

Subsystem: Financial Subsystem

Classes: Account, Balance Inquiry, Deposit Transaction, Funds Transfer, Transaction, Withdrawal Transaction

Description: This subsystem implements the financial aspects of a bank customer's interactions with the ATM machine.

Contracts

8. Execute a financial transaction

Server: Transaction

Subsystem: User Interface Subsystem

Classes: Bank Card Reader, Cash Dispenser, Deposit Slot, Display Device, Display Screen, Form, Input Device, Keypad, Menu, Output Device, Receipt Printer, Secure Form, User Interaction, User Message, User Response

Description: This subsystem implements the interface between the ATM machine and the bank customer.

Contracts

4. Get a numeric value from the user

Server: Form

6. Get a user selection from a list of options

Server: Menu

9. Display a message and wait for some event

Server: User Message

Class: ATM

(Concrete)

Superclasses: none

Subclasses: none

Description: This class represents a teller machine through which bank customers can perform financial services.

Private Responsibilities

Create and initiate transactions

uses Financial Subsystem(8)

Display the greeting message

uses User Interface Subsystem(6)

Display the main menu

uses User Interface Subsystem(6)

Eject the receipt

uses User Interface Subsystem(9)

Eject the bank card

uses User Interface Subsystem(9)

Class: Account

(Concrete)

Superclasses: none

Subclasses: none

Description: This class represents a customer's account in the bank's database. All accesses to and modifications of bank accounts must occur through this class. Creating an instance of this class does not insure against modifications to the account from other software with access to the database.

Contracts

1. Access and modify the account balance

Accept deposits

deposit(Fixed Point)

This method records a deposit to the account of the amount specified by the Fixed Point value. The database will not be updated until the commit method has been invoked. Updating the database does not change the balance recorded there, but registers the deposit until the amount has been verified.

Accept withdrawals

withdrawal(Fixed Point)

This method records a withdrawal from the account of the amount specified by the Fixed Point value. The database will not be updated until the commit method has been invoked. Updating the database causes a change in the account balance because the amount has already been verified. A negative account balance may result.

Know the account balance

balance() returns Fixed Point

This method returns the current balance as recorded in the bank's database.

2. Commit the results to the database

Commit changes to the database

commit() returns Boolean

This method causes any modifications to the account to be logged against the database if possible. Return true if the commit was successful. The modifications can fail if there is a transmission error.

commitWith(Account) returns Boolean

This method causes any modifications to either this or another account to be logged against the database if possible. Return true if the commit was successful. The modifications can fail if there is a transmission error.

Class: Balance Inquiry

(Concrete)

Superclasses: Transaction

Subclasses: none

Description: This class represents requests by a bank customer to access the balance of an account.

Contracts

8. Execute a financial transaction

This contract is inherited from Transaction.

Private Responsibilities

Access the balance

uses Account(1)

Class: Bank Card Reader

(Concrete)

Superclasses: Input Device, Output Device

Subclasses: none

Description: This class represents the hardware device capable of reading and validating a bank customer's card.

Contracts

5. Accept input from the user

This contract is inherited from Input Device.

7. Output to the user

This contract is inherited from Output Device.

Private Responsibilities

Read bank cards

Eject bank cards

Keep bank cards whose PIN is not correctly entered

Inform user of unreadable cards

uses User Message(9)

Prompt user for PIN

uses Form(4)

Class: Cash Dispenser

(Concrete)

Superclasses: Output Device

Subclasses: none

Description: This class represents the hardware device through which cash is dispensed to bank customers.

Contracts

7. **Output to the user**

This contract is inherited from Output Device.

Private Responsibilities

Dispense funds

Class: Deposit Slot

(Concrete)

Superclasses: Display Device, Input Device

Subclasses: none

Description: This class represents the hardware device through which a bank customer's deposit envelope is inserted.

Contracts

3. Display information

This contract is inherited from Display Device.

5. Accept input from the user

This contract is inherited from Input Device.

Private Responsibilities

Accept a deposit envelope

Class: Deposit Transaction

(Concrete)

Superclasses: Transaction

Subclasses: none

Description: This class represents a request from a bank customer to deposit funds into an account.

Contracts

8. Execute a financial transaction

This contract is inherited from Transaction.

Private Responsibilities

Prompt for the amount

uses User Interface Subsystem(4)

Deposit funds

uses Account(1), User Interface Subsystem(9)

Class: Device
Superclasses: none
Subclasses: none
Description:

(Concrete)

Class: Display Device

(Concrete)

Superclasses: none

Subclasses: Display Screen, Receipt Printer, Deposit Slot

Description: This class defines the behavior common to all devices that can display information for a bank customer.

Contracts

3. Display information

Display text and graphics

display(Text)

This method displays the Text on the device in the default location.

display(Text, Point)

This method displays the Text on the device at the specified Point.

display(Graphic)

This method displays the Graphic on the device in the default location.

display(Graphic, Point)

This method displays the Graphic on the device at the specified Point.

Class: Display Screen

(Concrete)

Superclasses: Display Device

Subclasses: none

Description: This class represents a screen on which text and graphics information can be displayed.

Contracts

3. Display information

This contract is inherited from Display Device.

Class: Form

(Concrete)

Superclasses: User Interaction

Subclasses: Secure Form

Description: This class represents an interaction with the user for the purpose of obtaining a numeric value.

Contracts

4. Get a numeric value from the user

Ask the user for information

uses Display Device(3), Input Device(5)

getNumber(String) returns User Response

This method displays the Text prompt on the screen to inform the user what type of value is expected, reads numeric key presses, and assembles those key presses into a value which it returns. The number representing a key press is echoed on the display to provide visual feedback to the customer.

Private Responsibilities

Know if user has responded

Know the user's response

uses Input Device(5)

Provide feedback on input

uses Display Device(3)

Class: Funds Transfer

(Concrete)

Superclasses: Transaction

Subclasses: none

Description: This class represents a request from a bank customer to have funds transferred from one account to another.

Contracts

8. Execute a financial transaction

This contract is inherited from Transaction.

Private Responsibilities

Prompt for the amount

uses User Interface Subsystem(4)

Transfer funds

uses Account(1)

Class: Input Device

(Abstract)

Superclasses: none

Subclasses: Bank Card Reader, Deposit Slot, Keypad

Description: This class defines the behavior of devices from which input can be obtained.

Contracts

5. Accept input from the user

Get user input

input() returns User Response

This method waits until the device to which it was sent has received the expected type of input, then returns an indication of whether the input was received, and when appropriate, the value of that input.

Class: Key

(Concrete)

Superclasses: none

Subclasses: none

Description:

Private Responsibilities

Know if it has been pressed

Class: Keypad

(Concrete)

Superclasses: Input Device

Subclasses: none

Description: This class represents the keys on the face of the ATM machine that can be pressed.

Contracts

5. Accept input from the user

This contract is inherited from Input Device.

Class: Menu

(Concrete)

Superclasses: User Interaction

Subclasses: none

Description: This class represents a form of user interaction in which a bank customer is asked to choose from one option from a small number of choices.

Contracts

6. Get a user selection from a list of options

Present user with choices

uses Display Device(3), Input Device(5)

getChoice(Text) returns User Response

This method presents the user with the list of choices specified (see addItem). When the user responds, the value associated with the selected choice is returned. The list of choices is labeled with Text describing the options and the purpose for the question.

addItem(Text, any)

This method adds a choice to the menu. The choice is represented to the user with the parameter Text. If this item is chosen, the second argument will be returned. If more items are added than can be displayed on the screen, the items will be divided into groups that will fit, with the last item of each group being a "next page" item. The last item is "return to start of menu."

Private Responsibilities

Know if user has responded

Know user's response

uses Input Device(5)

Class: Numeric Input Key

(Concrete)

Superclasses: none

Subclasses: none

Description:

Class: Output Device

(Abstract)

Superclasses: none

Subclasses: Bank Card Reader, Cash Dispenser, Receipt Printer

Description: This class defines the behavior common to all classes that can send some physical output to the bank customer.

Contracts

7. Output to the user

Output something physical

eject()

This method causes something physical to be ejected from the machine.

Class: Receipt Printer

(Concrete)

Superclasses: Display Device, Output Device

Subclasses: none

Description: This class represents the hardware device that can print information on a paper receipt, and eject that receipt.

Contracts

3. Display information

This contract is inherited from Display Device.

7. Output to the user

This contract is inherited from Output Device.

Private Responsibilities

Print receipt of transactions

Eject the receipt

Class: Secure Form

(Abstract)

Superclasses: Form

Subclasses: none

Description: This class represents a type of user interaction in which the user is prompted for numeric input, but in which the feedback includes only the number of digits entered, not the value of those digits.

Contracts

4. Get a numeric value from the user

This contract is inherited from Form.

Class: Transaction

(Abstract)

Superclasses: none

Subclasses: Balance Inquiry, Deposit Transaction, Funds Transfer, Withdrawal Transaction

Description: This class defines the behavior common to all requests from a bank customer to perform some financial transaction.

Contracts

8. Execute a financial transaction

Execute a financial transaction

execute() returns Boolean

This method executes a transaction, returning true if the transaction was completed, false if the user canceled the transaction before completion.

Private Responsibilities

Check if cancel key has been pressed

uses User Interface Subsystem(4), User Interface Subsystem(6), User Interface Subsystem(9)

Commit the transaction to the database

uses Account(2)

Prompt for an account

uses User Interface Subsystem(6)

Gather information

uses User Interface Subsystem(4), User Interface Subsystem(6), User Interface Subsystem(9)

Remember data relevant to the transaction

Print a record of the transaction

uses User Interface Subsystem(9)

Class: User Interaction

(Abstract)

Superclasses: none

Subclasses: Form, Menu, User Message

Description: This class describes the behavior common to all interactions with the bank customer.

Private Responsibilities

Check to see if cancel key has been pressed
uses Input Device(5)

Class: User Message

(Concrete)

Superclasses: User Interaction

Subclasses: none

Description: This class represents a type of user interaction in which the user is prompted to take some action. The message will not return to its caller until the action has been taken.

Contracts

9. Display a message and wait for some event

Display message text

uses Display Device(3), Input Device(5), Output Device(7)

InsertValidCard() returns User Response

This method displays a message asking the user to insert a card, and waits until a valid card has been inserted.

InsertDepositEnvelope() returns User Response

This message displays a message asking the user to insert a deposit envelope and waits until an envelope has been inserted. If no envelope is inserted within five minutes, the transaction is considered canceled, and that User Response is returned.

removeCard() returns User Response

This method displays a message asking the user to remove the bank card and waits until the card has been removed. If the card has not been removed after five minutes, a User Response is returned signifying that the user did not collect the bank card.

removeReceipt() returns User Response

This method displays a message asking users to remove the printed receipt of their transactions. If the receipt has not been removed after five minutes, a User Response is returned signifying that the user did not remove the receipt.

removeCash() returns User Response

This method displays a message asking users to remove the cash just withdrawn. If the cash has not been removed after five minutes, a User Response is returned signifying that the user did not remove the cash.

Private Responsibilities

Wait for the appropriate user response

Class: User Response

(Concrete)

Superclasses: none

Subclasses: none

Description: This class represents a response made by a user when asked to perform some task. The response can be invalid if the user pressed the cancel key or failed to perform the task. If the response is valid, there may be a value associated with the response indicating the results of the user's actions.

Private Responsibilities

Know a user's response

isValid() returns Boolean

This method returns true if the response is valid, false if not.

value() returns any

This method returns the value associated with the response, if there is one. If there is no value, or if the response is invalid, a null object is returned.

Remember a user's response

setValid()

This method sets the response to be a valid response.

setInvalid()

This method sets the response to be an invalid response.

value(any)

This method sets the value associated with the response to be the value of the parameter.

Class: Withdrawal Transaction

(Concrete)

Superclasses: Transaction

Subclasses: none

Description: This class represents a request by a bank customer to withdraw funds from an account in the form of cash.

Contracts

8. Execute a financial transaction

This contract is inherited from Transaction.

Private Responsibilities

Prompt for the amount

uses User Interface Subsystem(4)

Withdraw funds

uses Account(1), User Interface Subsystem(9)

Contract 1: Access and modify the account balance

Server: Account

Clients: Balance Inquiry, Deposit Transaction, Funds Transfer, Withdrawal Transaction

Description: This contract defines the way an account can be accessed and modified.

Contract 2: Commit the results to the database

Server: Account

Clients: Transaction

Description: This contract supports committing account changes to the database.

Contract 3: Display information

Server: Display Device

Clients: User Message, Form, Menu

Description: This contract supports the display of text and graphics to either the screen or receipt printer.

Contract 4: Get a numeric value from the user

Server: Form

Clients: Deposit Transaction, Funds Transfer, Transaction, Withdrawal Transaction, Bank Card Reader

Description: This contract supports prompting the user for numeric input.

Contract 5: Accept input from the user

Server: Input Device

Clients: User Message, Form, Menu, User Interaction

Description: This contract supports the ability to determine when the user has input some information.

Contract 6: Get a user selection from a list of options

Server: Menu

Clients: Transaction, ATM

Description: This contract supports prompting the user to choose among a finite set of choices.

Contract 7: Output to the user

Server: Output Device

Clients: User Message

Description: This contract supports the output of something physical.

Contract 8: Execute a financial transaction

Server: Transaction

Clients: ATM

Description: This contract supports executing financial transactions.

Contract 9: Display a message and wait for some event

Server: User Message

Clients: Bank Card Reader, Deposit Transaction, Transaction, Withdrawal Transaction, ATM

Description: This contract supports prompting the user to perform some action, such as inserting or removing a bank card.

