Activity 13-1: UML State Diagrams

Why?

UML state diagrams are an important modeling tool for designing complex behavior of software components. They can be used in mid-level design to describe the behavior of components or of individual objects.

Learning Objectives

- Understand the syntax and semantics of UML state diagrams
- Make interaction models using UML state diagrams

Success Criteria

- Be able to distinguish correct from incorrect UML state diagrams
- Be able to interpret and explain the meaning of UML state diagrams
- Be able to draw UML state diagrams that model component and object behavior

Resources

ISED section 13.1

Plan

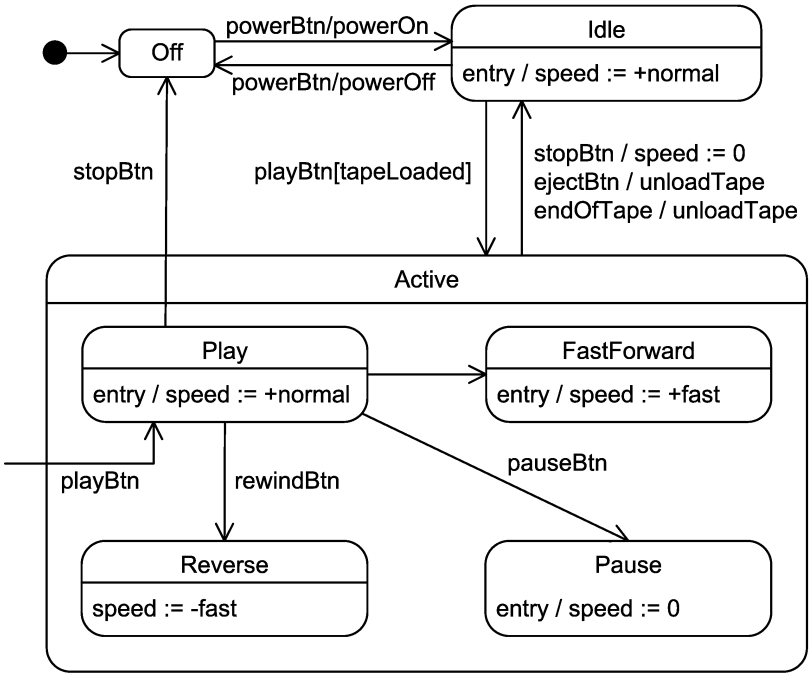
1. Review *ISED* section 13.1 individually.
2. Answer the Key Questions individually, and then evaluate the answers as a team.
3. Do the Exercises as a team, and check your answers with the instructor.
4. Do the Problems and Assessment as a team.
5. Turn in the Problems and Assessment as a team deliverable.
6. Do the Homework individually.

Key Questions

1. What differentiates one state of a software component from another?
2. Is a finite state machine with a final state guaranteed to halt?
3. Is a transition required to have a non-empty event signature?
4. What is the source of a transition that begins at the border of a composite state?
5. When a composite state and a simple state within it both have exit actions and they are exited simultaneously, which exit action is executed first?

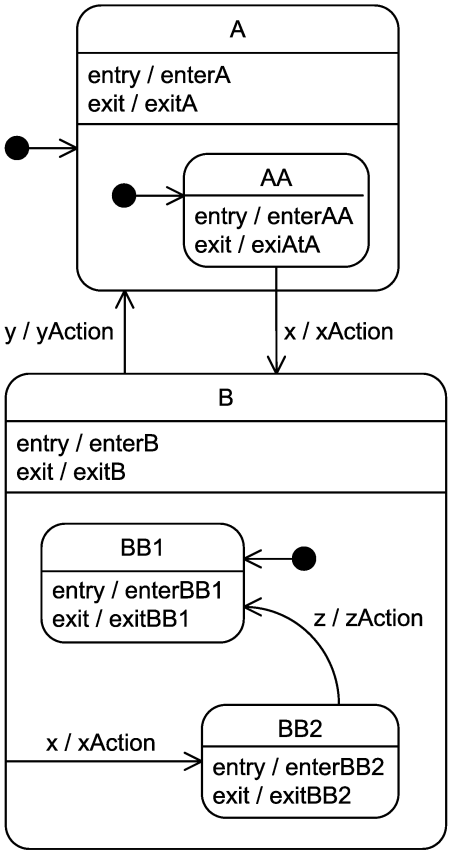
Exercises

1. Complete exercise 13.1 from the textbook.
2. The following UML state diagram models the behavior of a video tape player. Identify at least five errors in the diagram.



Problems (Deliverable)

1. According to *ISED* Figure 13-1-1, what state will the Tape Recorder be in if it is in its stopped state and the series of events <rewind, record> occurs?
2. What modification is necessary to *ISED* Figure 13-1-4 to make the vending machine refund the coins entered if a "Refund" button is pressed?
3. According to the state diagram below, what series of actions will be generated if the machine starts up and then processes the transition sequence <x, x, z, y>?



4. Create a state diagram to model the operation of a simple cell phone. The cell phone has an on/off switch. It has a numeric keypad that produces a keypad press event with a digit as its argument. The phone has a three-way switch that is set to ringing, vibrating, or both; it determines the action of the phone when a call comes in. The phone also has an action button that (a) initiates a call when seven digits have been entered, (b) answers a call when the phone is ringing or vibrating, and (c) terminates a call (hangs up) if a call is in progress. If the action button is pressed when fewer than seven digits have been entered and the phone is not ringing, the digits are erased (this is how dialing mistakes are corrected). Finally, the phone has a display that shows the digits that have been pressed so far, if any. Use at least one composite state in your model.

Assessment (Deliverable)

1. What part of this activity helped you most to achieve the learning objectives?
2. How could the instructor modify this activity to improve learning?