SOFTWARE ENGINEERING PRACTICAL DOCUMENT

PRACTICAL NO: 5

AIM: Study and implementation of State Transition Diagrams.

SOLUTION

State Transition Diagram are also known as Dynamic models. As the name suggests, it is a type of diagram that is used to represent different transition (changing) states of a System. It is generally used to graphically represent all possible transition states a system can have and model such systems. It is very essential and important and right for object-oriented modeling from the beginning.

Why State Machine Diagram?

Since it records the dynamic view of a system, it portrays the behavior of a software application. During a lifespan, an object underwent several states, such that the lifespan exists until the program is executing. Each state depicts some useful information about the object. It blueprints an interactive system that response back to either the internal events or the external ones. The execution flow from one state to another is represented by a state machine diagram. It visualizes an object state from its creation to its termination. The main purpose is to depict each state of an individual object. It represents an interactive system and the entities inside the system. It records the dynamic behavior of the system.

Difference between state diagram and flowchart –

The basic purpose of a state diagram is to portray various changes in state of the class and not the processes or commands causing the changes. However, a flowchart on the other hand portrays the processes or commands that on execution change the state of class or an object of the class.

Notation of a State Machine Diagram

Following are the notations of a state machine diagram enlisted below:
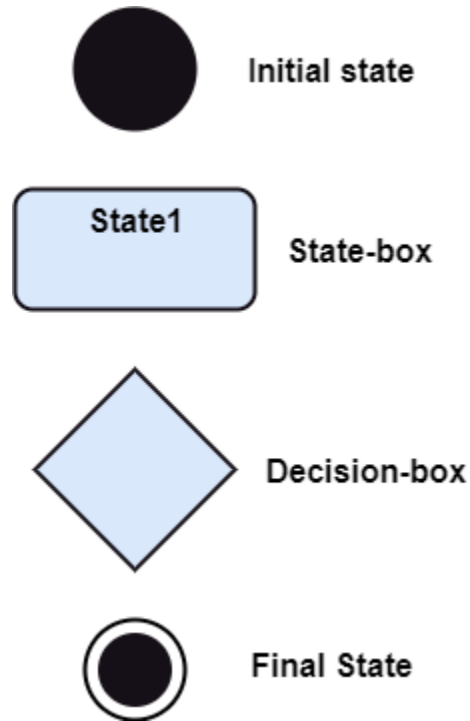
Initial state: It defines the initial state (beginning) of a system, and it is represented by a black filled circle.

Final state: It represents the final state (end) of a system. It is denoted by a filled circle present within a circle.

Decision box: It is of diamond shape that represents the decisions to be made based on an evaluated guard.

Transition: A change of control from one state to another due to the occurrence of some event is termed as a transition. It is represented by an arrow labeled with an event due to which the change has ensued.

State box: It depicts the conditions or circumstances of a particular object of a class at a specific point of time. A rectangle with round corners is used to represent the state box.

Example of a State Machine Diagram

Now let us see the State Transition Diagram of Automated Teller Machine (ATM) System. In this you will see the processing when the customer performs transactions using ATM card.

When the customer inserts the bank or credit card in the ATM's card reader, the entry action i.e., read card is performed by the ATM machine. If the card is not valid then the machine will perform exit action. After the card is being read successfully, the ATM machine will ask for Pin. Then the customer enters the pin and ATM machine then reads pin. If the pin entered is not valid then machine will perform exit action. If the pin entered is valid, then the machine further process towards transaction. After successful transaction, machine undergoes the exit action i.e., eject card that discharges the customer's card.
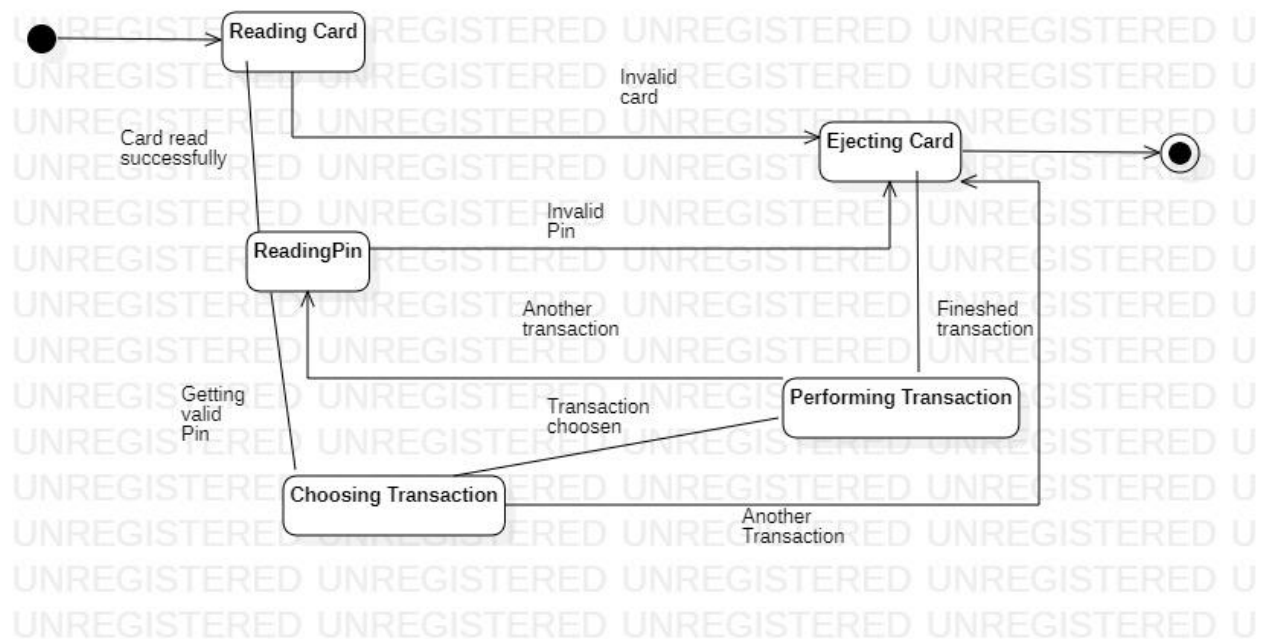
Example of a State Machine Diagram (Telephone System)

An example of a top-level state machine diagram showing Telephone System is given below. In this example, the phone line is idle at the start of a call. When the phone is removed from the hook, it emits a dial tone and can accept the dialing of digits. Upon entry a valid number, the phone system tries to connect the call and route to the proper destination. The connection can fail if the number or trunk are busy. If the connection is successful, the called phone begins ringing. When put on hook again, the phone line will go back to idle.