INTRODUCTION

* Description of the given problem

Our project is about PowerEnJoy, a system of car-sharing that employs only electric cars. It provides users to reserve and use shared cars of the system in a specific area, paying in function of the time of driving. The interface to communicate to the system is a mobile app or a web pages that make the renting simply and clear.

App nella macchina?

For the inscription is necessary a valid document and the driver’s licence. To be able to use the service the user has to associate a valid credit card to its profile, with which he will pay the travel. Every time the user wants to use the service has to insert his credentials. Through the app he is able to get in the car. There are 5 minutes for the driver to get himself comfortable in the car after which the payment will start. At the end of the travel the driver has to leave the car in the available area, and in particular he can respect some constraints to get some bonuses on the rate. The payment will be automatically charged from the user’s credit card.

Virtuous behaviour?

Goals:

1. Clients are allowed to register to the system giving their credentials and payment information
   1. The system controls if credentials are correct
   2. The system controls if payment information are correct
   3. Conferma?
   4. The system sends a password to the new client
2. Registered clients are able to see through an interactive map the positions of the available cars near a specific address (current position or inserted)
   1. The system checks if the client is “appiedato”
   2. The system gets the position from the GPS or from the position input
   3. The system obtains the actual position of the electric cars
   4. System generates a map with a marker for each available car in the selected zone
3. Registered clients can reserve a single electric car for at most an hour before picking it up
   1. The system modifies the state of the electric car from “available” to “reserved”
   2. The system changes the client state from “appiedato” to “reserving”
   3. The system stores the relationship between the car selected and client
   4. The system starts the one hour reservation countdown for the client
4. Clients that get the reservation countdown expired are punished with a fee of one euro
   1. The system changes the state of the car from reserved to available
   2. The system changes the state of the client from “reserving” to “appiedato”
   3. The system charges the client one euro
5. Clients can open the reserved car scanning the qr code
   1. The system controls the correspondence between qr code and reserved car
   2. The system unlocks the reserved car
   3. The system changes the car state from reserved to occupied
   4. The system changes the client state from “reserving” to “aboard”
   5. The system starts the five minutes courtesy countdown for starting payment (when the countdown expires the system starts to charge the user even if engine is still switched off)
6. Clients can monitor the amount of money to be payed, updated in real time on car display
   1. The system calculates the amount of money that has to be payed by the client starting from engine ignition (or courtesy countdown end)
   2. The amount of money is displayed on car monitor and is continuously updated
   3. The system stops charging the client at travel conclusion
7. Clients can leave the car locked in break continuing to pay, keeping it reserved
   1. The system asks the client if he wants to end his travel or to leave the car in break, sending him a notification through the app. This happen when sensors detect that all passengers are out of the car, engine is turned off and doors are closed
   2. Both the client and the car states are set to “in break”
   3. The system locks the car
   4. The system unlocks the car after the client rescans the qr code through the application
   5. The system change the client and car states
8. Cars are blocked automatically when client ends his travel
   1. The system asks the client if he wants to end his travel or to leave the car in break, sending him a notification through the app. This happen in the same way of point 7.a
   2. The system locks the car
   3. The system adds the car at the set of available cars if it respect the available constraints.
9. Client are charged proportionally to the driving time with some penalties or discounts
   1. SCONTI

DOMAIN PROPERTIES

These are the main properties of our world that we need to be always true:

* GPS always give the right position
* The service is always available
* User cannot switch off the car information system
* The connection of car information system never fail
* Course time is always positive
* The sensors system in each car always detects a positive number (or zero) of clients
* Countdowns cannot be stopped
* Car’s qr codes are unique
* A car can only be in one place at a time
* Any technological failure (for example a problem in locking system) is readily communicated to the direction by the car itself
* Broken cars are not available
* In case of accident, our insurance is able to operate directly with the client, making use of data provided by us
* Drivers never stop in the road with 0% of battery
* Drivers do not come with the car out from the authorized area
* God should exist

Glossary

Client: he is a person who uses PowerEnJoy (serve davvero??)

Registered client: he is a client who have already done the procedure for signing in. He provided to the system all the necessaries data: his credentials and payment information

Reserving client: he is a “registered client” who reserved a single electric car through PowerEnJoy. He has at most one hour for picking it up

Dismounted client: he is a “registered client” who doesn’t have any reservations on PowerEnJoy. Then he is allowed to reserve available electric cars

Electric car: it is an automobile owned by PowerEnJoy that is propelled by one or more electric motors, using electrical energy stored in rechargeable batteries

Available car: it is an “electric car” which currently doesn’t have any reservations. It is in a safe area with more than 80% of battery and in good conditions. Then registered clients can reserve them

Reserved car: it is an “electric car” which is currently reserved by a “reserving client”. As a consequence, in this state it cannot be reserved by other clients

Reservation countdown: it is a one-hour countdown that starts when the client reserves an available car and ends when he picks it up. During this time the car continues to be considered a “reserved car”

Courtesy countdown: it is a five minutes countdown that starts when the client opens the car and ends with the engine ignition. In this period the client, before starting to drive, can get himself comfortable, put in a proper positions his bag, adjust car mirrors and fast security belt.

Current position: it is the position detected by the GPS of the client device.

Virtuous behaviour: a way in which a person behaves respecting the environment. Examples of virtuous behaviours are: sharing the car with other passengers or leaving the car in the special parking areas where they can be charged

Zone: it is a zone of approximately 1km2. The town is divided in several zones

Available area

Special parking area

available constraints

ASSUMPTIONS

There are few points that are not very clear in the specification document, or not completely specified. So we will have to make some assumption and choices:

* The system is able, in the moment of the registration, to assure that the provided credentials are consistent and the client has a regular and active driving licence (scriviamo della connessione con un particolare ente?). This is true also for payment information: only credit (not debit) cards are accepted and the system is able to verify with principal bank circuit (ex. Visa or Mastercard) the actual validity of the card itself.
* The method for opening cars is to scan a qr code that each car has on its left door.
* In order to avoid that people could enter in the car and be stationed inside without paying, we put in the system a 5 minutes countdown, starting from the moment in which client enters in the car. After these 5 minutes user start to be charged, even if the engine is switched-off.
* SENSORI DI PESO per ogni pass