Software Modeling and Design

3700.002

Spring 2020

Solutions for Homework #2

Due: February 10, 2020 11:59PM (Monday)

Maximum points: 100

(Individual Assignment)

Note: Submit a single pdf document with solutions to all the questions. Embed all diagrams and text in the word document and create the pdf. Use the tool of your choice to generate UML diagrams. Possible options are PlantUML, ARGOUML, Visio, Word, or any other UML development tool.

Q1: (15 Points): Problem 5.1 from textbook page number 106.

Figure A5.1 shows a state diagram for an extension ladder. You could also include states for the ladder fully extended and fully contracted.

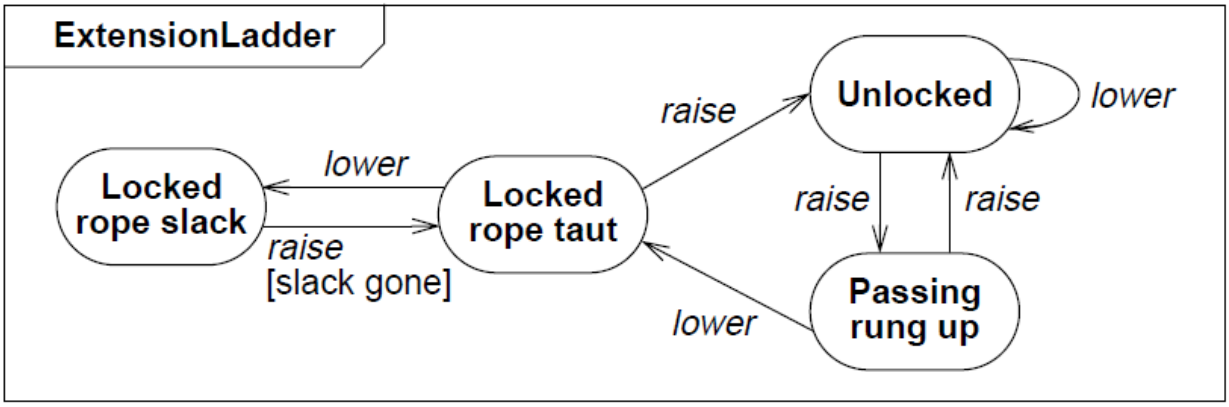

Figure A5.1 State diagram for an extension ladder.

Q2: (5 Points): Problem 5.3 from textbook page number 106.

Figure A5.3 elaborates the state diagram in the exercise.

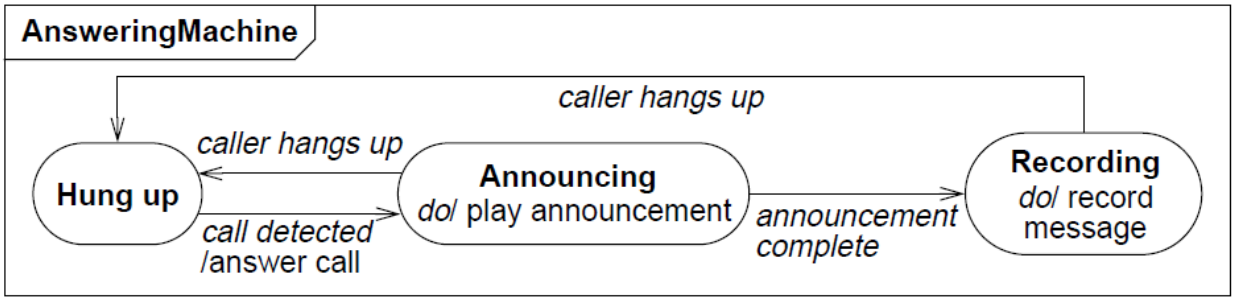

Figure A5.3 State diagram for a telephone answering machine

Q3: (15 Points): Problem 5.4 from textbook page number 107.

Figure A5.4 extends the state diagram from the previous answer to answer after five rings. The number of rings are kept in an internal counter that is reset on each new call and incremented on every ring.

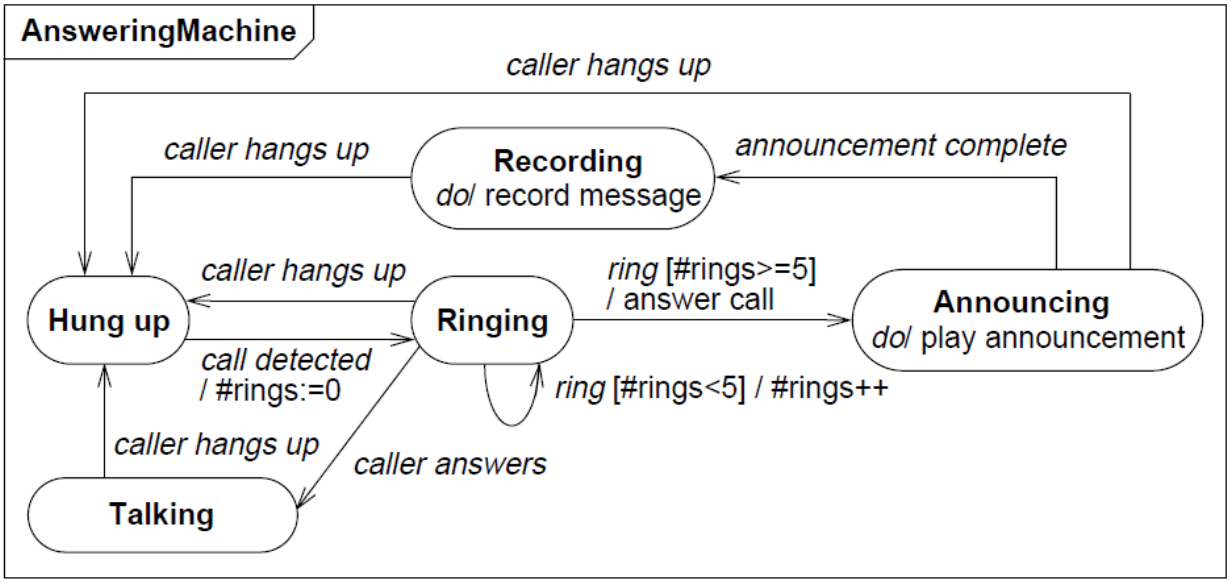

Figure A5.4 State diagram for a machine that answers after five rings

Q4: (15 Points): Problem 5.5 from textbook page number 107.

Figure A5.5 elaborates the state diagram in the exercise.

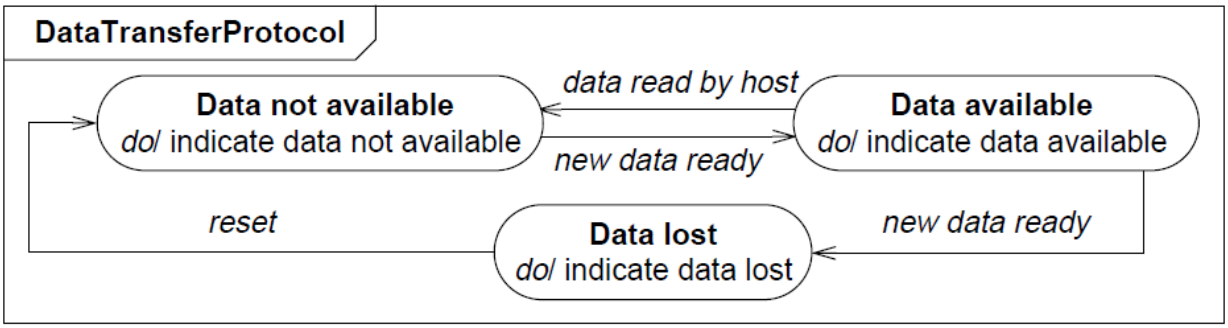

Figure A5.5 State diagram of a data transfer protocol

Q5: (10 Points): Problem 5.7 from textbook page number 108.

Figure A5.7 shows another approach for motor control.

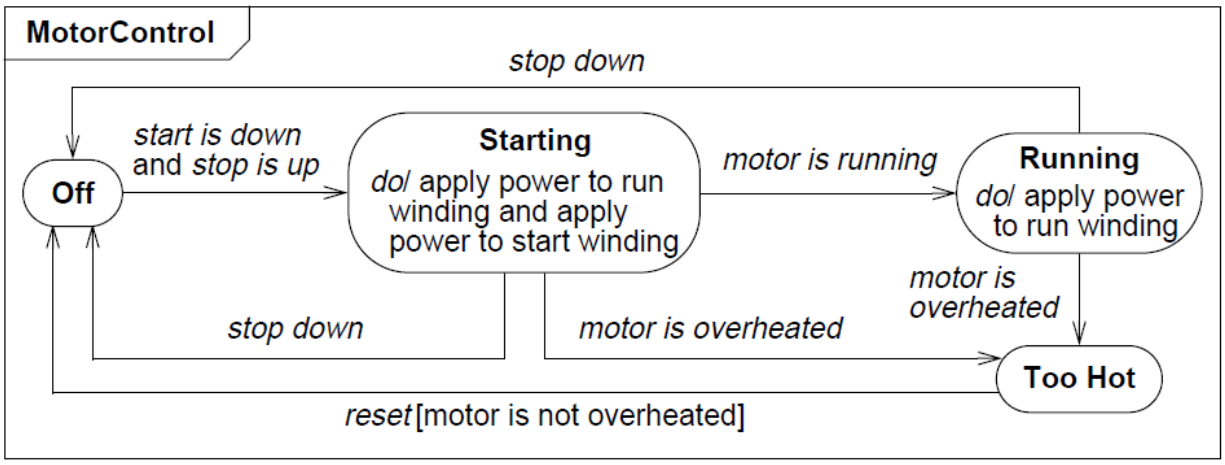

Figure A5.7 An alternate approach to motor control

Q6: (10 Points): Problem 6.2 from textbook page number 127.

Figure A6.3 extends Figure A5.2 for rapid setting of time. B means press button B while B means to release it. BB means to press and release it. (Instructor's note: you may want to give the students a copy of our answer to Exercise 5.2.)

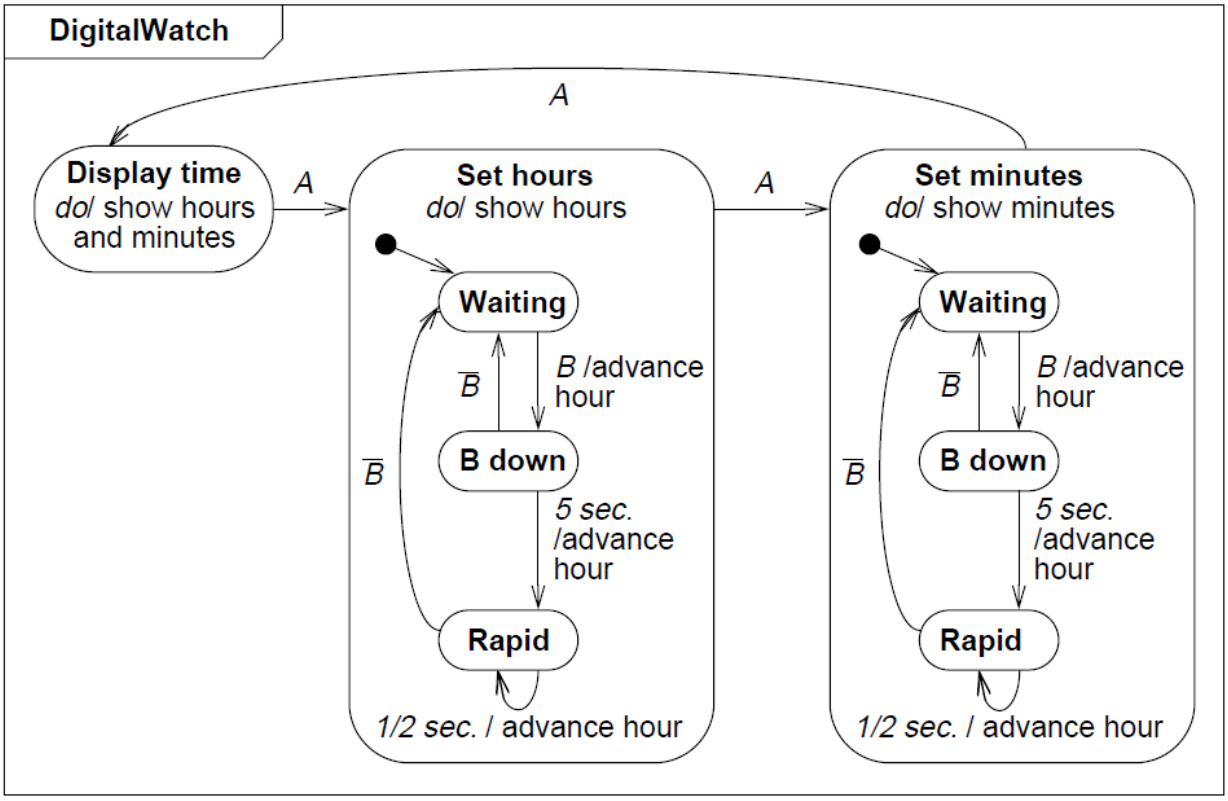

Figure A6.3 Extended state diagram for a digital watch

Q7: (5 Points): Problem 6.5 from textbook page number 127.

a. Add an arrow labeled "[overheating detected]" from each non-Off state to state Off.

b. Add an arrow labeled "[overheating detected]" from state On to state Off. Because state On has nested states, the transition applies to them.

Q8: (5 Points): Problem 6.6 from textbook page number 127.

Figure A6.6 places the signal classes into a generalization hierarchy along with a few sample signal attributes. Do not confuse textPick with characterInput. Often character-Input will follow a textPick event that indicates which input object receives the input character.

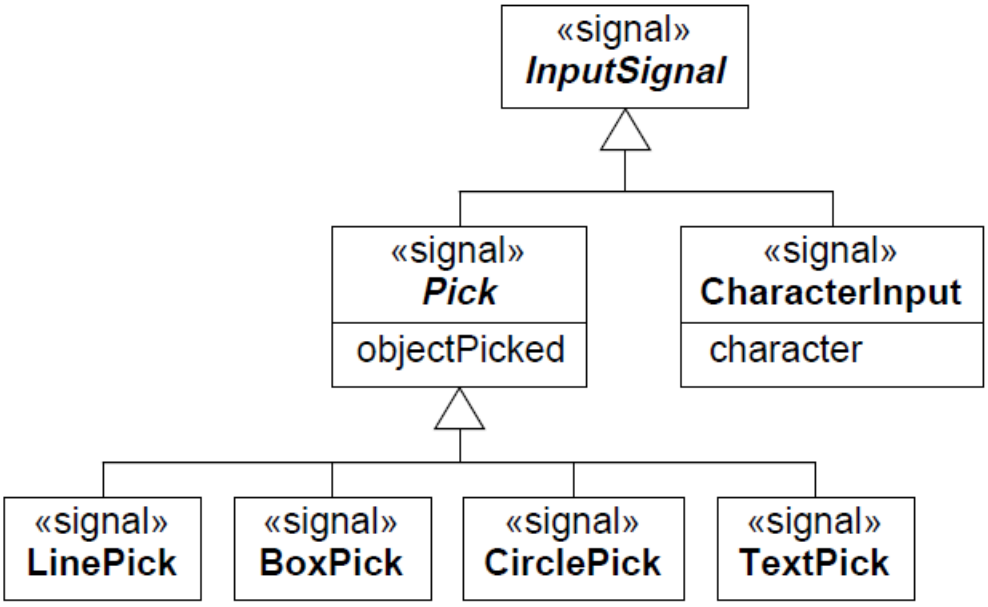

Figure A6.6 A signal hierarchy

Q9: (5 Points): Problem 6.9 from textbook page number 130.

Figure A6.9 uses nested states to repair the flaw in the state diagram for a copy machine. The power can be turned off at any time for the copy machine causing a transition to the off state.

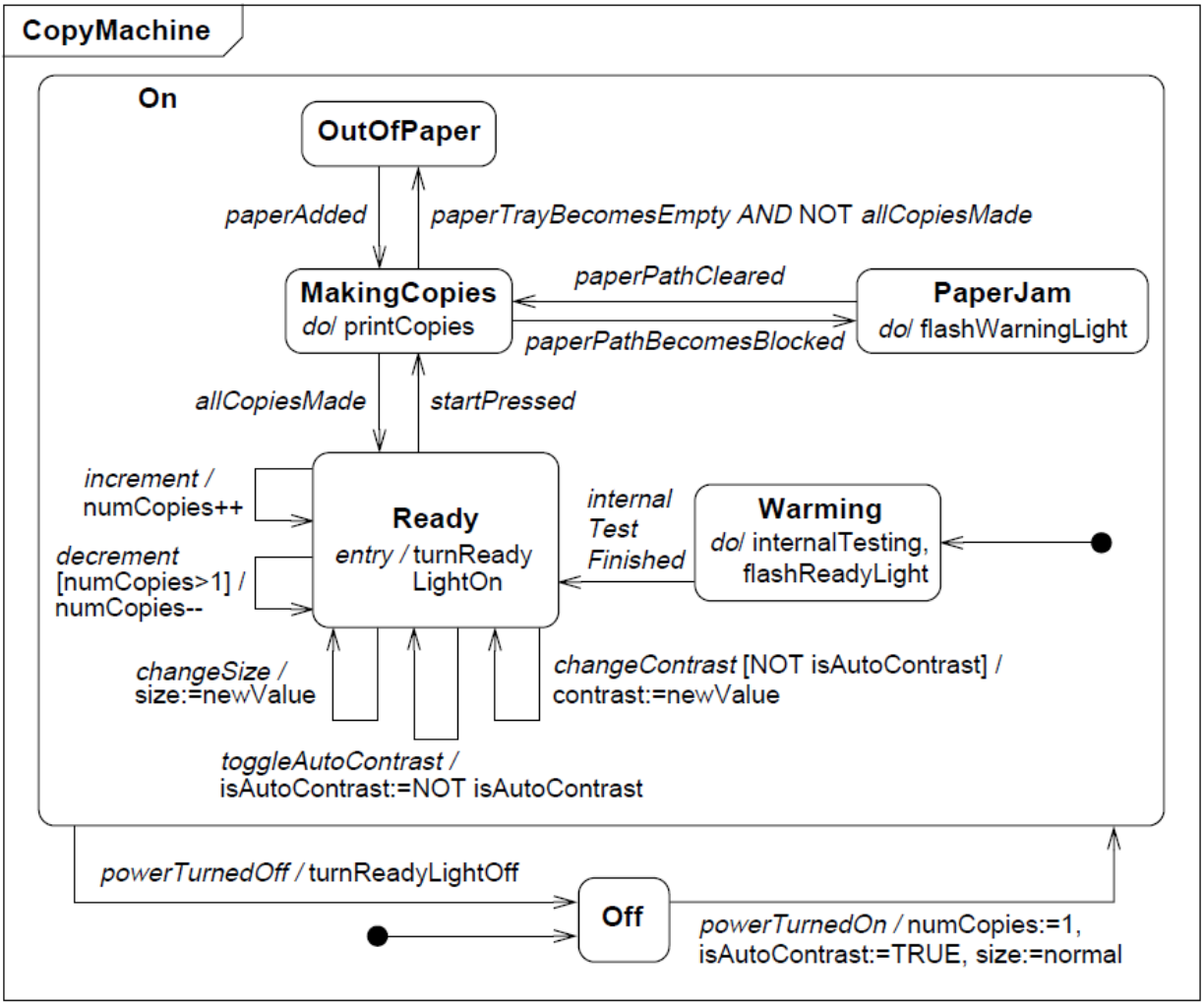

Figure A6.9 State diagram for copy machine with nested states

Q10: (15 Points): Problem 6.10 from textbook page number 130.

Figure A6.10 shows the state diagram for TableTennisGame. This is the only class with important temporal behavior. Consequently, this one state diagram constitutes the entire state model.

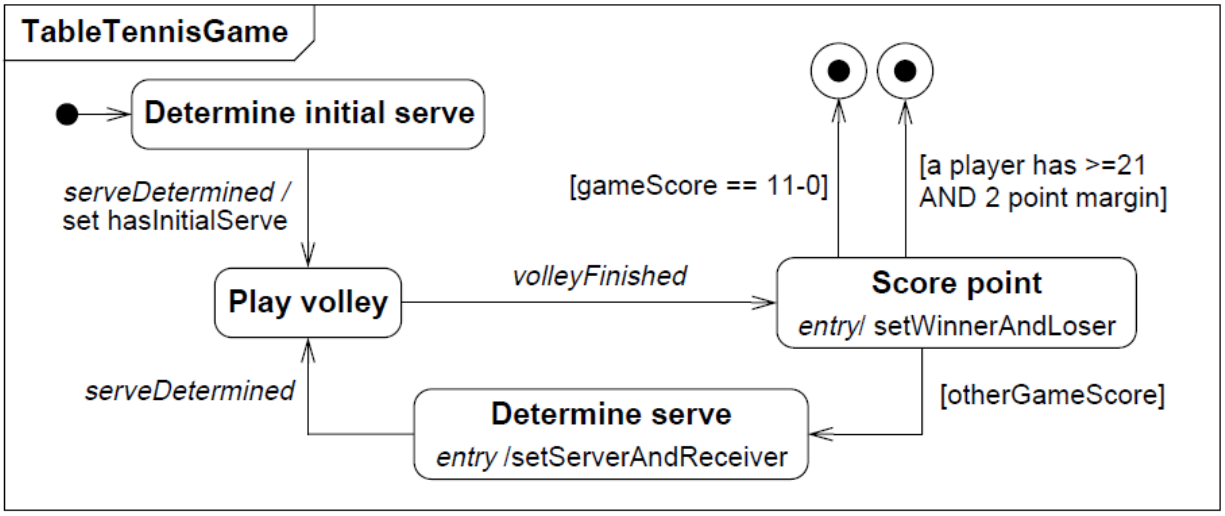

Figure A6.10 State diagram for *TableTennisGame*