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import javax.swing.*;
import java.awt.*;
import java.awt.event.*;
import java.util.*;

// Abstract Account class
abstract class Account {
    protected String accountNumber;
    protected double balance;
    protected String branch;

    public Account(String accountNumber, double initialBalance, String branch) {
        this.accountNumber = accountNumber;
        this.balance = initialBalance;
        this.branch = branch;
    }

    public void deposit(double amount) {
        if (amount > 0) {
            balance += amount;
        }
    }

    public double getBalance() { return balance; }
    public String getAccountNumber() { return accountNumber; }
    public String getBranch() { return branch; }

    public abstract void calculateInterest();
    public abstract String getAccountType();
}

// SavingsAccount class
class SavingsAccount extends Account {
    private static final double INTEREST_RATE = 0.0005; // 0.05% monthly

    public SavingsAccount(String accountNumber, double initialBalance, String branch) {
        super(accountNumber, initialBalance, branch);
    }

    @Override
    public void calculateInterest() {
        double interest = balance * INTEREST_RATE;
        balance += interest;
    }

    @Override
    public String getAccountType() { return "Savings"; }
}

// InvestmentAccount class
class InvestmentAccount extends Account {
    private static final double INTEREST_RATE = 0.05; // 5% monthly
    private static final double MIN_INITIAL_DEPOSIT = 500.00;

    public InvestmentAccount(String accountNumber, double initialBalance, String branch) {
        super(accountNumber, initialBalance, branch);
        if (initialBalance < MIN_INITIAL_DEPOSIT) {
            throw new IllegalArgumentException("Investment Account requires minimum BWP500.00");
        }
    }

    public boolean withdraw(double amount) {
        if (amount > 0 && balance >= amount) {
            balance -= amount;
            return true;
        }
        return false;
    }
}

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@Override
public void calculateInterest() {
    double interest = balance * INTEREST_RATE;
    balance += interest;
}

@Override
public String getAccountType() { return "Investment"; }
}

// ChequeAccount class
class ChequeAccount extends Account {
    private String companyName;
    private String companyAddress;

    public ChequeAccount(String accountNumber, double initialBalance, String branch,
                         String companyName, String companyAddress) {
        super(accountNumber, initialBalance, branch);
        this.companyName = companyName;
        this.companyAddress = companyAddress;
    }

    public boolean withdraw(double amount) {
        if (amount > 0 && balance >= amount) {
            balance -= amount;
            return true;
        }
        return false;
    }

    public String getCompanyName() { return companyName; }
    public String getCompanyAddress() { return companyAddress; }

    @Override
    public void calculateInterest() {
        // No interest for cheque accounts
    }

    @Override
    public String getAccountType() { return "Cheque"; }
}

// Customer class
class Customer {
    private String firstName;
    private String lastName;
    private String address;
    private ArrayList<Account> accounts;

    public Customer(String firstName, String lastName, String address) {
        this.firstName = firstName;
        this.lastName = lastName;
        this.address = address;
        this.accounts = new ArrayList<>();
    }

    public void addAccount(Account account) {
        accounts.add(account);
    }

    public ArrayList<Account> getAccounts() { return accounts; }
    public String getFirstName() { return firstName; }
    public String getLastname() { return lastName; }
    public String getAddress() { return address; }
    public String getFullName() { return firstName + " " + lastName; }
}

// Main GUI Application
class BankingSystemGUI extends JFrame {
    private ArrayList<Customer> customers;

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private Customer currentCustomer;

private JTextField firstNameField, lastNameField, addressField;
private JComboBox<String> accountTypeCombo;
private JTextField initialDepositField, companyNameField, companyAddressField;
private JList<String> accountlist;
private DefaultListModel<String> accountListModel;
private JTextArea outputArea;

public BankingSystemGUI() {
    customers = new ArrayList<>();
    initializeGUI();
}

private void initializeGUI() {
    setTitle("Banking System");
    setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
    setLayout(new BorderLayout());

    // Create panels
    JPanel customerPanel = createCustomerPanel();
    JPanel accountPanel = createAccountPanel();
    JPanel operationsPanel = createOperationsPanel();
    JPanel outputPanel = createOutputPanel();

    // Add panels to main frame
    add(customerPanel, BorderLayout.NORTH);
    add(accountPanel, BorderLayout.WEST);
    add(operationsPanel, BorderLayout.CENTER);
    add(outputPanel, BorderLayout.SOUTH);

    pack();
    setLocationRelativeTo(null);
}

private JPanel createCustomerPanel() {
    JPanel panel = new JPanel(new GridBagLayout());
    panel.setBorder(BorderFactory.createTitledBorder("Customer Information"));
    GridBagConstraints gbc = new GridBagConstraints();

    gbc.insets = new Insets(5, 5, 5, 5);

    gbc.gridx = 0; gbc.gridy = 0;
    panel.add(new JLabel("First Name:"), gbc);
    gbc.gridx = 1;
    firstNameField = new JTextField(15);
    panel.add(firstNameField, gbc);

    gbc.gridx = 2;
    panel.add(new JLabel("Last Name:"), gbc);
    gbc.gridx = 3;
    lastNameField = new JTextField(15);
    panel.add(lastNameField, gbc);

    gbc.gridx = 0; gbc.gridy = 1;
    panel.add(new JLabel("Address:"), gbc);
    gbc.gridx = 1; gbc.gridwidth = 2;
    addressField = new JTextField(30);
    panel.add(addressField, gbc);

    gbc.gridx = 3; gbc.gridwidth = 1;
    JButton createCustomerBtn = new JButton("Create Customer");
    createCustomerBtn.addActionListener(e -> createCustomer());
    panel.add(createCustomerBtn, gbc);

    return panel;
}

private JPanel createAccountPanel() {
    JPanel panel = new JPanel(new BorderLayout());

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panel.setBorder(BorderFactory.createTitledBorder("Account Management"));

// Account creation form
JPanel createPanel = new JPanel(new GridBagLayout());
GridBagConstraints gbc = new GridBagConstraints();
gbc.insets = new Insets(5, 5, 5, 5);

gbc.gridx = 0; gbc.gridy = 0;
createPanel.add(new JLabel("Account Type:"), gbc);
gbc.gridx = 1;
accountTypeCombo = new JComboBox<>(new String[]{"Savings", "Investment", "Cheque"});
accountTypeCombo.addActionListener(e -> toggleCompanyFields());
createPanel.add(accountTypeCombo, gbc);

gbc.gridx = 0; gbc.gridy = 1;
createPanel.add(new JLabel("Initial Deposit:"), gbc);
gbc.gridx = 1;
initialDepositField = new JTextField(10);
createPanel.add(initialDepositField, gbc);

gbc.gridx = 0; gbc.gridy = 2;
createPanel.add(new JLabel("Company Name:"), gbc);
gbc.gridx = 1;
companyNameField = new JTextField(10);
companyNameField.setEnabled(false);
createPanel.add(companyNameField, gbc);

gbc.gridx = 0; gbc.gridy = 3;
createPanel.add(new JLabel("Company Address:"), gbc);
gbc.gridx = 1;
companyAddressField = new JTextField(10);
companyAddressField.setEnabled(false);
createPanel.add(companyAddressField, gbc);

gbc.gridx = 0; gbc.gridy = 4; gbc.gridwidth = 2;
JButton createAccountBtn = new JButton("Create Account");
createAccountBtn.addActionListener(e -> createAccount());
createPanel.add(createAccountBtn, gbc);

panel.add(createPanel, BorderLayout.NORTH);

// Account list
accountListModel = new DefaultListModel<>();
accountList = new JList<>(accountListModel);
accountList.setSelectionMode(ListSelectionModel.SINGLE_SELECTION);
JScrollPane scrollPane = new JScrollPane(accountList);
scrollPane.setPreferredSize(new Dimension(300, 150));
panel.add(scrollPane, BorderLayout.CENTER);

return panel;
}

private JPanel createOperationsPanel() {
    JPanel panel = new JPanel(new GridBagLayout());
    panel.setBorder(BorderFactory.createTitledBorder("Account Operations"));
    GridBagConstraints gbc = new GridBagConstraints();
    gbc.insets = new Insets(10, 10, 10, 10);

    gbc.gridx = 0; gbc.gridy = 0;
    JButton depositBtn = new JButton("Make Deposit");
    depositBtn.addActionListener(e -> makeDeposit());
    panel.add(depositBtn, gbc);

    gbc.gridy = 1;
    JButton withdrawBtn = new JButton("Make Withdrawal");
    withdrawBtn.addActionListener(e -> makeWithdrawal());
    panel.add(withdrawBtn, gbc);

    gbc.gridy = 2;
    JButton interestBtn = new JButton("Calculate Interest");
    
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interestBtn.addActionListener(e -> calculateInterest());
panel.add(interestBtn, gbc);

gbc.gridx = 3;
JButton balanceBtn = new JButton("Check Balance");
balanceBtn.addActionListener(e -> checkBalance());
panel.add(balanceBtn, gbc);

return panel;
}

private JPanel createOutputPanel() {
    JPanel panel = new JPanel(new BorderLayout());
    panel.setBorder(BorderFactory.createTitledBorder("Output"));

    outputArea = new JTextArea(8, 50);
    outputArea.setEditable(false);
    outputArea.setFont(new Font(Font.MONOSPACED, Font.PLAIN, 12));
    JScrollPane scrollPane = new JScrollPane(outputArea);
    panel.add(scrollPane, BorderLayout.CENTER);

    return panel;
}

private void toggleCompanyFields() {
    boolean isCheque = "Cheque".equals(accountTypeCombo.getSelectedItem());
    companyNameField.setEnabled(isCheque);
    companyAddressField.setEnabled(isCheque);
}

private void createCustomer() {
    String firstName = firstNameField.getText().trim();
    String lastName = lastNameField.getText().trim();
    String address = addressField.getText().trim();

    if (firstName.isEmpty() || lastName.isEmpty() || address.isEmpty()) {
        showMessage("Please fill all customer fields.");
        return;
    }

    currentCustomer = new Customer(firstName, lastName, address);
    customers.add(currentCustomer);

    showMessage("Customer created: " + currentCustomer.getFullName());

    // Clear fields
    firstNameField.setText("");
    lastNameField.setText("");
    addressField.setText("");

    updateAccountList();
}

private void createAccount() {
    if (currentCustomer == null) {
        showMessage("Please create a customer first.");
        return;
    }

    String accountType = (String) accountTypeCombo.getSelectedItem();
    String depositStr = initialDepositField.getText().trim();

    if (depositStr.isEmpty()) {
        showMessage("Please enter initial deposit amount.");
        return;
    }

    try {
        double initialDeposit = Double.parseDouble(depositStr);
        String accountNumber = "ACC" + System.currentTimeMillis();
    }
}

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String branch = "Main Branch";

Account account = null;

switch (accountType) {
    case "Savings":
        account = new SavingsAccount(accountNumber, initialDeposit, branch);
        break;
    case "Investment":
        account = new InvestmentAccount(accountNumber, initialDeposit, branch);
        break;
    case "Cheque":
        String companyName = companyNameField.getText().trim();
        String companyAddress = companyAddressField.getText().trim();
        if (companyName.isEmpty() || companyAddress.isEmpty()) {
            showMessage("Please fill company information for Cheque account.");
            return;
        }
        account = new ChequeAccount(accountNumber, initialDeposit, branch, companyName,
companyAddress);
        break;
}

currentCustomer.addAccount(account);
showMessage("Account created successfully: " + account.getAccountNumber());

// Clear fields
initialDepositField.setText("");
companyNameField.setText("");
companyAddressField.setText("");

updateAccountList();

} catch (NumberFormatException e) {
    showMessage("Invalid deposit amount.");
} catch (IllegalArgumentException e) {
    showMessage(e.getMessage());
}
}

private void makeDeposit() {
    Account selectedAccount = getSelectedAccount();
    if (selectedAccount == null) return;

    String amountStr = JOptionPane.showInputDialog(this, "Enter deposit amount:");
    if (amountStr != null && !amountStr.trim().isEmpty()) {
        try {
            double amount = Double.parseDouble(amountStr);
            selectedAccount.deposit(amount);
            showMessage("Deposited BWP" + amount + ". New balance: BWP" + selectedAccount.getBalance());
            updateAccountList();
        } catch (NumberFormatException e) {
            showMessage("Invalid amount.");
        }
    }
}

private void makeWithdrawal() {
    Account selectedAccount = getSelectedAccount();
    if (selectedAccount == null) return;

    if (selectedAccount instanceof SavingsAccount) {
        showMessage("Withdrawals not allowed from Savings Account.");
        return;
    }

    String amountStr = JOptionPane.showInputDialog(this, "Enter withdrawal amount:");
    if (amountStr != null && !amountStr.trim().isEmpty()) {
        try {
            double amount = Double.parseDouble(amountStr);

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        boolean success = false;

        if (selectedAccount instanceof InvestmentAccount) {
            success = ((InvestmentAccount) selectedAccount).withdraw(amount);
        } else if (selectedAccount instanceof ChequeAccount) {
            success = ((ChequeAccount) selectedAccount).withdraw(amount);
        }

        if (success) {
            showMessage("Withdrew BWP" + amount + ". New balance: BWP" +
selectedAccount.getBalance());
            updateAccountList();
        } else {
            showMessage("Withdrawal failed. Insufficient funds or invalid amount.");
        }
    } catch (NumberFormatException e) {
        showMessage("Invalid amount.");
    }
}

private void calculateInterest() {
    if (currentCustomer == null) {
        showMessage("No customer selected.");
        return;
    }

    for (Account account : currentCustomer.getAccounts()) {
        double oldBalance = account.getBalance();
        account.calculateInterest();
        double interest = account.getBalance() - oldBalance;

        if (interest > 0) {
            showMessage("Interest added to " + account.getAccountType() + " Account: BWP" +
String.format("%.2f", interest));
        }
    }
    updateAccountList();
}

private void checkBalance() {
    Account selectedAccount = getSelectedAccount();
    if (selectedAccount == null) return;

    showMessage("Account Balance: BWP" + selectedAccount.getBalance());
}

private Account getSelectedAccount() {
    if (currentCustomer == null) {
        showMessage("No customer selected.");
        return null;
    }

    int selectedIndex = accountList.getSelectedIndex();
    if (selectedIndex == -1) {
        showMessage("Please select an account.");
        return null;
    }

    return currentCustomer.getAccounts().get(selectedIndex);
}

private void updateAccountList() {
    accountListModel.clear();
    if (currentCustomer != null) {
        for (Account account : currentCustomer.getAccounts()) {
            accountListModel.addElement(account.getAccountType() + " - " +
account.getAccountNumber() + " (BWP" + account.getBalance() + ")");
        }
    }
}

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}

private void showMessage(String message) {
    outputArea.append(message + "\n");
    outputArea.setCaretPosition(outputArea.getDocument().getLength());
}

public static void main(String[] args) {
    SwingUtilities.invokeLater(() -> {
        new BankingSystemGUI().setVisible(true);
    });
}
}
```