UNIT 5

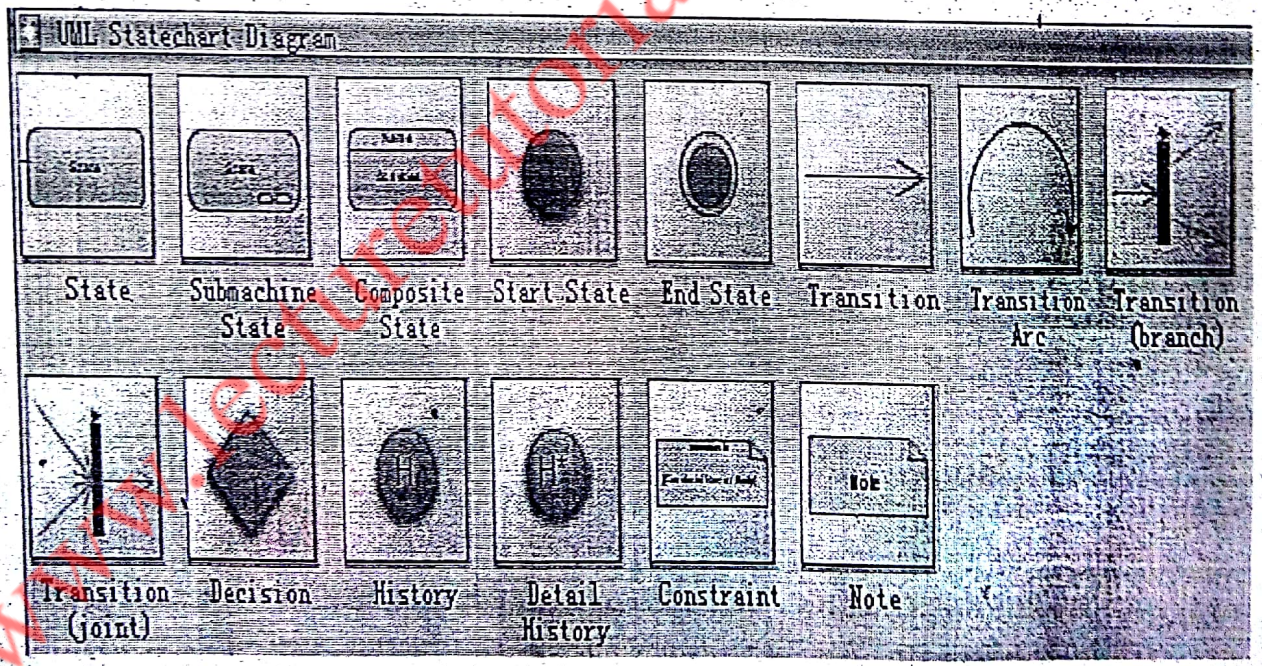
STATE CHART DIAGRAMS

- State chart diagrams are one of the five diagrams in the UML for modeling the dynamic aspects of the systems.
- State chart diagram shows a state machine.
- An activity diagram is a special case of a state chart diagram.
- Both activity and state chart diagrams are useful in modeling the life type of an object.
- Activity diagram shows flow of control from activity to activity.
- State chart diagram shows flow of control from state to state.

Contents:

- State chart diagrams commonly contain
  - » Set of states & Complex states
  - » Transitions including events and actions

State chart Diagram Symbols:



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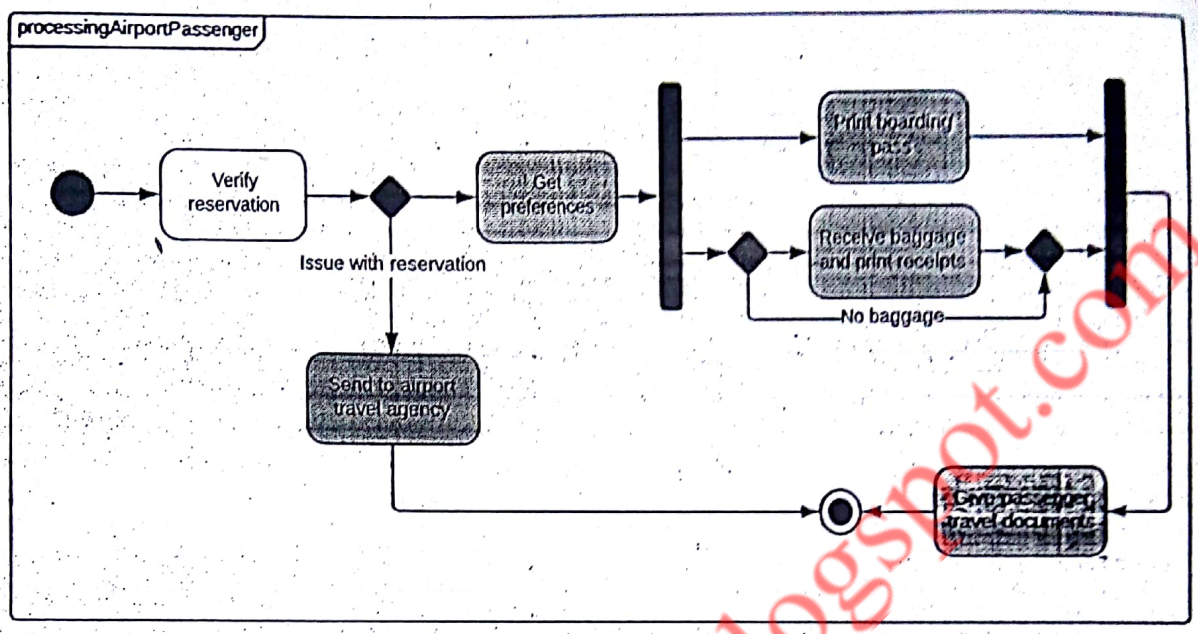
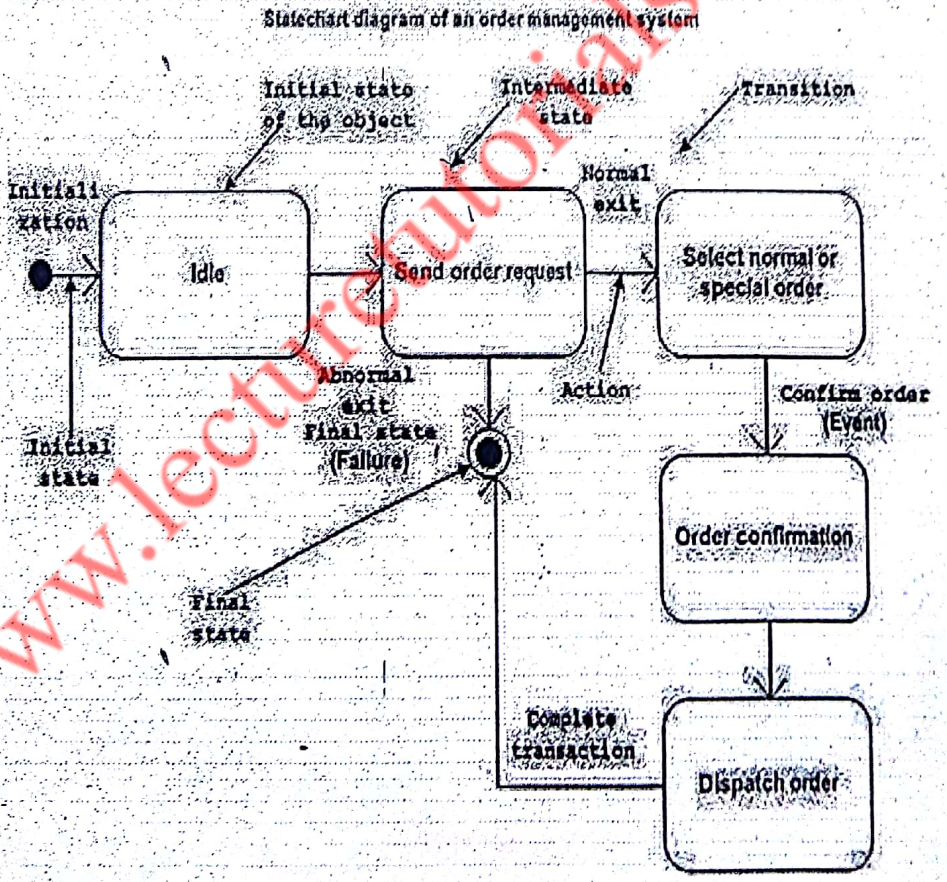
Examples:





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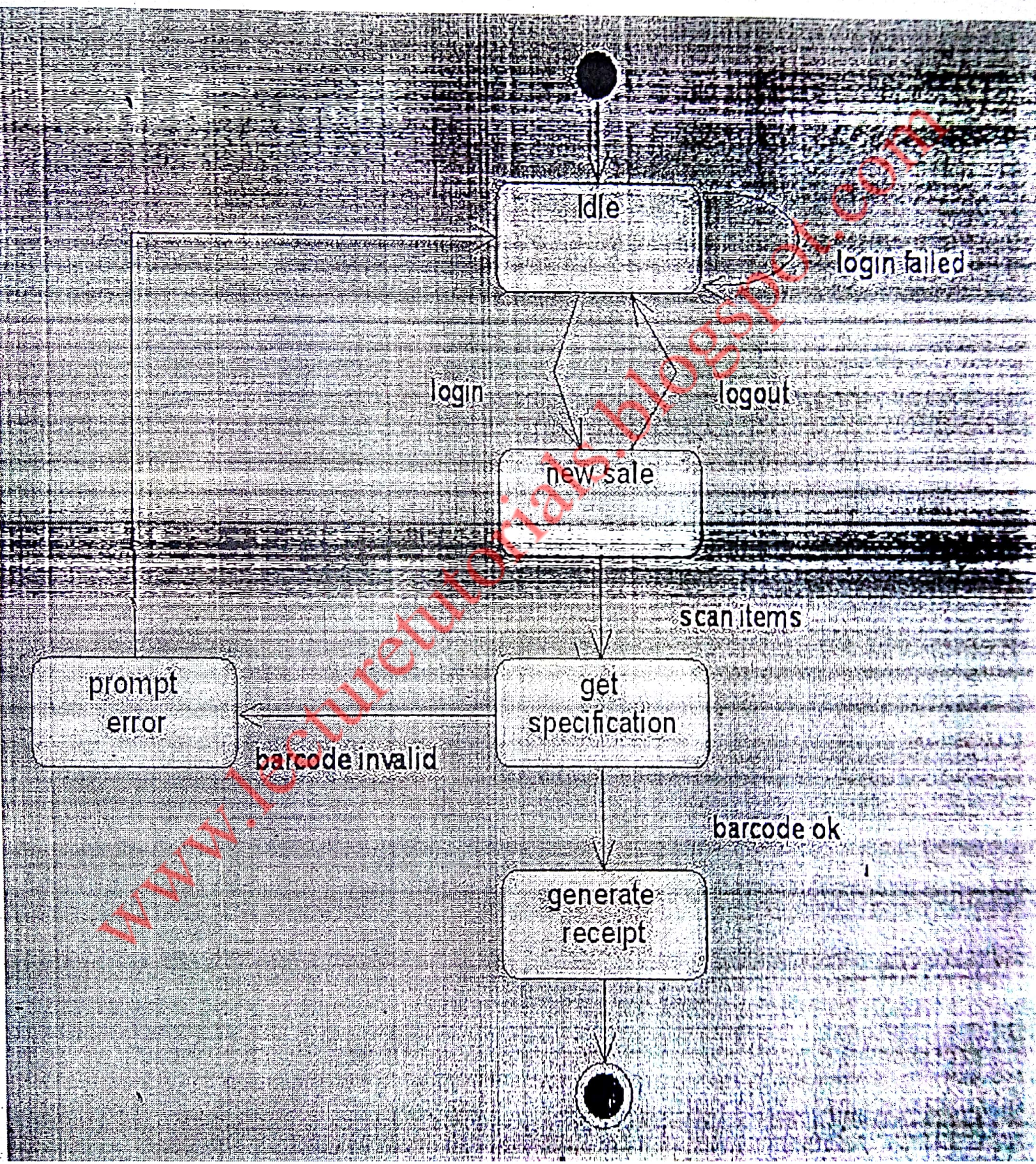

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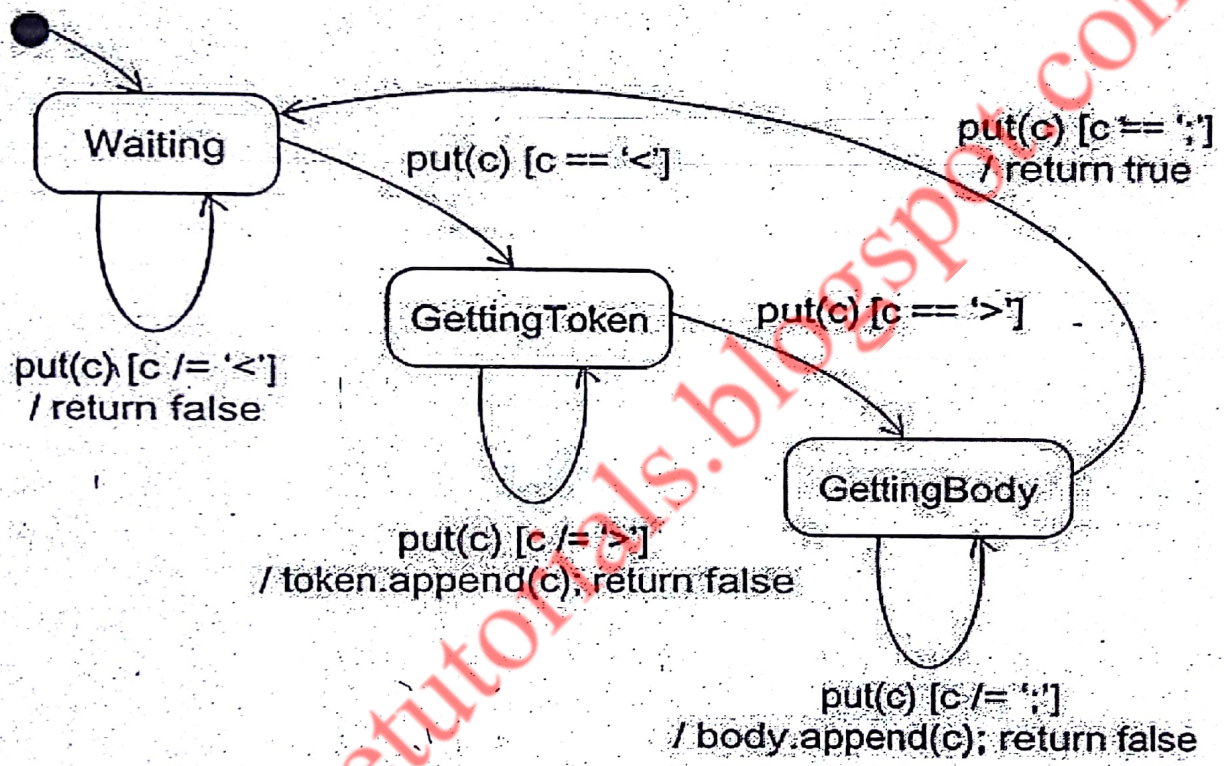
Modeling Reactive Objects:

- To model a reactive object
- For example the state chart diagram for parsing a simple context-free language message : '<'string '>'string ';'
- The first string represents a tag, the second string represents the body of the message.



Events

- An event is the specification of a significant occurrence that has a location in time and space.
- Anything that happens is modeled as an event in UML.
- In the context of state machines, an event is an occurrence of a stimulus that can trigger a state transition
- Four kinds of events – signals, calls, the passing of time, and a change in state.

Figure 1: Events

- Events may be external or internal and asynchronous or synchronous.
- Asynchronous events are events that can happen at arbitrary times eg:- signal, the passing of time, and a change of state. synchronous events, represents the invocation of an operation eg:- Calls
- External events are those that pass between the system and its actors. Internal events are those that pass among the objects that live inside the system.

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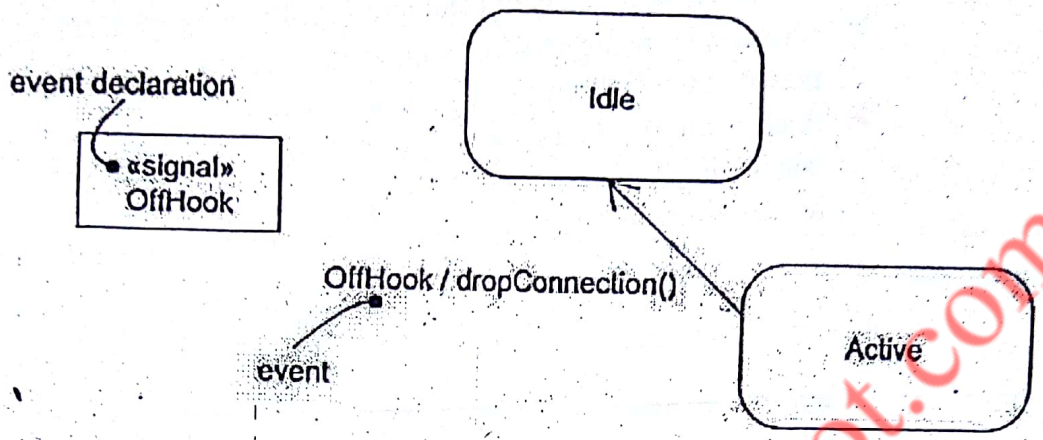
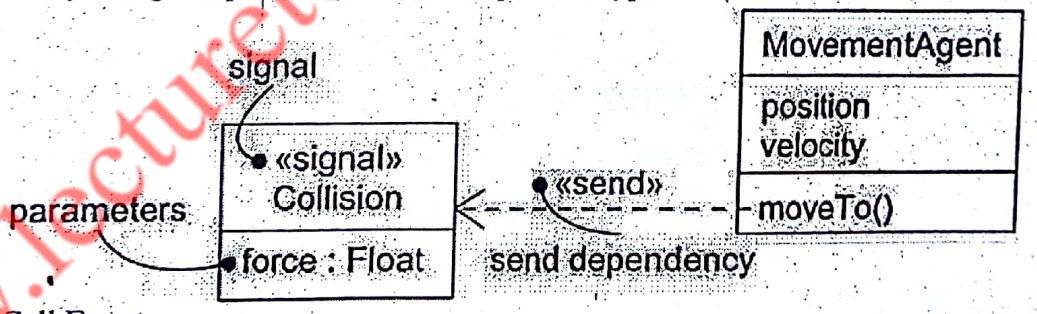
- A signal is an event that represents the specification of an asynchronous stimulus communicated between instances.



Kinds of events

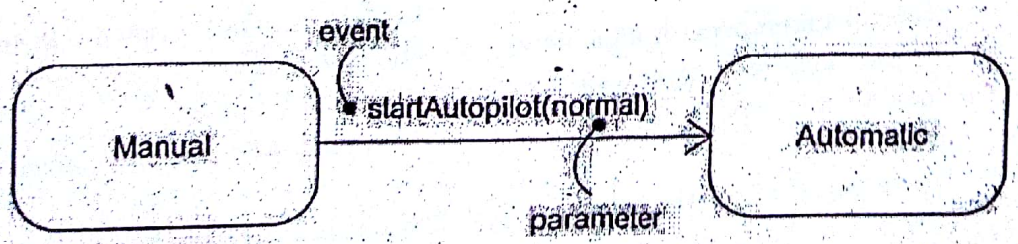
Signal Event

- a signal event represents a named object that is dispatched (thrown) asynchronously by one object and then received (caught) by another. Exceptions are an example of internal signal
- a signal event is an asynchronous event
- Signal events may have instances, generalization relationships, attributes and operations. Attributes of a signal serve as its parameters
- A signal event may be sent as the action of a state transition in a state machine or the sending of a message in an interaction
- signals are modeled as stereotyped classes and the relationship between an operation and the events by using a dependency relationship, stereotyped as send



Call Event:

- a call event represents the dispatch of an operation
- a call event is a synchronous event



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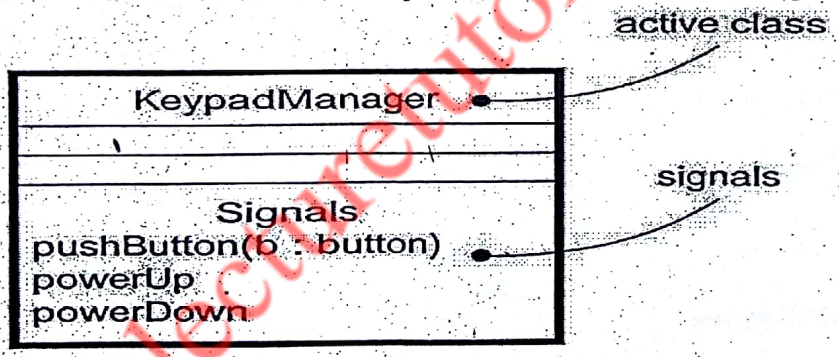
Time and Change Events:

- A time event is an event that represents the passage of time.
- Modeled by using the keyword 'after' followed by some expression that evaluates to a period of time which can be simple or complex.
- A change event is an event that represents a change in state or the satisfaction of some condition.
- Modeled by using the keyword 'when' followed by some Boolean expression.

Sending and Receiving Events

- For synchronous events (Sending or Receiving) like call event, the sender and the receiver are in a rendezvous (the sender dispatches the signal and wait for a response from the receiver) for the duration of the operation.
- when an object calls an operation, the sender dispatches the operation and then waits for the receiver.
- For asynchronous events (Sending or Receiving) like signal event, the sender and receiver do not rendezvous either sender dispatches the signal but does not wait for a response from the receiver.
- When an object sends a signal, the sender dispatches the signal and then continues along its flow of control, not waiting for any return from the receiver.
- call events can be modeled as operations on the class of the object.



Modeling family of signals:
To model a family of signals

- Consider all the different kinds of signals to which a given set of active objects may respond.
- Look for the common kinds of signals and place them in a generalization/specialization hierarchy using inheritance.
- Elevate more general ones and lower more specialized ones.
- Look for the opportunity for polymorphism in the state machines of these active objects.
- Where you find polymorphism, adjust the hierarchy as necessary by introducing intermediate abstract signals.

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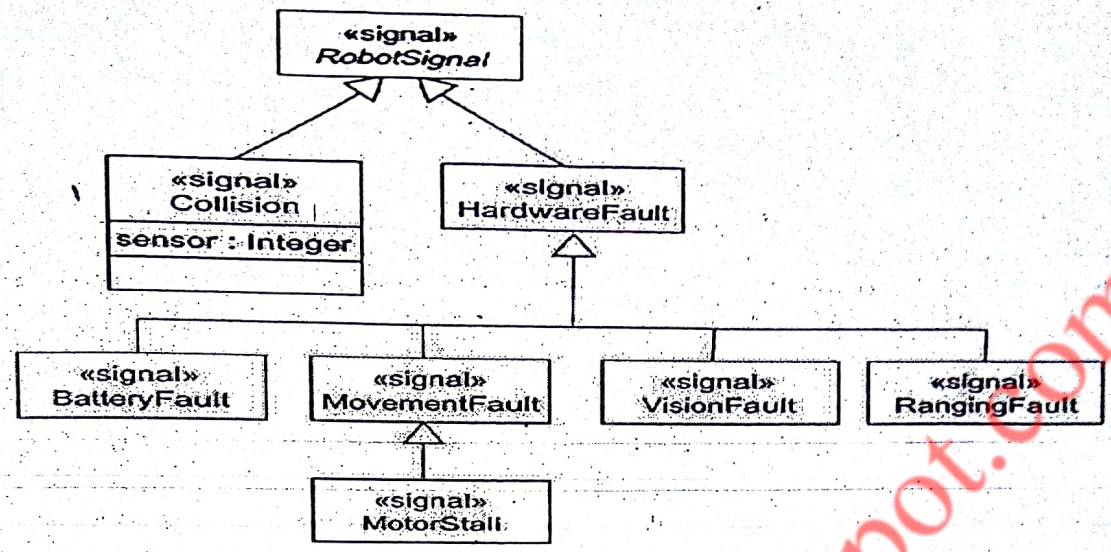
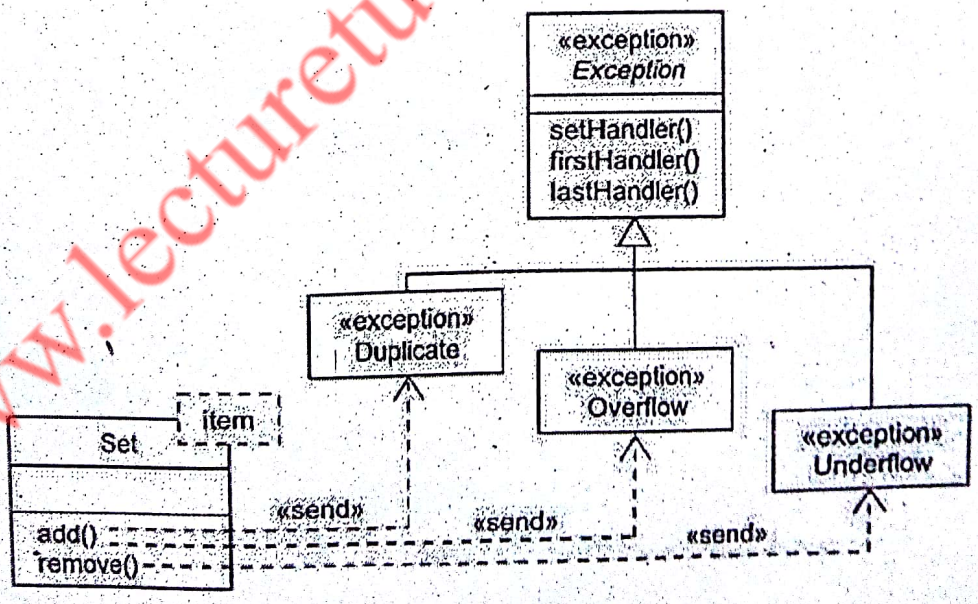
- 6 models a family of signals that may be handled by an autonomous robot.



Modeling Exceptions:

To model exceptions

- For each class and interface, and for each operation of such elements, consider the exceptional conditions that may be raised.
- Arrange these exceptions in a hierarchy. Elevate general ones, lower specialized ones, and introduce intermediate exceptions, as necessary.
- For each operation, specify the exceptions that it may raise.
- You can do so explicitly (by showing send dependencies from an operation to its exceptions) or you can put this in the operation's specification.



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