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PowerEnjoy

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Chapter 1

1 Introduction

1.1 Purpose

This document contains the **RASD** (*Requirement Analysis and Specification Document*), aimed to describe a car sharing system named PowerEnjoy which only employs electric cars, supposing no previous software infrastructure exists. Conforming to the *IEEE-STD-830-1993* standard for RASD documentation this will include an overview of the functional and the non functional requirements of the system, showing the constraints and the limit of the software and simulating typical post-development scenarios through corresponding use cases.

This document is intended to all developer and programmer who have to implement the requirements, to system analyst who want to integrate other system with this one, as well as for stakeholders interested in learning how the developed solution matches their request.

1.2 Scope

The project is aimed at creating a product that will allow end users to rent electric cars for any amount of time. Generic users should be able to register to the system by providing their credentials and payment information, receiving at the end of the process a password usable to access the system. Once accessed, the system should point the users the locations of nearby cars, that they'll be able to reserve for up to one hour before the estimated pickup time. Once arrived on the site where the car is parked within the allotted time, a user should be able to prove its identity as the booker of the car, which would then be unlocked. The user should be charged while driving, in proportion to the time spent driving, until the car is parked in a safe area, whose set is pre-defined by the system. Once the user is out of the car, the system would lock the car which would then be ready to be used by another user.

In case of expiration of the reservation, the user is charged of a pre-determined fee. Economical incentives and penalties should be awarded in proportion to how eco friendly the user's behaviour has been.

1.3 Actors

- **Guest**: a guest is a user who has yet to join the service; as such, it can only consult the information regarding the service available on

the homepage and navigate between it and the registration and the login pages. To become a registered user the guest will have to fill in a registration form and provide payment method data as well as a photo of its driving license; the system will then analyze the data and confirm the success of the registration process within 3 days.

- **Registered user**: a registered user is able to log in.

- **Logged-In User**: a user allowed to make and (within 15 minutes from its making) cancel a reservation for a car, possibly after the visualization of the nearby cars and the safe areas close to the destination. After the reservation it will be enabled to open the reserved car.

- **Car AI:** through its sensors, the car detects information regarding the ride that will be sent to the system, unlocks and locks itself and displays to the user infos about the surrounding area.

- **Power Enjoy System**: the Power Enjoy System primarily keeps a record of the users, the cars, reservations updating the status of each of them according to the input from the users and the cars AIs. It also calculates the price for each ride and coordinates itself with payment systems interfaces to finalize money transfers, and warns the staff about exceptional situations such as ones where a car has been damaged, or abandoned in a discharged state.

1.4 Goals

List of the goals of PowerEnjoy application:

- [G0] Allow a guest to visualize information regarding the service and become a registered user.

- [G1] Allow a registered user to log in.

- [G2] Allow logged in user to check the location of nearby cars.

- [G3] Allow logged in user to reserve a car.

- [G4] Allow logged in user to cancel its reservation until 15 minutes from the reservation time.

- [G5] Allow logged in user to open the car reserved.

- [G6] Carry out the transaction at the end of the ride, after the calculation of discounts and penalties.

- [G7] Allow logged in user to ride the car.

- [G8] Allow logged in user to enable money saving option when in the car.

1.5   Definitions, Acronyms, Abbreviations

1.5.1   Definitions

- **Pairing Code**: A code provided to the portable device by the system after the reservation, to be used to open the car exploiting bluetooth technology. When the car is reached by the user its portable device and the car join what is called a trusted pair through a discovery and authentication process where the matching of the code in possession of car and device is verified, and at the end of the process the car opens.

- **Blocked User**: a registered user who is able to access the service yet unable to reserve a car since the money transfer related to the last transaction failed.

- **Safe Area**: An area where the car can be parked without being subject to further time-based charging. It corresponds to a collections of parking spots in the city of Milan reserved by the service for the users.

- **Grid Station**: An area where it is possible to plug an electric car.

1.5.2   Acronyms

- **RASD**: Requirements Analysis and Specication Document

- **DB**: DataBase

- **DBMS**: DataBase management system

- **API**: Application Programming Interface

- **OS**: Operating System

- **JVM**: Java Virtual Machine

- **JEE**: Java Enterprise Edition

- **AI**: Artificial Intelligence

- **GPS**:Global Positioning System

- **MB**: Megabyte

1.5.3   Abbreviations

1.6   Reference Documents

- Assignment document: AA 2016-2017 Software Engineering 2 -Project goal, schedule, and rules

- SO/IEC/ IEEE Std 29148:2011(E) Systems and software engineering - Life cycle processes - Requirements engineering

1.7 Document overview

This document is divided in four sections:

- Section 1: Introduction, it consists of a generic introduction of the document aimed at providing the basic info necessary for the comprehension of the other sections contents.

- Section 2: Overall Description, gives general information about the software product with a special focus on constraints and assumptions.

- Section 3: Specific requirements, this part mainly includes different representations of functional requirements and also nonfunctional requirements.

- Section 4: Appendix, it cointains a modelization of the requirements created by using alloy language.

Chapter 2

2 Overall Description

2.1 Product perspective

The chosen solution is a web-based application meant for portable devices, which will take up to 20MB of free space on the device memory and will make use of Bluetooth technology for the car unlock mechanism as well as of GPS technology to detect the car closest to the user. Only interfaces to external systems of financial institutions and state authorities meant to verify the existence of the person associated to the document provided will be developed, since, as stated before, no other previous software infrastructure exists and the the application will be self contained.

2.2 User characteristics

We expect our user pool to be comprised of rather young individuals (age varying between 18 and 35), owning a driving license but still not in possession of a car and/or with a preference for electric cars due to environmental reasons. The user is expected to be used to exploiting mobile apps and should not require a particularly user-friendly interface.

2.3 Constraints

2.3.1 Regulatory policies

- As previously explained, to utilize the service a user must provide proof of its driving capability. No other legislation binding car sharing services exists.

2.3.2 Hardware limitations

No hardware limitations exist.

2.3.3 Interfaces to other applications

Interfaces to the systems of financial institutions responsible for the money transfers connected to the transactions are to be developed.

2.3.4 Parallel operation

PowerEnjoy must support parallelism since it is bound to face reservation and access to the service requests from multiple users at once on a 24 hour basis.

2.4 Assumptions and Dependencies

2.4.0.1 Assumptions concerning the user

- Users do not seek to trick the sensors of the car to trigger the application of a discount (for example carrying around weight to mimic the presence of passengers).

- No user who reserves a car and actually reaches it does not inform the system about damages seemingly previously incurred by the car, even when though damaged it is still possible to drive it.

- Every user is held responsible for the damages incurred by the car driven and accountable for every fine received while driving it, being informed of this policy within the terms of use.

- The user never approaches another car that himself doesnt have reserved.

2.4.0.2 Assumptions concerning the cars

- All the cars used are identical.

- Cars AI source of power is not the same as the engines.

- Cars' doors are locked while the engine is turned on.

- If the engine is turned on, the locking mechanism turns itself off only in case of accident.

2.4.0.3 Assumptions concerning the operating space

- The service is presently active in Milan and nowhere else. Attempts to lead the car beyond the city boundaries will succeed, yet no safe areas nor grid stations are defined outside of Milan.

- Safe areas are evenly distributed around the city.

- Every grid station is a safe area.

- In Milan there is at least a grid station per 5 km area.

2.4.0.4 Assumptions concerning payments and discounts policy

- The system checks the validity of the payment method provided by the user only once during the registration process.

- If a transaction is not carried out successfully, the user is blocked and becomes unable to reserve other cars until the debt to the service is repaid.

- The service calculates the price of a ride and charges the user only after 5 minutes it has left the car, so to allow him to plug the car and exploit the potential related discount.

- The user can visualize from the map how much battery is left in each car found before reserving one.

2.4.0.5 Assumptions concerning the rides

- Every user has 30 seconds to enter the car it has reserved once the lock has been lifted.

- A ride is deemed ended when the user parks in a safe area, the engine is turned off and the user has got out of the car. If the engine is turned on again before the user has got out of the car when that is parked in a safe area the counter restarts using the ride price previously calculated (that is the amount previously shown on the car display up to a second before parking) as zero value.

- It is thus not possible to stop the car, exiting and reentering the car and then keep driving under any circumstance.

- When the car battery fall to 5% a warning.

- If a car battery falls to 0% while the car is being driven and the car stops outside of a safe area as a consequence, the ride will be deemed concluded, but the driver will be held responsible for any accident or disturbance caused not having properly recharged the battery before the beginning of the ride and will be expected to move the car to a suitable location through any means, failure in doing so resulting in a violation of the terms of use.

2.5 Future possibile implementations