**NATIONAL UNIVERSITY OF COMPUTER AND**

**EMERGING SCIENCES**

**SL-2002 – Software Design & Architecture Lab**

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**Lab 09**

**State Chart Diagram:**

A state chart diagram, also known as a state machine diagram in UML (Unified Modeling Language), is a behavioral diagram that represents the different states of an object, along with transitions between these states in response to events. State chart diagrams are particularly useful for modeling the behavior of an object over its lifetime or in response to various stimuli. They are used to describe the dynamic behavior of a system or a part of a system.

**Key Elements of a State Chart Diagram:**

1. **States**:
   * Represents a condition or situation during the lifetime of an object.
   * Each state is depicted as a box with rounded corners, containing the name of the state.
2. **Transitions**:
   * Represents the movement of an object from one state to another in response to an event.
   * Transitions are depicted as arrows with labels indicating the event triggering the transition.
   * They show the conditions under which the transition occurs.
3. **Events**:
   * External stimuli or triggers that cause a state transition.
   * Events can be labeled on transitions to show what triggers the transition.
4. **Actions**:
   * Actions or activities performed when entering or exiting a state.
   * Actions can be associated with states or transitions.

**Symbols Of the State Chart Diagram:**

1. Initial State –
2. Final State –
3. Simple State –
4. Composite State **–**

|  |  |
| --- | --- |
| Type of State | Description |
| Initial State | In a System, it represents Starting state. |
| Final State | In a System, it represents Ending state. |
| Simple State | In a System, it represents a Simple state with no substructure. |
| Composite State | In a System, it represents a Composite state with two or more parallel or concurrent states out of which only one state will be active at a time and other states will be inactive. |

**Steps to Create a State Chart Diagram:**

**1. Identify States:**

* Determine the different states that the object or system can be in.
* States represent conditions or situations during the object's lifecycle.

**2. Define Events:**

* Identify events or triggers that can cause transitions between states.
* Events are stimuli or conditions that lead to state changes.

**3. Start with Initial State:**

* Begin by defining the initial state of the object.
* The initial state is where the object starts when it is created or activated.

**4. Add States:**

* Represent each state as a rounded rectangle.
* Label each state with its name.

**5. Define Transitions:**

* Draw arrows between states to represent transitions.
* Label each transition with the event or condition that triggers the transition.
* Optionally, add conditions or actions associated with transitions.

**6. Add Final State (Optional):**

* If the object or system has a final state (termination state), add it to the diagram.
* The final state represents the end of the object's lifecycle.

**7. Consider Hierarchical States (Optional):**

* If there are sub-states within a state, you can represent them using nested states.
* Nest a smaller rounded rectangle inside a larger one to indicate a sub-state.

**8. Add Actions (Optional):**

* Include actions or activities associated with states.
* Actions are actions performed when entering or exiting a state.

**9. Review and Refine:**

* Review the diagram to ensure it accurately represents the object's behavior.
* Refine the diagram for clarity and completeness.

Example:

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.

