Tecnología de la Programación - Academic Year 2017/2018

June's Exam (06/06/2018) - Duration: 3 hours.
Maximum grade: 10 points

Grados en Ingeniería Informática, del Software y de Computadores (Grupos A, E, F, I)
y Doble Grado en Informática y Matemáticas (Grupo A)

Instrucciones

- In this exam you have to start from the last version of assignment 5 that you have uploaded to the Campus Virtual recently. Shortly you will be provided with instructions on how to download it.
- **Create a text file `changes.txt` in the root of your project (inside `src`)**. In this file you will have to include the names of all files (classes, etc.) that you have modified or added. In addition, you can include other comments regards your solution that will be taken into account during the marking process.
- The submitted code ***MUST COMPILE***, otherwise you fail the exam.
- ***Breaking encapsulation*** (accessing private and protected fields from external classes, use of public fields, etc.) implies failing the exam.
- When marking the exam, we will evaluate functionality, clarity of the code, the use of object oriented principles (inheritance, polymorphism and dynamic binding) and comments.

You are advised to ...

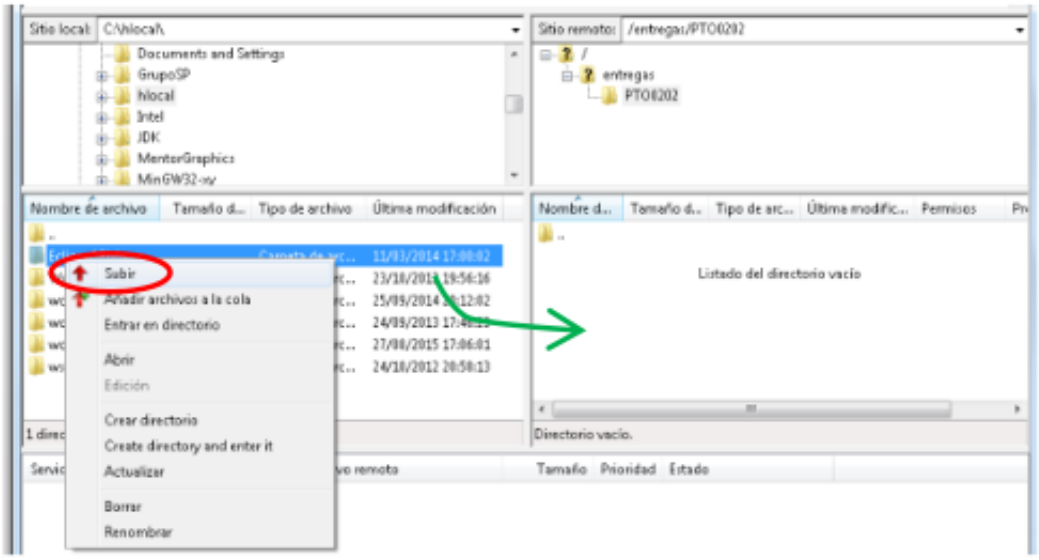
- Solve the different parts of the exam in the same order as they appear in the exam statement. Make sure the application still works correctly after each change. Whenever you finish one part, make a copy of the current solution just in case something goes wrong in the next parts.
- It is very recommended to include comments in `changes.txt` in which you briefly explain and justify the changes that you have done.

Submission Instructions

- To submit the exam, create a file called `YourName.zip` that includes your modified code and a file `student.txt` with your name.

Use only ZIP format, not rar, not 7z, etc.

- Double click on the icon **"EXAMENES en LABs entregas..."** that appears on the desktop, this will open a new window. Inside the window click on **"ALUMNOS entrega de practicas y examenes"**. A new window will pop up, in which you have to select the `zip` file that you have create and drag it to the right panel (or use the right button of the mouse and then select the option **Subir**). See the next figure.



- Before leaving the lab, you have to pass by the professor table to verify that you code has been submitted correctly and sign the submission form.

Questions:

1. **[3.5 points]** Add a new kind of junction, *roundabout junction*, to the simulator with the following behavior for its ADVANCE operation:

   - it advances one vehicle from the road that has a green light, if any, exactly as in a normal junction.
   - after the above, if the queue of the road with a green light is not empty then no traffic light changes, otherwise, the current green (if any) is turned to red and green is given to the following road that has a non-empty queue (searching from the *next road* in a circular way), and if all queues are empty then green is given to the *next road*.

   Note that, as in a normal junction, at the beginning, all incoming roads have red light, and the *next road* in such case is the first road.

   The events and reports of such a junction are like a normal junction, but in addition they have a field type with value ra. For example:

   ```
   [new_junction]
   time = 0
   id = j2
   type = ra
   ```

   ```
   [junction_report]
   id = j2
   time = 10
   queues = (r1,red,[v3]),(r2,green,[v1,v2])
   type = ra
   ```

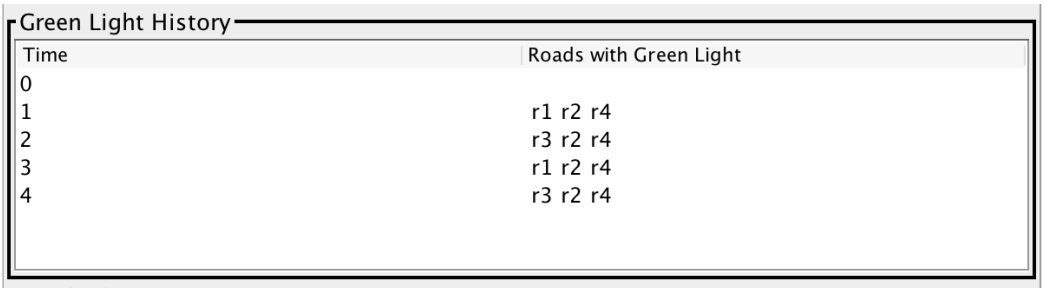
   NOTE: You can add new classes, but you cannot modify any existing class (except adding the corresponding event builder to the list of builders, and adding getters if needed).

2. **[3.5 points]** Modify the **batch mode** (i.e., -m batch) such that, once the simulation is over, it prints the *crowdedness factor* of each road on the *standard output*, which is defined as the maximum number of vehicles traveling on the road at the same time (measured at the end of each simulation step). The output should be as follows:

   ```
   [roads_info]
   crowdedness = (r1,3),(r2,3),(r3,5),(r4,0)
   ```

   NOTE: You can add new classes, but you cannot modify any class except the Main class (and adding getters if needed). Note that the information is printed on the *standard output*, e.g., using System.out.println, and not on the OutputStream of the simulator.

3. **[3 points]** Modify the Swing View to include a new table that shows the roads with green light in each simulation step: each row in the table represents a simulation step, and the table should be similar to the following one:

   NOTE: You can modify the view classes, not the model (except adding getters if needed).