**Introduction**

**General description of the problem**

We will project PowerEnJoy, a service that allows people to reserve and drive a car within some geographical areas like a common car sharing service.

The system allows users to reserve a car via mobile app or via web app, using a GPS system to identify the position of the user and the position of the available cars near him/her.

Users should only see the available cars displayed in a map, that means that he can’t see cars already reserved by other users or cars that are already running.

Users can drive a car everywhere but they must park within safe areas, otherwise SOMETHING HAPPENS.

We decided that the registration is mandatory before using the service to collect all the needed information about people who want to drive PowerEnJoy cars.

The system provides user some eventual discounts, for example if a user shares the car with at least two other people or if he/she charges the car at least at 80% of the power at the end of the ride.

**Stakeholders identifying**

**Actors identifying**

-guests can read a description of the service or sign up.

-users: people who has already signed up so that the system has given them the password that can be used to access the system.

**Goals**

The goals are:

* make car sharing more eco friendly using exclusively electric cars.
* allow guests to sign up.
* allow users to sign in.
* allow users to know if there are available cars near them.
* allow users to reserve an available car for up to one hour.
* allow users to use the car.
* allow users to receive a discount if they carry more than 2 people.
* allow users to know how much money they are spending during a ride.
* allow users to know the car’s battery level before reserving or unlocking it.
* allow users to see the charging level during a ride from an lcd screen.
* check if the car is parked in a “safe area”.  REQ
* check the car’s level of battery. REQ
* fine users if the car has been parked more than 3 km from the nearest power grid station or with less than 20% of battery.
* reward users if they let the car with more than 50% of battery.
* reward users if they let the car in charging into a power grid station.
* recognise if a user is near a car and unlocks it only if the car is available or was reserved by him.

Cancel the reservation

**Domain assumption**

* Someone must be successfully registered before using the service
* A user can’t reserve multiple cars at once, only one reservation is allowed
* A car can’t be reserved simultaneously by two or more users, once a car is reserved it disappears from the list of available cars
* Cars numbers are unique
* The same person can’t have multiple accounts
* The maximum of other passengers excluding the driver during a ride is 4
* Only the owner of a reservation can drive the car he has reserved
* All the GPS always give the right position of the cars and must be always working
* Only credit cards can be used for payment
* If the credit card of a user is out of money during a ride, the user will receive a beep from the car, and he should end his ride within 5 minutes, otherwise his account will be blocked
* If a user doesn’t park his/her car in a safe area at the end of the ride, he will pay a fee

**Glossary**

Guest: person who hasn’t registered yet to the service. He can only read a description or sign up.

Registration: process that permits to a Guest to provide his password so that he can access to the system. In the regitration process he has to compile a form giving these informations:

1. Name

2. Surname

3. Phone number

4. Birth date

5. Birth place

6. Sex

7. Email address

8. SSN

9. Address

10. Zip code

11. Credit card number

12. Driving licence’s number

13. Username

the system will reply sending him an email containing the user’s password

User: person who has already registered and can access to the system reserving or unlocking an available car.

The system returns to the user a password that can be used to access the system using also his username.

Reservation: a process thanks to which a user can reserve an available car up to one hour: from when he reserves it, he has only one our to reach it and to begin his ride until the system cancels his reservation and gives to him a fee of 1 Euro.

Ride: is the time from when a user unlocks a car to when he exits from it and let it parked.

Available car: is a PowerEnJoy’s car that is not reserved by another user and  no other user is riding it.

Safe area: a car is parked in a safe area if it is in one of the parkings belonging to the set pre-defined by the management system.

Sharing discount: is a discount of 30% given to users who carrys at least other two people.

Power grid station: is the station where the car can be plugged to in order to charge it.

**Constraints**

Regulatory policies

The system must ask the user the permission to get his position and the permission to manage sensible data (position, phone number) according to the privacy law. Furthermore, the systems must not use notiﬁcations to send SPAM respecting the privacy law.

Mobile application

* 3G/4G/Wi-Fi connection
* GPS
* Enough space for app package
* 512 MB of RAM

Web Browser

* Modern browser with AJAX

Parallel operations

The server supports parallel operations from diﬀerent clients.

**Reference documents**

**Requirements**

**Functional requirements**

make car sharing more eco friendly using exclusively electric cars:

allow guests to sign up:

- The system can save the informations of all the people who register themselves.

- The system reply to every registration with a password that the user  will have to use to access.

-the system must be able to control if the registration informations are correct.

- the system must control if the credit card number is valid

allow users to sign in:

- the system must be able to control if the username and the password match one with each other.

allow users to know if there are available cars near them:

- The system must have access to the GPS position of all the available cars and to the user’s or to the position that the user decides to give to the system (he can search for a car in a determinated zone even if he is far from it).

allow users to reserve an available car for up to one hour.

- The system must control if every reservation timer is under 1 hour.

- The system must send a fee to users that haven’t taken the cars they reserved within one hour.

allow users to use the car:

- The system controls the duration of a riding.

- the system calculates the cost of the ride in real time.

- the system informs in real time users about duration and the cost of the ride.

-the system calculates and displays the final cost of the ride in order of the fees or the discounts accumulated by users.

-the system controls if the car has been parked in a “safe area”.

-the system must be able to charge the cost of the ride to the user.

allow users to receive a discount if they carry more than 2 people:

-the system must be able to control how many people are in the car using seat sensors.

allow users to know how much money they are spending during a ride:

-the system must display the cost of the ride in real time.

allow users to know the car’s battery level before reserving or unlocking it:

-the system must know the battery level of each car.

allow users to see the charging level during a ride from an lcd screen.

-the system must display the battery level on a lcd screen.

fine users if the car has been parked more than 3 km from the nearest power grid station or with less than 20% of battery

-the system must know the GPS position of every power grid station -the system must calculate the distance between every parked car and its nearest power grid station.

-the system must have people who will take the out-of-charge cars

to the power grid station using special transport means.

reward users if they let the car with more than 50% of battery.

-the system must have people who will take the out-of-charge cars

to the power grid station driving them.

reward users if they let the car in charging into a power grid station.

-the system must recognise if every car is in charge or not.

recognise if a user is near a car and unlocks it only if the car is available or was reserved by him.

-the system must have a precise GPS position of every car and user.

**Non-functional requirement**

**Functional Modeling**

**Possible scenarios**

**Use case diagram**

**Object Modeling**

**Class diagram**

**State diagrams**

**Dynamic Modeling**

**Sequence diagrams**

**Activity diagrams**

**Alloy modelling**

**Model**

**Alloy tool results**

**World generated**

**Future development**

**Used tools**

**Hours of work**