Requirement Analysis and Specification Document

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Introduction

1.1 Purpose

This document aims to describe, specify and analyze the software requirements for *My Taxi Service*.
My Taxi Service is needed to provide a passenger-friendly interface to interact with the city's taxi service, and ensure a fair management of the city-wide taxi deployment.

1.2 Scope

The passengers should be able to use an application (either mobile or browser based) to request a taxi through the system, which in turn should answer with the ETA and identification code of the incoming tax.
The passengers should be compelled to provide their current location to the system, for their request to be accepted.
The taxi drivers should be able to use a mobile application to communicate their availability to the system, and accept or refuse incoming calls.
The system shall manage a queue of taxis for each taxi zone[1].
The system shall receive GPS location data from each taxi, and use that information to assign each taxi to a taxi zone; an available taxi is automatically placed into the taxi queue belonging to the taxi zone it currently occupies.
The system shall remove a taxi from the queue upon receiving a confirmation in which the driver accepts an incoming call; a further confirmation is also sent back to the driver.If a taxi (driver) does, on the other hand, refuse an incoming call, the system shall move it to the bottom of its taxi queue.
The system matches a passenger's position to a taxi zone, and uses that information to forward the call to the first taxi available in the relative taxi queue.
The system shall provide an Application Programming Interface, to make room for future improvements.
The system shall also provide the possibility of requesting the reservation of

[1] Partition of the city

a taxi; said reservation must occur at least 2 hours before the actual time of the ride; the time of the ride has to be specified by the passenger during the reservation procedure, as well as the passenger's location and destination. However, the system will actually allocate a taxi (by means of removing it from the queue) only 10 minutes before the requested time of the ride.

1.3 Domain properties

In this section we will analyze the background laying behind My Taxi Service:

- Passengers are assumed to be reliable and trustworthy, meaning that if they request a taxi or make a reservation they will declare their real position and actually use the taxi
- Passengers will pay at the end of the ride the amount of money demanded by the taxi driver
- Taxi drivers must own a valid taxi driving license
- ETA is estimated with a maximum error margin of 5 minutes
- We assume that, for each zone, if its queue is empty, then at least one queue in the eight adjacent zones has available taxis
- We assume GPS coordinates reliable

1.4 Goals

The passengers must be able to:

G1 Transmit its position and the desired destination to the system, thus initiating the Request of a taxi

G2 Receive the code and the ETA of the incoming taxi

G3 Reserve a taxi for a time period, starting at the time specified during the reservation[2], and ending after the ride is complete.

G4 Request a shared ride

G5 Receive the fee amount he need to pay in case of a shared ride

The taxi driver must be able to:

G6 Answer a passenger's request

[2]the starting of the reserved ride must occur at least 2 hours after the time of the reservation

G7 Render him/herself available to the scheduler

G8 Render him/herself unavailable to the scheduler

G9 Receive informations regarding the fee defined for each passenger in case of shared ride

The system must be able to:

G10 Offer a programmatic interface to enable the development of additional services

1.5 Definitions, Acronyms and Abbreviations

Passenger: the user who sends a taxi request.

User: an human interacting with the system. Users are split in 2 classes: 'passengers' and 'taxi drivers'.

System: the automatic part that manages the service.

ETA: estimated time of arrival.

Taxi zones: geographical partitions of the city, non overlapping, with an average size of $2Km^2$.

Queue: a list of all available taxis in the corresponding taxi zone. It is managed as a FIFO queue. There is exactly one taxi queue associated to each taxi zone.

GPS: global position system.

Shared ride: a passenger shares the ride with other people that origins from the same zone, and go to the same direction

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1.6 Reference documents

1.7 Overview

Overall description

2.1 Product perspective

The system must interact with a map service, to retrieve information about the route to send to the taxi driver in case of shared ride.

2.2 Constraints

We will develop a unique mobile application that can be used by both passengers and taxi-drivers.
The web application will include only passengers functions.
The mobile application must be available for Android, Windowsphone and iOS.

2.3 User characteristics

The users must be connected to the network to use the application. Passengers can interact with the service through a web browser or a mobile application; they don't need any particular ability or foreknowledge to use it.
Taxi driver must access to the application with a device provided of GPS; since they must follow a standard procedure they must attend a formation course before starting (2 hours will be enough).

2.4 Assumptions

- If a request comes from a zone, whose queue is empty, then the system forwards the call to the first taxi in the queue corresponding to an adjacent taxi zone, starting from the northeast.
- A passenger doesn't need an account to request a taxi, however, an account is required to use the reservation service.

- Taxi drivers can create only one account per vehicle ID
- Passengers who reserve a taxi can delete the reservation; if a taxi was allocated for the ride, the system will notify the taxi driver and put him at the top of the queue.
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Specific requirements

3.1 Functional Requirements

For each goal, we define the specific function that we will have to implement;

G1 :

- Passengers can select from a menu the option of requesting a taxi as soon as possible;
- Passengers can insert their position filling an input form and confirm it;
- The system will receive the request and identify the zone in which the passenger is in;
- The system will forward the request to the first taxi in the selected zone queue and wait for an answer;
- If the taxist accepts, the system will remove him from the queue; otherwise it will append the taxist to the last position and scan the list for a taxist to accept;

G2 :

- As soon as a taxist accepts a request, the system invokes the support system to calculate the ETA giving the position of the taxi and the position of the passenger;
- The system will communicate the taxi code and the ETA;

G3 :

- Passengers can select from a menu the option of reserving a taxi for a chosen ride and date;
- Passengers can insert the initial and final position, time and date, their email and confirm it;
- The system will receive the reservation and if it respects the 2 hour constraint it will send a confirmation;

- Ten minutes before the ride starts, the system allocates a taxi for it.

G4 :

- The application must have a selectable option labled:"share your ride", that allows passengers ,who reserved a ride, to enable the shared ride service.
- When the system receive a request of a shared ride, it will search for others shared ride requests starting from the same taxi zone, and going in the same direction
- When a new passenger is added to a shared ride, the system will interact with the map service, in order to retrieve a new route for the taxi driver, and to calculate new fees
- After the taxi allocation, the passengers who requested the shared ride will receive, not only the taxi ID, but also the fee they have to pay.

G6 :

- When a request comes or there is a reservation for the next 10 minutes without an assigned taxi driver, the system must search for the first queued taxi and forward him the request.
- If a taxi driver refuse to take care about a call, the system will move him at the end of the queue, and forward the request to the next taxi driver in the queue. If a queue is empty, the system will search a taxi driver in a queue belonging to an adiacent taxi zone

G7 :

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