13. Describe the steps used to create a communication diagram.
14. When drawing a communication diagram, what guidelines should you follow?
15. Are states always depicted using rounded rectangles on a behavioral state machine? Explain.
16. What kinds of events can lead to state transitions on a behavioral state machine?
17. What are the steps in building a behavioral state machine?
18. When drawing a behavioral state machine, what guidelines should you follow?
19. How are guard conditions shown on a behavioral state machine?
20. Describe the type of class that is best represented by a behavioral state machine. Give two examples of classes that would be good candidates for a behavioral state machine.
21. What is CRUDE analysis and what is it used for?
22. Identify the models that contain each of the following components: actor, association, class, extends, association, final state, guard condition, initial state, links, message, multiplicity, object, state, transition, and update operation.

EXERCISES

A. Think about sending a first-class letter to an international pen pal. Describe the process that the letter goes through to get from your initial creation of the letter to being read by your friend, from the letter's perspective. Draw a behavioral state machine that depicts the states that the letter moves through.

B. Draw a behavioral state machine that describes the various states that a travel authorization can have through its approval process. A travel authorization form is used in most companies to approve travel expenses for employees. Typically, an employee fills out a blank form and sends it to his or her boss for a signature. If the amount is fairly small (<$300), then the boss signs the form and routes it to accounts payable to be input into the accounting system. The system cuts a check that is sent to the employee for the right amount, and after the check is cashed, the form is filed away with the canceled check. If the check is not cashed within 90 days, the travel form expires. When the amount of the travel voucher is a large amount (>$300), then the boss signs the form and sends it to the CFO, along with a paragraph explaining the purpose of the travel; the CFO signs the form and passes it along to accounts payable. Of course, the boss and the CFO can reject the travel authorization form if they do not feel that the expenses are reasonable. In this case, the employee can change the form to include more explanation or decide to pay the expenses.

C. Think about the system that handles student admissions at your university. The primary function of the system should be able to track a student from the request for information through the admissions process until the student is either admitted to the school or rejected.

1. Write a use-case description that can describe an Admit Student use case.

Assume that applicants who are children of alumni are handled differently from other applicants. Also, assume that a generic Update Student Information use case is available for your system to use.

2. Create a use-case diagram that includes all of the above use cases.

Assume that an admissions form includes the contents of the form, SAT information, and references. Additional information is captured about children of alumni, such as their parent's graduation year, contact information, and college major.

3. Create a class diagram for the use cases identified with questions 1 and 2. Also, be sure to include the above information.

Assume that a temporary student object is used by the system to hold information about people before they send in an admission form. After the form is sent in, these people are considered students.

4. Create sequence diagrams for the scenarios of the above use cases.
5. Create a communication diagram for the scenarios of the above use cases.
6. Create a behavioral state machine to depict a person as he or she moves through the admissions process.
7. Perform a CRUDE analysis to show the interactivity of the objects in the system.

D. For the A Real Estate Inc. problem in Chapters 4 (exercises I, J, and K) and 5 (exercises P and Q):

1. Choose one use case and, for each scenario, create a sequence diagram.
2. Create a communication diagram for each scenario of the use case chosen in Question 1.
3. Create a behavioral state machine to depict one of the classes on the class diagram you created for Chapter 5, exercise P.
4. Perform a CRUDE analysis to show the interactivity of the objects in the system.
5. Perform a verification and validation walkthrough of the problem.

E. For the A Video Store problem in Chapters 4 (exercises L, M, and N) and 5 (exercises R and S):

1. Choose one use case and, for each scenario, create a sequence diagram.
2. Create a communication diagram for each scenario of the use case chosen in Question 1.
3. Create a behavioral state machine to depict one of the classes on the class diagram you created for Chapter 5, exercise R.
4. Perform a CRUDE analysis to show the interactivity of the objects in the system.
5. Perform a verification and validation walkthrough of the problem.

F. For the gym membership problem in Chapters 4 (exercises O, P, and Q) and 5 (exercises T and U):

1. Choose one use case and, for each scenario, create a sequence diagram.
2. Create a communication diagram for each scenario of the use case chosen in Question 1.
3. Create a behavioral state machine to depict one of the classes on the class diagram you created for Chapter 5, exercise T.
4. Perform a CRUDE analysis to show the interactivity of the objects in the system.
5. Perform a verification and validation walkthrough of the problem.

G. For the Picnics R Us problem in Chapters 4 (exercises R, S, and T) and 5 (exercises V and W):

1. Choose one use case and, for each scenario, create a sequence diagram.
2. Create a communication diagram for each scenario of the use case chosen in Question 1.
3. Create a behavioral state machine to depict one of the classes on the class diagram you created for Chapter 5, exercise V.
4. Perform a CRUDE analysis to show the interactivity of the objects in the system.
5. Perform a verification and validation walkthrough of the problem.

H. For the Of-the-Month-Club problem in Chapters 4 (exercises U, V, and W) and 5 (exercises X and Y):

1. Choose one use case and, for each scenario, create a sequence diagram.
2. Create a communication diagram for each scenario of the use case chosen in Question 1.
3. Create a behavioral state machine to depict one of the classes on the class diagram you created for Chapter 5, exercise X.
4. Perform a CRUDE analysis to show the interactivity of the objects in the system.
5. Perform a verification and validation walkthrough of the problem.

MINICASES

1. Refer to the functional model (use-case diagram, activity diagrams, and use-case descriptions) you prepared for the Professional and Scientific Staff Management (PSSM) Minicase in Chapter 4. Based on your performance, PSSM was so satisfied that they wanted you to develop both the structural and behavioral models so that they could more fully understand both the interaction that would take place between the users and the system and the system itself in greater detail.
   a. Create both CRC cards and a class diagram based on the functional models created in Chapter 4.
   b. Create a sequence and a communication diagram for each scenario of each use case identified in the functional model.
   c. Create a behavioral state machine for each of the complex classes in the class diagram.
   d. Perform a CRUDE analysis to show the interactivity of the objects in the system.
   e. Perform a verification and validation walkthrough of each model: functional, structural, and behavioral.
2. Refer to the structural model (CRC cards and class diagram) that you created for the Holiday Travel Vehicles Minicase in Chapter 5. Based on your performance,

Holiday Travel Vehicles was so satisfied that they wanted you to develop both the functional and behavioral models so that they could more fully understand both the interaction that would take place between the users and the system and the system itself in greater detail.

a. Based on the structural model you created in Chapter 5 and the problem description in Chapter 5, create a functional model (use case diagram, activity diagrams, and use case descriptions) for the business processes associated with the Holiday Travel Vehicles sales system.

b. Create a sequence and a communication diagram for each scenario of each use case identified in the functional model.

c. Create a behavioral state machine for each of the complex classes in the class diagram.

d. Perform a CRUDE analysis to show the interactivity of the objects in the system.

e. Perform a verification and validation walkthrough of each model: functional, structural, and behavioral.