College of Engineering
Computer Science & Eng. Dept.
Course: COE 312 Software Design
for Engineers (Lab)
Date: 18th October 2020
Location: Online

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Homework 2: Java Threads and Threads Synchronization

Objectives:

- o To understand threads and thread synchronization
- o To create and use threads
- o To implement internal and external synchronization

Hand in: One team member needs to upload on iLearn:
- one clear and organized solution document (following the template provided).
- The Java files (attach the entire project with all the classes zipped).

You should also add your solution to your GitHub repository.

Due Date: Thursday 29th October, 11:59pm (5% per day will be applied on late submissions).

➢ **Useful resources:**
- o **Java Tutorial:** https://www.w3schools.com/java/default.asp
- o **Lecture**: Multithreading
- o **Labs**: Lab 7.
- o **GitHub repository** with the code discussed during lectures

Harry goes around at night to try to find Hermione who disappeared after dinner. He uses the Marauder's map to find her and he has only 3 minutes before someone sees him. He looks at the watch every once in a while, to check the time. After 3 minutes, he should hide the map contents by saying *mischief managed*. Hermione is in the Library studying for the upcoming exams.

Implement the above scenario using threads and thread synchronization.

➢ Harry, Hermione and the Watch should each be running on separate threads. The handling of the user interface (console) for printing the messages and entering commands should also be running on a separate thread.
➢ Harry starts the watch once he starts looking for Hermione and continuously monitors if time is up (3 minutes passed).
➢ The watch should print how many minutes passed every minute. If 3 minutes passed, it should update a flag that time is up and warn Harry to hide the map contents.
➢ If Harry finds Hermione, i.e. both are in the same location (Library), he should say "found Hermione" and hide the map contents.
➢ Hermione also continuously monitors the location of Harry and if he comes in the Library, she should shout out "Harry I am here!".
➢ Once Harry recognizes that time is up, he has 10 seconds to hide the map contents. If Harry doesn't hide the map contents in time, the game should print that Harry was caught and the Marauder's map was confiscated. The game will then end.
➢ You must make the program multithreaded and use internal thread synchronization where appropriate.
➢ Feel free to use your solution of Homework 1 to complete this assignment.

Sample outputs are shown on the next page.

Sample Output:

When Harry and Hermione are in the same room, Harry says "Found Hermione" and user has to type mischief managed to hide map contents.

```
"Messrs Moony, Wormtail, Padfoot and Prongs Purveyors of Aids to
magical Mischief—Makers are proud to present THE MARAUDER'S MAP"
Say the magic phrase to reveal the map.
I solemnly swear that I am up for no good
The Entrance
You arrive at the doors of Hogwarts. The door on the north wall leads to
the dining hall, the door to the east leads to the Potions class, and
the door to the west leads to the Library.
walk north
1 minute passed...

The Dining Hall is biggest open area inside Hogwarts. Professor
Dumbledore is here.

exit
Leaving the room...enter a new direction
walk west
2 minutes passed...

The Library is where students spend a lot of their time once the
academic year starts. Hermione is here.
Found Hermione!

Mischief managed

Hiding map contents...end.
```

If Harry does not find Hermione and does not hide the map after 3 minutes, he will be caught.

```
"Messrs Moony, Wormtail, Padfoot and Prongs Purveyors of Aids to
magical Mischief—Makers are proud to present THE MARAUDER'S MAP"
Say the magic phrase to reveal the map.
I solemnly swear that I am up for no good
The Entrance
You arrive at the doors of Hogwarts. The door on the north wall leads to
the dining hall, the door to the east leads to the Potions class, and
the door to the west leads to the Library.
walk north
1 minute passed...

The Dining Hall is biggest open area inside Hogwarts. Professor
Dumbledore is here.

exit
Leaving the room...enter a new direction
walk east
3 minutes passed...Hide map contents before someone sees you!

The Potions Classroom is one of the core subjects that first year
students are required to study. Professor Snape is here.


You have been caught... and the Marauder's map has been confiscated.
```