
Software Engineering

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Exercise Sheet 6

Exercise 1: Class diagram (10 Points)

Model a car rental agency with fulfills the following requirements.

- 1 For each car, the license number and the year of manufacture is stored.
- 2 A type is assigned to each car. Each type consists of an identifier and a daily lease price. Types are stored even if no cars of the type are available. Cars can only be gathered if the corresponding type exists.
- 3 For each rented car exists a borrower which is the driver at the same time. Furthermore up to three additional drivers can be registered. For each driver (borrower and additional drivers) the name, address and date of birth is stored.
- 4 A person can rent at most 5 cars at the same time (borrower).
- 5 No further data is required to be stored for rental.
- 6 The information about cars and drivers remains in the system even if they are currently not involved in a rental.

Provide an UML class diagram on the basis of the requirements described.

Exercise 2: Statechart Diagram (10 Points)

NASA hired you as chief engineer for their next Mars mission.

Your job is to realize the control system of an autonomous robot exploring the surface of planet Mars. After landing, the robot first waits for an activation signal transmitted from Houston. The robot is supposed to fulfill three different tasks on planet Mars.

On the one hand, the robot shall at any time be able to take a picture from the surroundings on request from earth and send it back to NASA headquarter. Independently, it shall repeatedly first take a sample of the soil and analyse it, and after that, measure the high-level radiation coming from the sun. Each time when a task is completed, the robot sends data from the task back to earth.

If the robot runs low on energy in the meantime, it interrupts its current task for a while, recharges its batteries using a solar panel, and continues afterwards the task from before. In case the robot receives the deactivation signal, it returns to its landing position and waits for its pickup.

Model the desired behaviour of the robot as a UML statechart diagram; make use of structuring means like “composite states” and “concurrent states”, as well as history pseudostates, whenever appropriate.