Informal analisys of project description v.1

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Contents

1) Users must be able to register to the system by providing their credentials and payment information.

Ideas, hypothesis and questions

1. We thought about the basic assumption that all the data is checked by the system itself and not by human being.
2. What kind of credentials does the user have to insert, and how does he do that?
3. A person must insert payment information containing the same data of the previously selected cards. In other words the person who is registering and the person that will pay when using the service are the same.
4. How can the user access is own account (provided by the system)?
5. An already registered user cannot register him/herself again to the service.

Possible solutions

The user has to drive a car, so the Driving Licence is strictly required. Moreover any ID Card could be requested, to identify furthermore the person.
The system can check for the validity of the information inserted by the user (cards expired? false documents?).
The payment information must be consistent with the previously given data: the system can also check that.
After the registration is complete, the system can send a password, that must be unique for each user, thanks which the user can access to his/her account. Such password or code is sent by mail (that the user gave during the registration to the service).
We do not consider the case where someone can actually use the credentials of someone else, maybe a friend: such possibility is purely user-related and the system has no way to control it.

2) Registered users must be able to find the locations of available cars within a certain distance from their current location, or from a specified address.

Ideas, hypothesis and questions

1. The user will be able to use this "finder service" only if registered.
2. Whenever the GPS localisation isn't working (no signal, device not supporting it), the user can manually put his/her own location as if he/she was inserting a specified address.
3. If the user inserts an address that is not existent or wrong (not recognised), he/she will be asked to re-insert the address.
4. How are the available distances, and cars, displayed to the user?
5. Geographical coherence is required: if the user is in Milan, he won't receive a list of the available cars in Rome.

Possible solutions

Point 1 in the previous section is accomplished by making the service available only from the private account of the users.
To answer to point 4, we developed two ideas: the user will be able to select from a set of available distances (100 m, 500 m, 1 km and so on) or all the cars are shown to the user ordered by their specific distance from the indicated location. Moreover, cars can be grouped by other factors, such as distance, as previously said, number of seats, battery percentage, nearness to a safe station.

3) Among the available cars in a certain geographical region, users must be able to reserve a single car for up to one hour before they pick it up.

Ideas, hypothesis and questions

1. A situation where a user makes a reservation hours before the real need is quite unfair. How can such a situation be avoided, granting a fair treatment to all users?
2. What happens if a user takes back a reservation?
3. A user cannot make more than one reservation with is account.
4. The reservation must be at least one hour before the real use, not less.
5. To reserve a different car, the user must before delete his/her previous reservations, if he/she has one.

Possible solutions

An idea to solve the problem described at point 1 relies on the strategy adopted by a quite large number of companies in the world. A user can make a reservation whenever he/she wants, but that will be free for only a short range of time, such as from one up to two ours before the usage of the service. If he/she intends to make a reservation before that period, the user will have to pay a sort of fee, proportional (or not) to the anticipated reservation time.
Point 2 is quite tricky. It would be unfair if a user takes a reservation and then takes it back at the last minute, maybe leaving people in need of that specific car with nothing but to wait. A possible solution (if we intend to find one) is to create a sort of waiting queue, where people that do not have already made a reservation on other cars, can enlist. Whenever the first in queue, so the user that made the reservation, would leave the queue, all the waiting users are notified that the car is free once again, and repeat the whole process.

4) If a car is not picked-up within one hour from the reservation, the system tags the car as available again, and the reservation expires; the user pays a fee of 1 EUR.

Ideas, hypothesis and questions

1. What if the user has not that much money?
2. If the user picks up the car within the time limit of his/her reservation (which could be more than one hour), he/she doesn't have to pay any fee.

Possible solutions

To solve point 1, we thought about another famous strategy used by many real world services: the trial time. The user receives a notification on his/her account that he/she has a short period of time to refill his/her payment cards (or whatever other way he/she uses to pay the service). If such time expires, he/she will receive another notification and possibly a fee.

5) A user that reaches a reserved car must be able to tell the system she's nearby, so that the system unlocks the car and the user may enter.

Ideas, hypothesis and questions

1. How can the user communicate it?
2. What happens if someone else than the user take the car instead?

Possible solutions

Point 1 requires one more specification: such communication can be manual, done by the user, or automatic, done by the system checking continuosly the GPS localisations of every user. The latter one is not considered by us. The manual one can be done having the user access his/her account and use a special action (available only if the car is reserved).
The second point is problematic. One solution is to make such "procedure" available only within a limited distance from the car, like 10 meters. But that implies that the system knows in every moment the distance between the user (device) and the car. Another possibility is to give the user another unique code, that he must use to access the car once reached.

6) As soon as the engine ignites, the system starts charging the user for a given amount of money per minute; the user is notified of the current charges through a screen on the car.

Ideas, hypothesis and questions

1. The screen must represent exactly the sum of money "to be spent" for every minute that he/she stays on the working car.
2. If the car stops, so does the money counter (just think about the situation at a semaphore). As soon as the engine re-ignites, the counter will start again, from the previous sum of money, so to it's previous value.

7) The system stops charging the user as soon as the car is parked in a safe area dn the user exits the car, at this point the system locks the car automatically.

Ideas, hypothesis and questions

1. If more passengers are on the car (detected with sensors on each seat), all the people on it must exit the car to make the system lock it.
2. When the car is locked, the system changes its status to "available for the next reservation".
3. The system updates the location and status of the car.
4. A particular situation may occur. It can happen that the user and one passenger excanghe seats and the user leaves the car allowing the passenger to drive. In such case however, the real user will continue to be charged and that makes the situation extremely improbable.
5. The money topic is the same as section (and requirement) 4.
6. Do users have a kind of map to reach the nearest safe areas?

Possible solutions

A possible way to solve the problem expressed in point 6 is to make the screen of the car show not just the money counter but also a look-like map that informs the users of the nearest safe areas, maybe distinguishing the special ones from the normal ones, and that gives indications about how to reach a specific area, selected by the user.

8) The set of safe areas for parking cars is pre-defined by the management system.

Ideas, hypothesis and questions

1. What if the user abandons the car in a not safe area?
2. The system must always keep updated the amount of areas available for the users and the status of the cars and parking lots.
3. Related to section (requirement) 7. The user must be notified of the free parking spaces available when selecting the nearest safe-area, special or not.
4. When a safe area is selected, it becomes reserved for the car and don't appear on the screen of other cars in the same zone.

Possible solutions

Point 1 lead us to an ambiguous thought: can the user abandon the car, or simply exit it (ending the service)? The answer was given us by the additional requirement D, and is yes, the user can. The worst case scenario for the user is leaving a door open, letting the counter rise and not ending the service.

A) If the system detects the user took at least two other passengers onto the car, the system applies a discount of 10% on the last ride.

Ideas, hypothesis and questions

1. The discount must only be applied to the rides where there are more passengers. As said in requirement 7, sensors applied on the car seats can detect how many passengers there are.
2. How is the case where a passenger leaves the car before the user destination (and equivalently if a passenger enters the car after the user started his/her ride) treated?
3. What exactly is intended with the terms "last ride"?
4. Is the user notified by the reasons of the possible discounts? If yes, how?

Possible solutions

Point 2 requires a further discussion with the customer. Thinking his/her way, the best way to handle such problem is to simply consider positive the condition if during the ride, somewhere, the car has two or more passengers, allowing a discount (even if the period in which there are more passengers and the service time don't coincide). However this is dificult to implement and requires more condition on the sensors of the car and it's inner system. The solution we want to adopt is the easy: "the discount is applied only if the same number of users inside the car, both driver and passengers, at the beginning of the service, is the same as the end".
To solve the problem of point 3, we assumed that with "last ride" we refer to the whole ride of an user, intended from the start of the service to its end.
The idea to solve the problem of point 4 is to show on the screen of the car, when it stops, not just the amount of money the user has to pay, but also the discount he/she is getting. An example to clarify: when the user stops the car (not always coincident with the engine shut down) and it has two passengers, the display will show the money count and a phrase like: "You are now carrying more than two passengers, if the condition persist at the end of your service, you will get a discount of 10%". Another idea is to simply leave the discount calculus to the car machinery, not informing the user.

B) If a car is left with no more than 50% of the battery empty, the system applies a discount of 20% on the last ride.

Ideas, hypothesis and questions

1. Before the user exits the car and closes the door, the car must check the remaining amount of battery.
2. How are multiple discounts applied to the cost of the ride? Cumulative or recursively applied?

Possible solutions

Point 1 is simply an enhancement of what discussed in requirement A. The check can be done anytime the car stops and the message is shown to the user in the same way as before, along with the other messagges.
Point 2 is more customer-oriented. Cumulative discounts on the cost of the ride is the solution that we will adopt, and from a customer point of view it's also the best one (because it allow the maximum discount over the total).

C) If a car is left at special parking areas where they can be recharged and the user takes care of plugging into the power grid, the system applies a discount of 30% on the last ride.

Ideas, hypothesis and questions

1. The system must be able to recognise the special areas from the normal ones. The "how" corresponds to the requirement 8.
2. How can the user show his/her will to plug the car and not exit and end the service?
3. Same doubts and assertions over the discount topic as requirements A and B.

Possible solutions

We thought about two ways to solve the problem of point 2. An easy one is user-driven: he/she has just to leave the door open, plug in the car, enter to see if the discount message is shown (and so applied) and end the service. The other solution requires more car complexity: the user can manually select the "recharge" option from a menu on the car and the charging door will open. The discount will be applied only if the user really plugs in the car.

D) If the car is left at more than 3 km from the nearest power grid station or with more than 80% of the battery empty, the system charges 30% more on the last ride to compensate for the cost required to recharge the car on-site.

Ideas, hypothesis and questions

1. The system must keep trace of the car position and should detect when it stops and the user leaves the car (possibly closing the door).
2. As mentioned before, when the car stops, the display show not just the money counter but also the possible discounts/overcharges of the ride to the user.
3. The terms "recharge the car on-site" implies that the car is rechargable everywhere, not just in the special safe areas. How is the recharge discount dealt with in that case?
4. Same doubts and assertions over the discount topic as requirements A, B and C.

Possible solutions

Point 3 can be solved in more than one way. One idea is to grant everyone the permission to recharge it everywhere but just those who do that in a special safe area receive the discount. Then the car can have a special plug that is accessible only by the pluggers located in the special areas or given to technicians so that unautorized users can't access it everywhere. Lastly, the plugging can be available only in special safe areas (special lock on the plug) and technicians can access it using a special badge or code.

Hours of work

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18-10-2016: 1.30 hours (meeting)
20-10-2016: 0.45 hours (meeting)
24-10-2016: 2.00 hours (document writing)
25-10-2016: 0.30 hours (document revision + meeting)

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