ROCHESTER INSTITUTE OF TECHNOLOGY
COLLEGE OF COMPUTING AND INFORMATION SCIENCES
SWEN610- Foundation of Software Engineering – (Section 01)
Fall 2020

RTD -2: Class Modeling

Learning Objective

The purpose of this RTD is to develop a concrete understanding of developing static view (class models, object models). The RTD also focuses on modeling a the OO dynamic behaviors. You as a software engineer (designer) will be required to analyze the business requirements and accordingly propose a suitable design that is complete and sound.

1. EXERCISE (1)

    A. Draw the class diagram and define the multiplicity for the following associations / description:

        a. "Spouse", linking person to itself.
        b. "Is occupying", linking chess piece to a square on a chess board
        c. A country "has" a capital city
        d. A dining philosopher "is using" a fork
        e. A file "is an" ordinary file or "a" directory file.
        f. Classes may have several attributes

2. EXERCISE (2)

    Prepare a class diagram to describe undirected graphs. An undirected graph consists of a set of vertices and a set of edges. Edges connect pairs of vertices. [Your model should capture only the structure of graphs (i.e. connectivity), and need not be concerned with geometric details such as location of vertices or length of edges]. A typical graph is shown in Figure 1
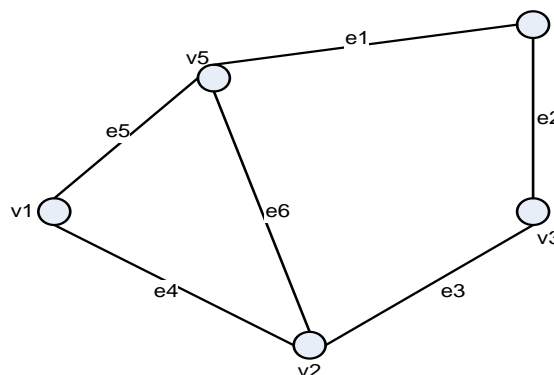

Figure 1 – Exercise 2 – Undirected Graph

3. **EXERCISE (3)**

Draw a class diagram modeling the system described in the following: A company has decided to computerize the circulation of documents round its offices, and to do this by installing a network of electronic desks. Each desk provides the following services:

- a *blotting pad,* which can hold a document that the user is currently working on. The blotting pad provides basic word-processing facilities;
- a *filing cabinet,* which models a physical filing cabinet. It is divided into drawers, and each drawer is divided into folders. Documents can be stored either in drawers or in folders within drawers;
- a *mail service,* which allows the user to communicate with other users on the network. Each desk is provided with three *trays,* corresponding to the IN, OUT and PENDING trays in traditional offices. The network will automatically put new mail in a user's IN tray, and periodically take documents from the OUT tray and mail them to their recipients.
- Documents can be moved between the mail trays and the blotting pad, and between the blotting pad and the filing cabinet. There is no provision to move documents directly between the trays and the filing cabinet. Only one document can be on the blotting pad at any given time.

4. **EXERCISE (4)**

Prepare an instance diagram (object Diagram) for the following class diagram in Figure 2 for the expression $(X + Y / 2) / (X / 3 + Y)$. Parenthesis are used for grouping only, but are not needed in the diagram. The "*many"* multiplicity indicates that a term may be used in more than one expression.
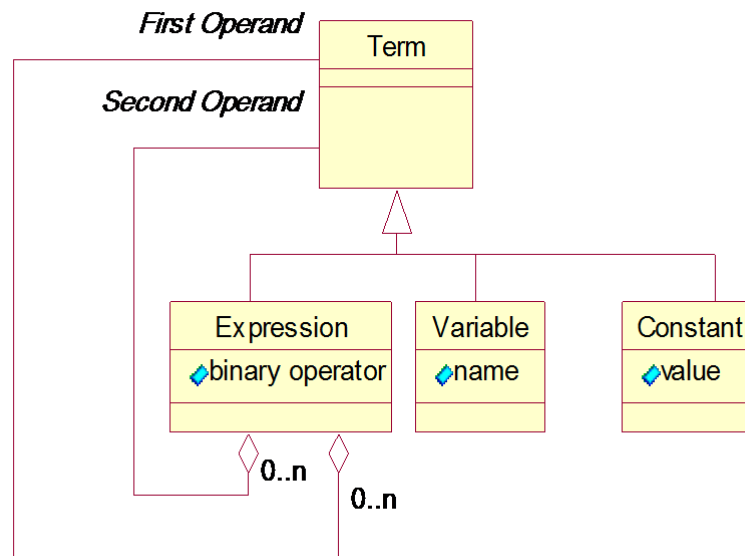

Figure 2 Class diagram for simple arithmetic expressions

5. **EXERCISE (5)**

Examine the figure blow. Assume that: ***Closed***, ***Open***, and ***playing*** are three possible states for the CD player, the figure below shows an incomplete version of the CD player's behavior using UML StateChart diagram. Suppose you need to model the behavior of the object when a *Pause* button is included in the CD player.
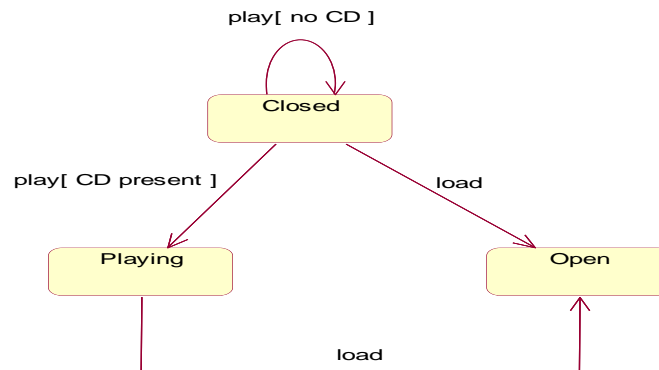

Figure 1 A simple state machine for a CD player

- o Refine the above StateChart to include the new behavior as well as adding the missing suitable transition, transitions labels, guard conditions, entry actions, exit actions. Consider the following actions and activities:

    - Find start of track

    - Lower head

    - Raise head

    - Play track

    - Open drawer

    - Close drawer

    - Display time