("Serif", Font.PLAIN, 20));
    yearCombo.setBounds(450, 320, 100, 30);
    add(yearCombo);
}
```

```
private void addButtons() {
    submitButton = new JButton("Submit");
    submitButton.setFont(new Font("Serif", Font.PLAIN, 20));
    submitButton.setBounds(50, 530, 150, 40);
    submitButton.addActionListener(this);
    add(submitButton);

    exitButton = new JButton("Exit");
    exitButton.setFont(new Font("Serif", Font.PLAIN, 20));
    exitButton.setBounds(250, 530, 150, 40);
    exitButton.addActionListener(this);
    add(exitButton);

    okButton = new JButton("OK");
    okButton.setFont(new Font("Serif", Font.PLAIN, 20));
    okButton.setBounds(850, 520, 100, 40);
    okButton.addActionListener(this);
    add(okButton);

    resetButton = new JButton("Reset");
    resetButton.setFont(new Font("Serif", Font.PLAIN, 20));
    resetButton.setBounds(970, 520, 100, 40);
    resetButton.addActionListener(this);
    add(resetButton);
}

@Override
public void actionPerformed(ActionEvent e) {
    if (e.getSource() == submitButton) {
        handleSubmit();
    } else if (e.getSource() == resetButton) {
        resetFields();
        } else if (e.getSource() == exitButton) {
            dispose();
        } else if (e.getSource() == okButton) {
            printTicketFromPreview();
        }
    }

    private void handleSubmit() {
        try {
            String name = nameField.getText();
            String source = (String) sourceCombo.getSelectedItem();
            String dest = (String) destCombo.getSelectedItem();
            String mobileNumber = mobileField.getText();
            String day = (String) dayCombo.getSelectedItem();
            String month = (String) monthCombo.getSelectedItem();
            String year = (String) yearCombo.getSelectedItem();
            int numPassengers = Integer.parseInt(numPassengersField.getText());
            String seatNumber = seatField.getText();

            validateInputs(name, source, dest, mobileNumber, day, month, year, numPassengers,
seatNumber);

            String travelDate = day + " " + month + " " + year;
            int distance = Math.abs(sourceMap.get(source) - destMap.get(dest));
            float cost = calculateCost(distance, numPassengers);

            if (returnCheckBox.isSelected()) {
                cost *= 2; // Double the cost for return journey
            }

            printTicket(name, source, dest, travelDate, mobileNumber, numPassengers, seatNumber, cost);
        } catch (NumberFormatException ex) {
            JOptionPane.showMessageDialog(this, "Please enter valid numeric values for number of passengers.", "Invalid Input", JOptionPane.ERROR_MESSAGE);
        } catch (Exception ex) {
            JOptionPane.showMessageDialog(this, ex.getMessage(), "Error", JOptionPane.ERROR_MESSAGE);
        }
    }

    private void validateInputs(String name, String source, String dest, String mobileNumber, String day, String month, String year, int numPassengers, String seatNumber) throws Exception {
        if (name.isEmpty() || source.isEmpty() || dest.isEmpty() || mobileNumber.isEmpty() || day.isEmpty() || month.isEmpty() || year.isEmpty() || seatNumber.isEmpty()) {
            throw new Exception("All fields are mandatory.");
        }

        if (mobileNumber.length() < 10) {
            throw new Exception("Mobile number must be at least 10 digits.");
        }

        Calendar selectedDate = Calendar.getInstance();
        selectedDate.set(Integer.parseInt(year), Arrays.asList(months).indexOf(month), Integer.parseInt(day));
        if (selectedDate.before(Calendar.getInstance())) {
            throw new Exception("Travel date cannot be earlier than the current date.");
        }

        if (day.equals("31") && !MONTHS_WITH_31_DAYS.contains(month)) {
            throw new Exception("Invalid day selected for " + month + ".");
        }

        if (source.equals(dest)) {
            throw new Exception("Source and Destination cannot be the same.");
        }
    }
    private float calculateCost(int distance, int numPassengers) {
        float ratePerKm = 5.0f; // Assume a rate per kilometer
        return ratePerKm * distance * numPassengers;
    }

     private void printTicket(String name, String source, String dest, String travelDate, String
mobileNumber, int numSeats, String seatNumber, float cost) {
         String ticketDetails = "Passenger Name: " + name + "\nSource: " + source + "\nDestination: " +
dest +
                  "\nTravel Date: " + travelDate + "\nMobile Number: " + mobileNumber + "\nNumber of
Passengers: " + numSeats +
                "\nSeat Number: " + seatNumber + "\nTotal Cost: Rs. " + cost;

        ticketTextArea.setText(ticketDetails);
    }

    private void resetFields() {
        nameField.setText("");
        sourceCombo.setSelectedIndex(0);
        destCombo.setSelectedIndex(0);
        mobileField.setText("");
        dayCombo.setSelectedIndex(0);
        monthCombo.setSelectedIndex(0);
        yearCombo.setSelectedIndex(0);
        numPassengersField.setText("");
        returnCheckBox.setSelected(false);
        seatField.setText("");
        ticketTextArea.setText("");
    }

    private void printTicketFromPreview() {
        String ticketDetails = ticketTextArea.getText();
        if (!ticketDetails.isEmpty()) {
            JOptionPane.showMessageDialog(this, ticketDetails, "Print Ticket", JOptionPane.PLAIN_MESSAGE);
        } else {
            JOptionPane.showMessageDialog(this, "No ticket to print. Generate a ticket first.", "Print Ticket", JOptionPane.ERROR_MESSAGE);
        }
    }

    public static void main(String[] args) {
        SwingUtilities.invokeLater(LoginFrame::new);
    }
}

class LoginFrame extends JFrame implements ActionListener {
    private JTextField usernameField;
    private JPasswordField passwordField;

    public LoginFrame() {
        setTitle("Login");
        setSize(400, 300);
        setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
        setLayout(null);

        addTitleLabel();
        addUsernameAndPasswordFields();
        addLoginButton();

        setVisible(true);
    }

    private void addTitleLabel() {
        JLabel titleLabel = new JLabel("Airline Reservation System Login");
        titleLabel.setFont(new Font("Serif", Font.BOLD, 24));
        titleLabel.setBounds(50, 20, 300, 30);
        add(titleLabel);
    }

    private void addUsernameAndPasswordFields() {
        addLabelAndField("Username:", 80, usernameField = new JTextField());
        addLabelAndField("Password:", 130, passwordField = new JPasswordField());
    }

    private void addLabelAndField(String labelText, int yPos, JTextField textField) {
        JLabel label = new JLabel(labelText);
        label.setBounds(50, yPos, 80, 30);
        add(label);

        textField.setBounds(140, yPos, 200, 30);
        add(textField);
    }

    private void addLoginButton() {
        JButton loginButton = new JButton("Login");
        loginButton.setBounds(150, 200, 100, 40);
        loginButton.addActionListener(this);
        add(loginButton);
    }
    @Override
    public void actionPerformed(ActionEvent e) {
        String username = usernameField.getText();
        String password = new String(passwordField.getPassword());
        // Check login credentials (for demonstration purposes)
        if (username.equals("lokesh") && password.equals("2003")) {
            JOptionPane.showMessageDialog(this, "Login successful!", "Success",
JOptionPane.INFORMATION_MESSAGE);
```

```
            new Deepak();

            dispose(); // Close the login window

        } else {

                JOptionPane.showMessageDialog(this, "Invalid username or password.", "Login Failed",
JOptionPane.ERROR_MESSAGE);

        }

    }

}
```

Output

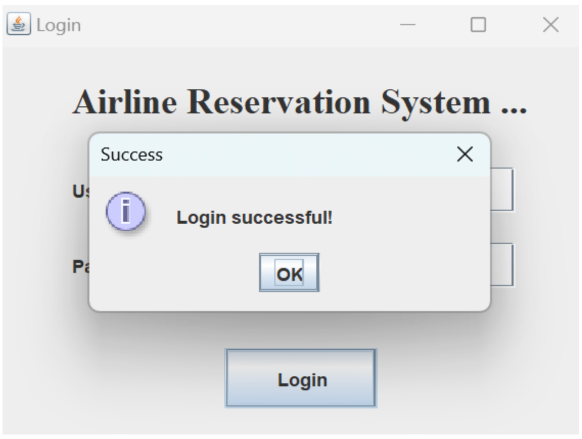

Login

Airline Reservation System ...

Username: lokesh

Password: ••••

Login


Login

Airline Reservation System ...

Success

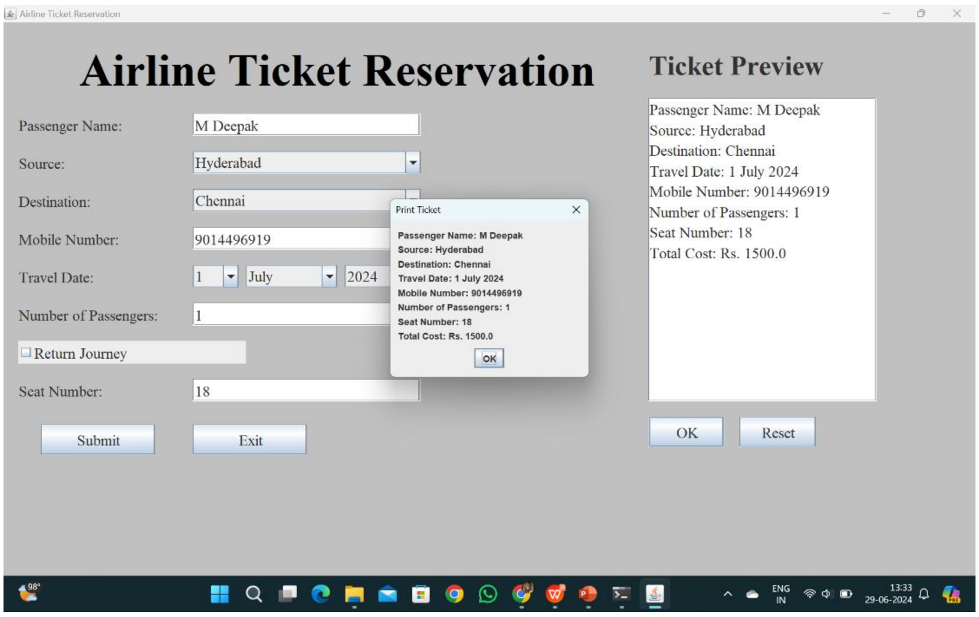
Login successful!

OK

Login

Fig 2&3: Login Interface of Airline Reservation System.

Fig 2&3: The interface of an attendance app typically features a login screen with fields for entering the username and password, ensuring secure and personalized access. The username field allows users to input their unique identification, often assigned by the system administrator. After a successful login into the attendance app, users are seamlessly transitioned into the main interface.



Airline Ticket Reservation

Passenger Name: M Deepak
Source: Hyderabad
Destination: Chennai
Mobile Number: 9014496919
Travel Date: 1 July 2024
Number of Passengers: 1
☐ Return Journey
Seat Number: 18

Print Ticket

Passenger Name: M Deepak
Source: Hyderabad
Destination: Chennai
Travel Date: 1 July 2024
Mobile Number: 9014496919
Number of Passengers: 1
Seat Number: 18
Total Cost: Rs. 1500.0

Ticket Preview

Passenger Name: M Deepak
Source: Hyderabad
Destination: Chennai
Travel Date: 1 July 2024
Mobile Number: 9014496919
Number of Passengers: 1
Seat Number: 18
Total Cost: Rs. 1500.0

Fig 4: Calculating the amount required to travel from source to destination by using Airline Reservation System.

Fig 4: The system computes the cost according to the selection from source to destination to travel in the text field. The system computes the total amount required to travel and determines the fare how much needed to travel and prints the ticket with the fare.

Conclusion

In conclusion, the development of the Airline Reservation System (ARS) using Java Swing represents a commitment to leveraging robust technologies to meet the evolving needs of the airline industry. By adopting Java as the core programming language and Java Swing for the graphical user interface, the ARS ensures platform independence and a consistent user experience across different environments. Utilizing MySQL or PostgreSQL for data management supports reliable storage and retrieval of critical flight, booking, and passenger information, while frameworks like Java EE or Spring facilitate the development of scalable backend components with enhanced security features.

This approach not only aims to streamline operations for airline staff by providing efficient tools for managing bookings and passenger data but also enhances the booking experience for customers through a user-friendly interface. By emphasizing security measures such as encryption and secure authentication, the ARS maintains the integrity and confidentiality of sensitive data, ensuring compliance with industry standards and regulations.

Looking forward, the ARS is poised to deliver a comprehensive solution that not only meets current operational requirements but also adapts to future technological advancements and scalability needs. Through continuous improvement and adherence to best practices in software development, the ARS strives to contribute positively to the efficiency, reliability, and customer satisfaction within the airline industry.

In conclusion, by embracing these future enhancements, the ARS can evolve into a cutting-edge solution that not only meets current industry standards but also anticipates and adapts to emerging trends and customer expectations. This proactive approach ensures that the ARS remains a robust and competitive tool in the dynamic landscape of the airline industry, driving efficiency, enhancing user experience, and fostering innovation.

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