EE461L Homework Assignment #1

Your Name:
Your UT EID:

Due Date: October 22nd Tuesday at 11:00AM. Please submit an electronic copy to the blackboard before class on Tuesday. While you are required to submit shell scripts, you do not need to submit separate Java code for design patterns. Just embed the code snippets in your answer.

1. (25PT) Shell scripting: Create SVN history statistics

Write a bash script to count how many added and deleted lines exist for each consecutive version pair of the entire version history of a given SVN repository URL.

There are two requirements about the bash script that you need to create:

(1) Name a bash script "svnCounter.sh."

(2) The bash script must take the SVN repository URL as well as a user name and password as command line arguments. For example, *./svnCounter.sh URL [username] [password]*. The second and third arguments could be optional in the sense that the open access repository does not require a user to provide a user name and password.

Here are some examples of the expected input and the expected ouput.

Input(run in terminal):

bash svnCounter.sh https://subversion.assembla.com/svn/circlecal461L/ husttroy 1234567

Output:

Repository: https://subversion.assembla.com/svn/circlecal461L/
Reversion: 8
There are 0 different lines between R1 and R2
There are 60 different lines between R2 and R3
There are 11 different lines between R3 and R4
There are 8 different lines between R4 and R5
There are 0 different lines between R5 and R6
There are 0 different lines between R6 and R7
There are 60 different lines between R7 and R8
Done

What you need to submit:

(1) a bash script named svnCounter.sh. The teaching staff must be able to test a script by providing a SVN URL as an command line arguemtn.

(2) a pdf file that explains your script and anything the teaching staff need to know.

Please submit a single zip file named as YourNameScript1.zip including both a bash script and a pdf. For example, the file should be named as "MiryungKimScript1.zip."

2. (25PT) Shell scripting: Monitor network data usage

Write a bash script to monitor the data flow in your ethernet or wlan (pick the one you generally use). The script must provide the following three functionalities as specified below:
(1) print an uploading and downloading speed every 2 second. Hint: You can get the speed simply by dividing data usage amount by 2 seconds.
(2) print the data usage every 2 second since the moment you start running the dataflow monitoring script.
(3) your script should must take two command line arguments. The first one is ethernet card name and the second one is data usage threshold (the unit is in megabytes). If your usage is out of limit, the script must send a warning email to your email account, which is hardcoded in your script.

Tips: This type of a monitor seems hard to write but shell scripting makes it possible to write this script in a fairly straightforward manner. Here are some tips on which commands that you can explore this possible. You can find all the data info with 'ifconfig.' You can use regular expressions to extract information from the output of runnning the command. There are several ways that you can automatically send an email (so google is your friend). If you have any question, please post your questions to Piazza or come and see the teaching staff!

Here is an example input and output of the script.

Input:

bash dataFlow.sh eth0 20

Output:

10-01 14:20 Now_In_Speed: 0kbps Now_OUt_Speed: 0kbps Data_Usage: 252kb(0MB)
10-01 14:20 Now_In_Speed: 11kbps Now_OUt_Speed: 41kbps Data_Usage: 13883kb(0MB)
10-01 14:20 Now_In_Speed: 1kbps Now_OUt_Speed: 0kbps Data_Usage: 14277kb(0MB)
10-01 14:20 Now_In_Speed: 0kbps Now_OUt_Speed: 0kbps Data_Usage: 14526kb(0MB)
10-01 14:20 Now_In_Speed: 0kbps Now_OUt_Speed: 0kbps Data_Usage: 14859kb(0MB)
10-01 14:20 Now_In_Speed: 7kbps Now_OUt_Speed: 15kbps Data_Usage: 20773kb(0MB)
….
….
….

What you need to submit:

(1) Your bash script named dataFlow.sh.
(2) a pdf file that explains your script and anything the teaching staff needs to know.

Please submit a single zip file named as YourNameScript2.zip including both a bash script and a pdf. For example, the file should be named as "MiryungKimScript2.zip."

3. (15PT) Design Pattern: Creation of Maze

Imagine you are developing a maze program API. The precise maze and game will vary slightly

from example to example, e.g., in one maze, you are trying to find a way out, in another maze, there may puzzles, dangers, and a partial map. We're thinking about ways to create different variants of mazes in a flexible manner. Some code snippets are shown as follows.

```
public enum Direction {North, South, East, West}
```

```
public abstract class MapSite {
    public abstract void Entry();
}
```

```
public class Room extends MapSite {
    public Room(int roomNo) {...}
    public MapSite getSide(Direction direction) {...}
    public void setSide(Direction direction, MapSite site) {...}
    public void Entry() {...}

    private MapSite[] _sides = new MapSite[4];
    private int _roomNumber;
}
```

```
public class Door extends MapSite {
    public Door(Room room1, Room room2) {...}
    public Room OtherSideFrom(Room room) {...}
    public void Entry() {...}

    private Room _room1;
    private Room _room2;
    private boolean _isOpen;
}
```

```
public class Wall extends MapSite {
    public Wall() {...}
    public void Entry() {...}
}
```

```
public class Maze {
```

```
    public Maze() {}
    public void addRoom(Room room) {...}
    public Room getRoom(int roomNo) {...}
}
```

```
public class MazeGame {
    public Maze createMaze () {
        Maze aMaze = new Maze();
        Room r1 = new Room(1);
        Room r2 = new Room(2);
        Door theDoor = new Door(r1, r2);
        aMaze.addRoom(r1);
        aMaze.addRoom(r2);
        r1.setSide(Direction.North, new Wall());
        r1.setSide(Direction.East, theDoor);
        r1.setSide(Direction.South, new Wall());
        r1.setSide(Direction.West, new Wall());

        r2.setSide(Direction.North, new Wall());
        r2.setSide(Direction.East, new Wall());
        r2.setSide(Direction.South, new Wall());
        r2.setSide(Direction.West, theDoor);
    }
    return aMaze;
}
```

In this question, you will discuss design problems associated with the above code and refactor the above code using one of the design patterns covered in the class.

(A) What are the drawbacks of the current design? Please be as specific as possible. You may go over the lecture on the Information Hiding design principle to discuss changeability and flexibility of the above code.

(B) Create a refactored version of the above code using one of the design patterns covered in the class. **Hint: you may use one of the following 4 design patterns: AbstractFactory, Factory, Singleton, Mediator.**

In the refactored version of the code, demonstrate how you can reuse existing code to create two different types of mazes:

a. DoorNeedingSpell—need to perform a spell
b. EnchantedRoom—pick up keys or spells

You must specify how you can change CreateMaze so that it can create mazes with these new types of objects.

(C) Discuss the pros and cons of the code before and after refactoring in 100 words.

4. (10PT) Design Pattern: Singleton

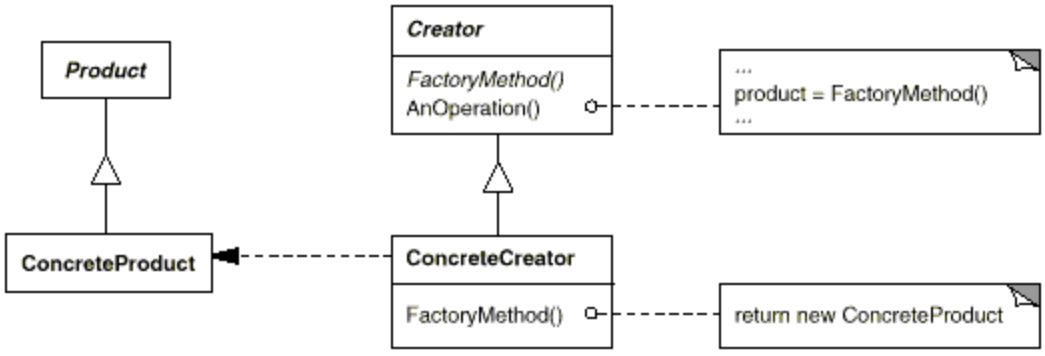
The following shows a Singleton example of MazeFactory. If you want to subclass it to create an EnchantedMazeFactory, what are the problems you may run into? When you make the required changes, is it still Singleton? How do you modify MazeFactory and implement EnchantedMazeFactory?

```
public class MazeFactory {
    public static MazeFactory instance() {
        return SingletonHolder.INSTANCE;
    }
    public Maze makeMaze() {...}
    public Wall makeWall() {...}
    public Room makeRoom(int roomNo) {...}

    private MazeFactory() {...}
    private static class SingletonHolder {
        private static final MazeFactory INSTANCE
                = new MazeFactory();
    }
}
```

5. (15PT) Design Pattern: Factory Method

The following figure shows the class diagram of an application using Factory Method.



(A) What are the advantages of the Factory Method Pattern when you only have one ConcreteCreator?
(B) The following provides the code snippets of Creator and Product. Could you provide specific evolution scenarios and corresponding program implementations for the scenario?
(C) Discuss the advantages and disadvantages of Factory Method with respect to anticipated changes in your answer (B). You answer must include changeability assessment table, similar to the table shown in the lecture notes on Information Hiding principle.

```
public abstract class Product {...}
```

```
public class NewConcreteProduct extends Product {...}
```

6. (10PT) Library vs. Design Pattern

(A) Why can't someone build a standard library of design pattern programs, such as Java SDK or C++ STL, so the developers do not have to implement any code when trying to use design patterns?
(B) What are the ways of promoting uses of design patterns?

This is an essay question and describe your perspective in 100 words at maximum.