ATM User Interface Design

Requirements

A statement of requirements for a portion of the system may be extracted from the use cases and other Inception documents. A brief narrative is useful for identifying the problem domain objects (concepts).

A bank customer is able to access his or her account using an automatic teller machine. To be able to use an ATM a customer must first register an account number and a passcode number. The customer's information is then added to a list of registered users. The ATM user interface consists of a keypad, a display window, a selection of choice options, and a help screen that displays instructions for completing an ATM transaction. Users are asked to enter their account number from the keypad followed by their passcode. If the customer is a valid user, instructions are given for choosing a transaction. During a transaction, the user's account is accessed and updated. Upon completion of a transaction, the user may elect to make another transaction or to quit.

This prototype simulates the actual machine that includes a card reader and buttons implemented in the hardware.

Requirements

Identify the noun phrases and verb phrases in the narrative

A **bank customer** *is able to access* his or her **account** using an **automatic teller machine**. To be able to use an ATM a **customer** *must* first *register* an **account number** and a **passcode number**. The **customer’s information** *is* then *added to* a **list of registered users**. The **ATM user interface** *consists of* a **keypad**, a **display window**, a **selection of choice options**, and a **help screen** that *displays* **instructions for completing an ATM transaction**. **Users** *are asked to enter* their **account number** from the **keypad** followed by their **passcode**. If the **customer** *is* a **valid user**, **instructions** *are given* for choosing a **transaction**. During a transaction, the **user’s account** *is accessed* and *updated*. Upon completion of a transaction, the **user** *may elect to make* another **transaction** or *to quit*.

List of Noun Phrases

Bank customer	Concept		
Account	Concept		
Automatic teller machine	Redundant, same as ATM		
ATM	Concept		
Account number	Attribute		
Passcode number	Attribute		
Customer information	Concept		
List of registered users	Concept		
ATM user interface	Concept	But in this example the ATM relates only to the user interface – same as ATM	
Keypad	Concept		
Display window	Concept	Instructions	Attribute Text strings
Help screen	Concept		
Selection of choice options	Concept		
Transaction	Concept		

Associations

Customer *accesses* **Account (via ATM)**

Customer Information *is added to* **List of registered users**

ATM *consists of* **Keypad**, **Display**, **Help screen**, **Selection of choice options**

Account is accessed *by* (**ATM**)

ATM *verifies* **Customer Information**

Implicit

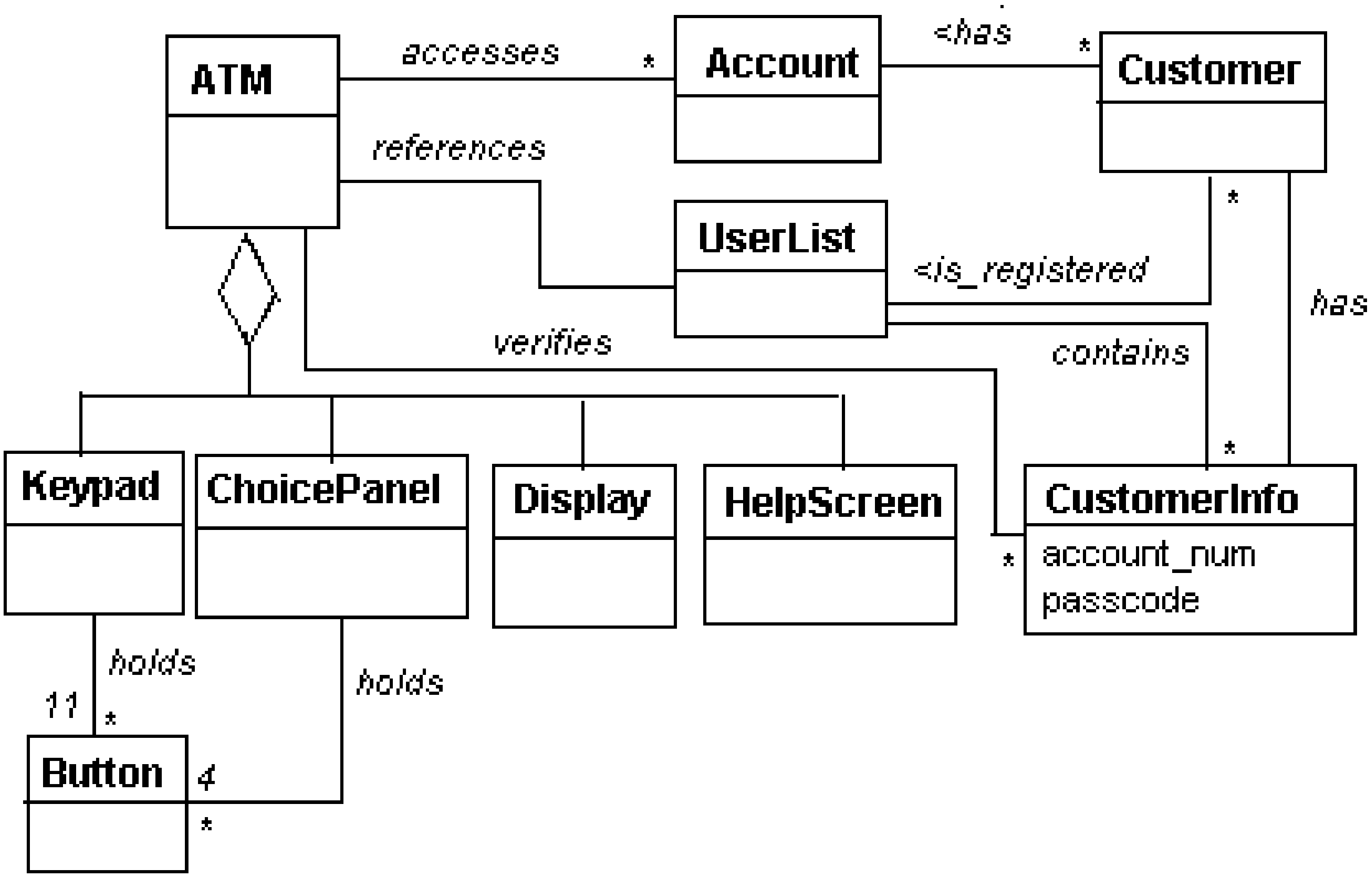
Customer *has* **Account**

Keypad *has* **Buttons**

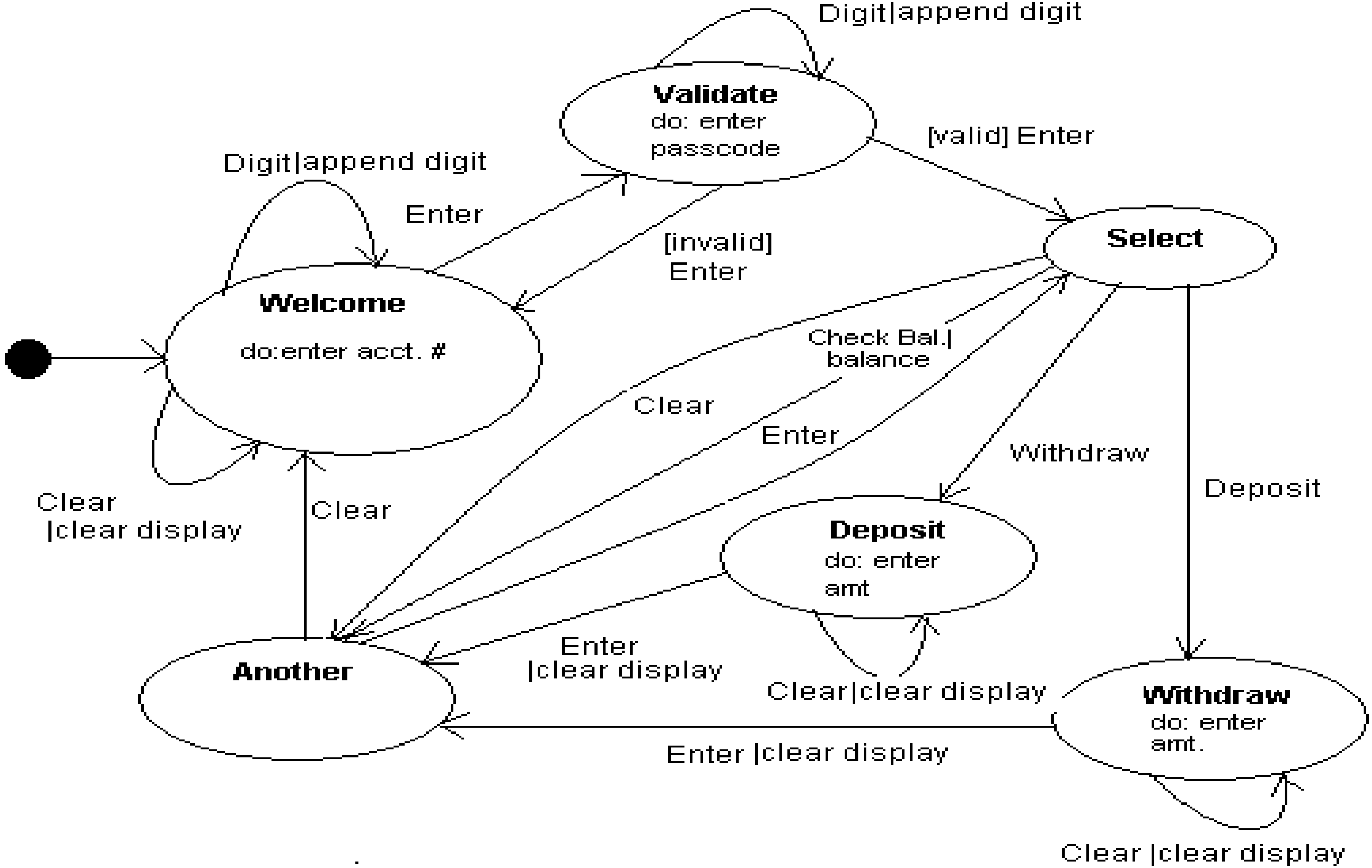
Choice Selection *uses* **Buttons**

Draw a Domain Model relating these Concepts

ATM User Interface Domain Model



State Transition Diagram



Implementation of a Prototype

To provide an illustration of the ATM user interface, we will implement an Applet that uses stubs to represent the Account, UserList, and CustomerInfo objects.

The prototype shows a working model of the user interface with the message sequence that the customer will encounter. The purpose of the prototype is to examine the human factors issues relating to the interface and to make certain that there are no deadlocks or partial cycles and that each transaction will properly terminate and return the system to the welcome state.

The ATM User Interface

Test Plan for the User Interface Prototype

Test Plan for the Interface Prototype

1. Specify the paths through the system to be tested

Welcome screen (ask for Account Number) (DIGITS + ENTER) →

Passcode State (Ask for Passcode) (DIGITS + ENTER) →

Select State (Show Options) (DEPOSIT or WITDRAW + ENTER) →

Deposit State or Withdraw State (Key-in amount and press ENTER) →

Other State (Ask if user wants to make another transaction) (CLEAR = NO) →

Goodbye screen (if answer is NO) (CLEAR) →

Welcome screen is returned

Alternative paths from Select State

User aborts transaction by pressing CLEAR → Goodbye (CLEAR) → Welcome

User selects check balance (BALANCE) → Other State (CLEAR = NO) →
Goodbye screen (CLEAR) → Welcome

Test Plan for User Interface Prototype

Other Alternate Paths

After a Deposit or Withdrawl make another transaction

Deposit (ENTER) → Other State(ENTER = YES) → Select screen (BALANCE) → Other State (CLEAR = NO) → Goodbye screen (CLEAR) → Welcome

Test that pressing ENTER before keying in the amount of the deposit or withdrawl will generate the appropriate error message recovery sequence.

2. When debugging and testing the prototype, keep a log of corrections and changes made in the code.

   You should NOT record simple errors like missing semicolons, missing parentheses, or misspelled identifiers, but errors that lead to changes in the code like adding the boolean hold flag to ensure that the goodbye screen would display after a balance check.

   Changes to the code made during debugging and testing can modify or override design decisions and should be documented for later review.

Results of Testing

Errors Detected

- Account numbers and passcodes that are 9 digits or longer can cause integer overflow errors.
- If ENTER is pressed before an amount is indicated when performing a withdrawal, then ENTER must be pressed twice after an amount has been entered before the correct screen is displayed.

Plan for the Next Iteration

Start Date: Sept. 9, 2004 Due Date: Sept. 23, 2004

Artifact	Comment
Use cases: Withdrawal Deposit Check Balance	Use cases describe the main sequence scenario and lists alternate sequence scenarios (to be developed in next iteration). Fully dressed use cases are begun for each of these goals.
Actor-Goal List	Identify the stakeholders (and external systems) and make a list of the goals that each might have.
Use case diagrams	From the Actor-Goal List, identify use cases and the actors that participate in each. Display the system boundary.
State Model Diagram	Add error states for incorrect passcode – do not accept passcodes with more than 6 digits.
Prototype	Construct a table for verifying user accounts/passcode. Construct a database for user accounts and incorporate these data bases into the ATM simulation.

Homework

Complete the artifacts listed in the iteration Plan. In particular:

1. Write use cases for Witrhdraw, Deposit, and Check Balance (as described in the comments.)
2. Construct an Actor-Goal List and Use Case Diagram.
3. Construct a Table for verifying account number/passcode pair. Assume that Account numbers are pre-assignned and let the passcodes be established at that time. (You may add the ability for a user to change his/her passcode as an option in this iteration.
4. Construct a database for user accounts. (A structure of your own creation holding account information and providing methods for performing transactions will suffice here.)
5. Incorporate the databases into the prototype system. Add checking of account number/passcode for valid user (and don't allow passcode numbers greater than 6 digits).
6. Write a test plan for testing the prototype and perform test.