8 Breaking the Circle.

Introduction

In this assignment we focus on circularly referential data. We also leverage again the power of the Abstract Data Type we used in the last assignment (IMapping) and introduce a new ADT that allows us to traverse over a structured data from outside.

Start by defining the following classes and interfaces- but without examples yet. The schedule represents a list of courses students is taking during this semester. Roster contains a list of students enrolled in the course offered this semester. We assume student’s name is unique and the course key value is unique as well.
8.1 Problem: Representing Circularly Referential Data

Define the classes that represent students and courses.

A. Design first the classes that implement a list of objects (either students or courses) and implement the IMapping interface.

B. Extend the definition so it also implements the Traversal interface. Throw an exception if the client attempts to perform an illegal operation, such as advancing in an empty data set.

C. Use these classes to now define lists of students and lists of courses and make examples of data.

D. Define the ISame method for the classes that represent students and courses. Compare only the student’s name and major when comparing two students, and only the course key, course number, and the instructor when comparing two courses.

E. Define the toString method for the student class that prints only the student’s name and the major. It does not print the schedule.

F. Define the toString method for the course class that prints the course information: the key, the number, and the instructor. It does not print the roster.

8.2 Problem: Designing Methods for Circularly Referential Data

Define the class Registrar that contains a list of all students at the university and a list of all courses taught this semester. Use the list of objects you defined earlier to handle both lists. In the Registrar class define the following methods (use helper methods in this class or in other classes as needed):

A. Design the method showStudent in the class Student that produces a String where the first line is the information about the student and each of the following lines contains the information about one course in the student’s schedule.

B. Design the method showCourse in the class Course that that produces a String where the first line is the information about the course and
each of the following lines contains the information about one student enrolled in the course.

C. Design the method in the Registrar class that produces a list of all courses on a schedule for a student with the given name.

D. Design the method in the Registrar class that determines whether two students are enrolled in the same course.

E. Design the method in the Registrar class that produces a list of all students enrolled in the given course.

8.3 Problem: Mutating Circularly Referential Data

Of course, the registrar has only one list of students and one list of courses. Actions such as a new student enrolling in the university, student adding a course to her schedule, or dropping a course should only change the contents of the instance of the registrar object.

A. Design the addStudent method to the Registrar class that adds a student with the given name and major to the registrar database. Initially this student is not enrolled in any courses.

B. Design the method add that enrolls a given student in a specified course. Analyze the problem first and describe in a couple of lines of comments what is the information the registrar instance needs to perform this task, and what will be the effects.

C. Design the method that allows the registrar to change the instructor assigned to teach a course.

8.4 Problem: Mutating a Binary Search Tree

Finish the problem from Lab 8 that asked you to design a mutable version of a binary search tree.
8.5 Writing Problem

Writing assignments are separate from the rest of the assignment for the week. You should work on this assignment alone, and submit your work individually on the due date for the rest of the homework. The answer should be about two paragraphs long – not to exceed half a page or 300 words.

Read the following article on outsourcing. Write a short essay that describes your thoughts on this issue.

http://www.acm.org/globalizationreport/