



RASD

Patricia Abbud
Maddalena Andreoli Andreoni
Paolo Cudrano

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1 Introduction

1.1 Description of the given problem

The system we are going to develop is a carsharing service called *PowerEnJoy*. The system allows registered users to locate and reserve a car to use.

1.2 Goals

- **G1** The system registers users with their credentials and payment information.
- **G2** User receives password from the system as an access key.
- **G3** The system enables the registered user to find the locations of an available car within a certain distance from user's location or from specified address.
- **G4** The system enables user to reserve a single available car in a certain geographical region for one hour before the user picks it up.
- **G5** If the reserved car is not picked up within one hour from the reservation time, the reservation expires and the system tag this car as available. The system charges user a fee of 1 EUR.
- **G6** User tells the system that he's near the reserved car. The system unlocks the car to let the user enter.
- **G1** The system charges the user for a predefined amount of money per minute.
- **G2** The system starts charging the user as soon as the car ignites.
- **G3** The system stops charging the user when the car is parked in a safe area and the user exits the car. The user must confirm the operation, otherwise the system keeps charging them.
- **G4** A screen on the car notifies the user of the current charges.
- **G5** The system locks the car automatically when the user exits the car.
- **G6** The system allows the user to open the car through a bluetooth system when the user has reserved it.
- **G8** If the user has chosen to keep being charged, the system allows them to exit and close and re-open the car through a bluetooth system.
- **G9** If the user has chosen to stop being charged, the system keeps a 10minutes window of time when they are allowed to re-open the car if it has not already been reserved by someone else.

- **G10** The set of safe parking areas is predefined by the management system.
- **G11** The system allows the user to earn a 10% discount on the standard price for the current ride if there are at least two other passengers in the car.
- **G1** The system applies a 20% discount on the standard price for the current ride if the car is returned by the user with less than 50% of power charge.
- **G2** If a user returns a car to a recharging area and plugs it into the power grid once left, the system applies a 30% discount on the standard price of his current ride.
- **G3** The system applies a 30% increase of the standard price for the current ride if the car is returned in a parking area at more than 3 Km from the nearest recharging area.
- **G4** The system applies a 30% increase of the standard price for the current ride if the car is returned with less than 20% of power charge.
- **G5** The system provides an option (*money saving*) to get information about the best safe area where the user can leave the car. The system applies a ???% increase of the standard price for the current ride if the car is returned in the suggested safe area.

1.3 Domain properties

We assume that the following properties hold in the analyzed world:

- All cars are equipped and located with a GPS system.
- All the GPS always give the right position.
- The GPS system cannot be switched off.
- All cars are equipped with a Bluetooth system.
- The Bluetooth system is always on.
- The user is always able to be located, either by GPS or by giving their position themselves.
- The safe areas are predefined and within the municipality of Milan.
- The payment of all services is always accepted.
- The cars always ignite when they are charged
- The cars cannot be reserved by more than one user at any given time.
- The system is always able to tell how many people occupy a car.

1.4 Glossary

User We will refer to all people who are registered to the system as 'users'. All users have personal profiles which contain the following information:

- First name;
- Family name;
- Email;
- Username;
- Password;
- Payment information; this in particular includes
 - Credit card number;
 - Credit card expiration date;
 - CVV number.

And, optionally:

- Personal photo;
- Telephone number.

Users should be able to locate, reserve and drive the cars offered by the service.

Guest We shall call 'guests' all people who are using the interface of the system without being registered or logged in. Guests can't access any functionality of *PowerEnJoy* except for the registration process or the log in.

Parking areas Also called *Safe areas*, parking areas are predefined parking slots within the municipality that are reserved for the carsharing system *PowerEnJoy*.

Special parking areas , or *recharging areas* are parking slots where the car can be recharged; parking areas and recharging areas do not always coincide: parking areas *may* be recharging areas, while the contrary doesn't apply.

Reservation We will call 'reservation' the operation of booking a specific car for the sole use of the user who reserved it. Reservations allow the users to access the car, open it and drive it.

Power grid

Standard price We shall call 'standard price' the price per minute charged to the user, without any discount or sanction applied.

Discount A discount always lowers the price per minute charged to a user. It is a negative percentage that is applied every time a user has a virtuous behaviour.

Sanction A sanction always increases the price per minute charged to a user. It is a positive percentage that is applied every time a user has a wasteful or incorrect behaviour.

1.5 Assumptions

The assignment document was unclear and ambiguous on some points of the specifications. Hence, we will make the following assumptions:

- Parking areas and special parking areas are two different things; however, common sense suggests that it isn't logical to charge users if they plug the car to the power grid in a recharging area but are not parked in a safe area. Neither it makes sense to sanction them if they park it in a safe area that is 3km far from the power grid. Having the two areas separate would lead to the consequences above, so we decided that while a safe area may not be a recharging area, recharging areas are always safe areas.
- The system is completely autonomous and can manage emergencies (such as the car breaking down, or street accidents) without the need of an administrator.
- It wasn't clear from the assignments document whether the user would be able to reserve a specific car; we assume so.
- There is a "manual" way to close and open the car, i.e. that the user is allowed to temporarily park the car while still being charged, get out, close the car, and then get back and open it again.
- Parking areas and special parking areas are allotted and private parking spaces owned by *PowerEnJoy* and distributed throughout the urban area.

1.6 Constrains

1.7 Proposed system

1.8 Identifying Stakeholders

1.9 Reference documents

2 Actors Identifying

3 Requirements

4 Scenario identifying

4.1 Scenario 1: Registration

Anakin has just moved to Milan and has rented a flat; however, he couldn't afford a place close to the city centre, where he works; he also doesn't have a car, so he's been going back and forth with public transport. Because of that, he needs to wake up half an hour earlier and usually gets home very late, and he's getting tired. He then decides to look for a solution on Google, and he finds the carsharing service of *PowerEnJoy*, which has a parking place close to his home. The *PowerEnJoy* web page has all the information readily available, pricing, features and an approximated map of the parking areas included, so Anakin decides to sign up. He completes a form, where he writes his complete name, personal information, personal email and payment information; the system accepts his registration, so he can access the private area of the system.

5 UML models

6 Alloy modeling

7 Appendix

List of Figures

List of Tables

7.1 Used tools

For this assignment, we used the following tools:

LaTeX The group used LaTeX to structure the final document and to help with versioning.

Github We leaned on Github for versioning and coordinating synchronized work.

Toggl We used toggl to keep track of work hours.

Alloy

7.2 Hours of work