REQUIREMENTS ANALYSIS AND SPECIFICATIONS DOCUMENT

SOFTWARE ENGINEERING II PROJECT - A.Y. 2019-2020

SafeStreets

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1 Introduction

1.1 Purpose

The main purpose of SafeStreets is to create a software that provides users the possibility to notify authorities when parking violations occur providing some useful features such as finding the most unsafe areas around them and proposing suggestions to the municipality. In addition, SafeStreets will enable the Local Police to generate traffic tickets from it and to cross all the information it owns with the data of the accidents happened.
Specifically, we want to realize a product which is able to:

- Retrieve pictures uploaded by users of parking violations with possible attached information such as license plate position in the image, type of violation and GPS meta-data.

- Automatically complete the data of a reported violation running a recognition algorithm able to read license plate text.

- Highlight to users the areas with the highest frequency of violations and information about vehicles that commit most violations.

- Automatically identify potentially unsafe areas crossing SafeStreets' information with accident datas from the Local Police, possibly suggesting possible interventions.

- Send violations data to the Local Police to automatically create new traffic tickets if it can be proved that the chain of custody of the information coming from the users is never broken.

- Generate statistics related to ticket emissions to inform users about how effective SafeStreets is.

On the other hand, the purpose of this paper is to define in a detailed way all the functions and requirements of the application.
In doing this, we start focusing on a brief overview to characterize the product with relevance to its interaction with the world, then we will proceed deeply in analysing which functions are relevant and should be provided, and which requirements are needed to the stakeholders.

1.2 Scope

As our software needs to be compliant with different laws and as it needs to interact with the Local Police, initially, SafeStreets will have a restricted geographic domain coincident with the Italian city of Milan.

Indeed, in order to provide the most complete service, SafeStreets will require the access the Local Police web application to be able to process traffic tickets.

It goes without saying that to organize this kind of service in the most effective way we must experiment first this activity in a internationally-visible city, then applying that to anyone who will demand.

1.2.1 The world-machine phenomena

The first model of our system to be presented is the model "The world and the machine" by M. Jackson and P. Zave. This model highlights the division between phenomena that happen entirely either in the world or in the machine, and those that are shared between the two of them.

The World   **The Machine**

People park in dangerous spots

Illegals parking causes traffic congestion and accidents

The Local Police process traffic tickets to fine who does not follow the rules

People call the Police to report violations

Users make the city better

Users report photos of violations

Local institutions use analitycs to take contromeasures for a better city

Users can see most unsafe areas around the city

Automatically reads the license plate from a picture

Sends accurate information to the Police to create new tickets

Traffic tickets are stored in a safe way to mine information
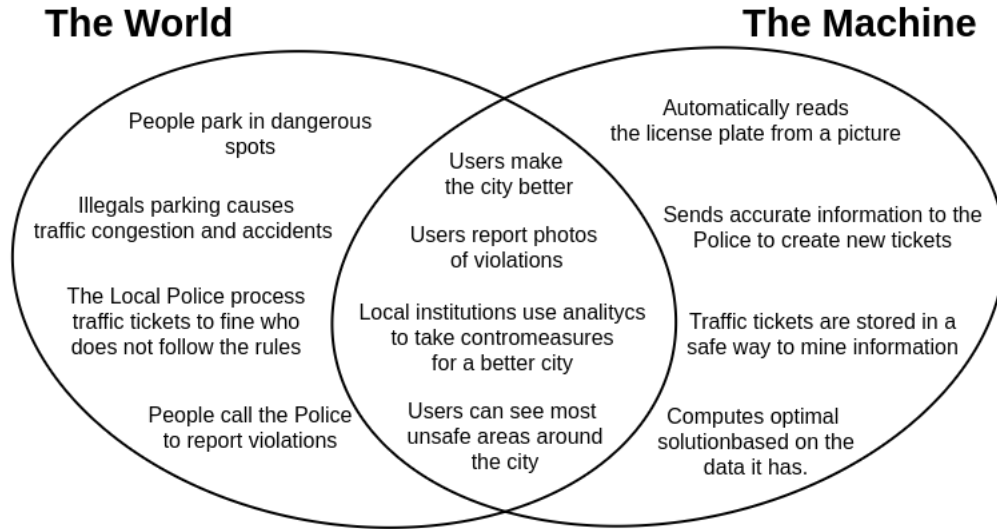
Computes optimal solutionbased on the data it has.

Figure 1: The world-machine phenomena chart.

1.3   Goals

- **[G1]** Notifing authorities when particular parking violations occur.

- **[G2]** Allowing users to indirectly improve respect for their city rules.

- **[G3]** Permitting both users and authorities to learn which areas have the highest frequency of violations.

- **[G4]** Permitting both end users and authorities to learn which vehicles commit the most violations.

- **[G5]** Suggesting possible interventions to potentially unsafe areas.

- **[G6]** Allowing the local police to generate traffic tickets from SafeStreets data.

- **[G7]** Building and exhibiting statistics.

1.3.1   Traceability Matrix

Since goals, functions and constraints are related to each other a traceability matrix is provided in order to enlight the various relashionships among them.

Goal ID	Functions ID	Constraints ID	UseCases ID	Other references
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-

Table 1: Traceability Matrix

1.4 Definition and Acronyms

1.4.1 Definitions

1.4.2 Acronyms

1.5 Revision

1.6 Actors

- *Guest*: This actor plays the role of a person who is not registered and thus logged in.

- *User*: This actor refers to the condition of a normal person (not an officer) already signed up and logged.

- *Officer*: This actor represent a signed up and logged in public officer.

1.7 References

- The 2019-2020 Software Engineering 2 Project Assignment document

- The IEEE Standard for RASD

1.8 Document Structure

This document is divided in four parts:

- **Introduction**: a description about the goals of SafeStreets and the context in which it will be implemented is provided. Subsections dedicated to the understaing of some acronyms and definitions are also present.

- **Overall Description**: gives an overall description of SafeStreets, focusing on the domain assumptions and the constraints of the application. This section also aims to provide a context to the whole project and to show its integration with the real world. It also shows the possible interactions between the world and the users of SafeStreets.

- **Specific Requirements**: the software requirements, explained in a sufficiently detailed manner to design a system that satisfy them, and the testers to test said requirements are provided. It is also present a

detailed description of the possible interactions that can occur between the world and the system, followed with a series of simulations and previews about the above mentioned interactions.

- **Formal Analysis using Alloy**: the requirements are expressed through the Alloy model, with which is possible, since it is a declarative specification language, to define the functions, the constraints and the interactions of SafeStreets.

In the last part of the document a short note that summarize the effort spent in producing this RASD by its authors is shown.

2 Overall description

2.1 Product perspective

The idea is to create an application to allow users to report parking violations without taking much time to their daily life. According to this intention, we would like to realize an extremely friendly user interface and a lightweight software in order to make SafeStreets affordable to many people as possible and runnable by many devices.
Users will certainly be able to exploit the advanced functions of SafeStreets such as charts and analitycs, but as those functions rely over data, the basic violations reporting function will be the core one.

Since a small downtime of SafeStreets is not going to cause damage to anyone, it will be tolerated without much thoughts. On the other hand, as our software is going to run some kind of OCR and AI recognition algorithm that will probably be expensive in terms of resources, it should be very dynamic to support different queries in a few seconds.
In addition, our software is going to process very specific data that could potentially lead someone to be fined, hence it should ensure that the chain of custody is never broken and the images are never altered.
To upload a new picture on SafeStreets or to view charts about violations, it is obviously required an active and functional internet connection. But as said, as data are the core business of SafeStreets, there will be put in place a mechanism such that a user can insert all the information needed to report someone on his mobile application, then those information will be sent as soon as the internet connection is restored.

Concerning the hardware, we intend to have a database which contains all the historical information about reports made by the people. This database will allow both users and officers to see both aggregated and detailed information that require an huge amount of data to be processed. Hence, the internal database engineering should take this into consideration.

2.2 Product functionalities

2.3 User characteristics

The users of SafeStreets can be both males or females of any age with no particular limitations. Of course, said users should have at least basic knowledge of smartphones and electronic devices in general, especially on how to make photos and videos. Users should also have an e-mail address, primarly used to register and authenticate themselves.

Authorities instead can also be both males or females but they need to be actual public officers. They should have a medium knowledge of networks, softwares and hardwares as well as a fully understaing of how traffic tickets laws can be applied, and they should be capable of using municipality tools and softwares fluently.

2.4 Assumptions and dependencies

2.4.1 Domain Assumptions

- A user should input only correct data when reporting a violation, for example the license plate position should be correct

- The image and picture meta-data aren't altered by the user who first submit the report

- The municipality is supposed to provide correct information about the accidents

- The municipality services are supposed to be functional during the uptime of SafeStreets.

2.4.2 General Assumptions

2.4.3 Constraints

- [C1] Is impossible to login without being signed up.

- [C2] Is impossible to login if already logged in.

- [C3] Is impossible to signup if already signed up.

- [C4] Altering the image after being shot is prevented.

- **[C5]** Selecting an image from the gallery instead of shotting a picture is prevented.