



POLITECNICO DI MILANO 1863

SOFTWARE ENGINEERING 2 PROJECT

REQUIREMENT ANALYSIS AND SPECIFICATION DOCUMENT (RASD)

SafeStreets

Version 1.0

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Download page: [HTTPS://GITHUB.COM/TIBERIOG/GALBIATIREZAEI.GIT](https://github.com/TiberioG/GalbiatiRezaei.git)

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1 Introduction

1.1 Purpose

general description ...

1.2 Scope

1.2.1 Description of the given problem

1.2.2 Goals

- [G1] Allow users to notify authorities about traffic violations
- [G2] Allow users to send pictures with metadata of violations
- [G3] Allow users to mine information recorded
- [G6] Have at least two different privilege for mining data
- [G7] Generate traffic tickets
- [G8] Generate statistics
- [G3] Be sure every information uploaded is never altered

1.3 Definitions, acronyms, abbreviations

1.3.1 Definitions

1.3.2 acronyms

- ALPR : Automated Licence Plate Recognition

1.3.3 abbreviations

1.4 Revision history

1.5 Reference Documents

1.6 Document Structure

2 Overall Description

2.1 Product perspective

add here class diagram + verbal description

2.2 Product functions

2.2.1 login

2.2.2 sending pics

2.2.3 Explore Data

The app will offer the possibility to the users to visualize the data collected. Two kind of visualizations are offered:

1. Streets with the highest frequency of violations
2. Veichles that committed the most violations

In order to get those data the system will periodically query the database of violations in order to create a table where the count of violation is stored, both for streets and veichles. There will be a section in the app called "Explore Data" where will be able to choose which kind of data to visualize.

2.2.4 Issue a ticket

Every time a new violation is inserted in the database, the System will use the new data available to generate a proposal of ticket, combining the data from violations with data coming from Municipality databases.

A ticket has the following structure:

1. Place where violation occurred
2. Date when violation occurred
3. Plate of veichle
4. Article and code of violation
5. Amount to be paid
6. Date when the payment is due

The ticket will be in a pending-approval status because we want always an human check before sending it to the offender. Authority users (e.g. policemen) will check the pending-approval tickets and they can approve them or not. If ticket is not approved it will go in approval-denied status. If ticket has been approved it will have to be sent to the offender. The system will connect to the external vehicle registration database in order to retrieve the name, surname, address of the offender knowing the licence plate of his/her veichle. Now we have all the data to print the ticket and send it via regular mail. There will be an office of police station which will do the job.

2.2.5 generate statistics

2.3 User characteristics

2.4 Assumptions, dependencies and constraints

[D] Device has internet connection

[D1] The device should acquire position with an accuracy of enough meters in order to univocally determine the road (e.g. 5 meters)

[D] We have access to an ALPR service which is able to read every licence plate in a picture and return the string

[D1] The device should take pictures with enough resolution to be able to read by the ALPR service

[D5] ALPR service has an accuracy of more than 90%

[D2] Every vehicle that can be reported should have a licence plate visible

[D3] The number and kind of violations should be finite (defined by the law)

[D4] Every authority account is verified and it's not possible to be created using the frontend

[D6] We have access to the vehicle registration database where are stored licence plates, names and the addresses of the owners of every vehicle registered

[D7] We have access to a database where are stored all the codes of violations and the amount of fine for the violation

The app will be dependent on a third-party service to read the licence plate of the cars. (For example <http://www.openalpr.com>)

The app will be dependent on a smartphone, which has to provide the following features:

1. Internet connection, possibly using 2G/3G/4G in order to be available where there is no WiFi, considering the use case "on the road"
2. GPS sensor

3 Specific Requirements

3.1 External Interface Requirements

3.1.1 User Interfaces

3.1.2 Hardware Interfaces

3.1.3 Software Interfaces

3.1.4 Communication Interfaces

3.2 Functional Requirements

Evrey function shoud work onlly after succesful login.

[G1] Allow users to notify authorities about traffic violations

[R1] User must be able to choose the kind of violation from a list

[G2] Allow users to send pictures with metadata of violations

[R1] Application should access the camera

[R2] Date, time and position should be automatically added to the violation reported

[R] We shoud require the user to send again a picture in case the plate is not visible

[R] The user must be able to select the veichle to report in case there are other veichles in picture

[G3] Allow users to mine information recorded

[R1] Application must be able to count occurrency of violations

[R2] Application must be able to count violation for each veichle

[R3] Application should show streets with highest frequency of violation

[R] Application should show the first n (input by user) veichles with the highest number of violations

[R3] The type of violation should be clear in the picture.

[G3] Be sure every information uploaded is never altered

[G4] Automatically add metadata to the reported pictures

[G5] allow users to mine information recorded

[R] All individual users who have signed up for mining the information

[G] have at least two different priviledge for mining data

[G7] generate traffic tickets

[G8] Authorities can see the the licence plates of violators, regular users cannot

3.2.1 Use Cases

This section contains all the use cases initially described with the use cases UML model, then the most important Use Case have their own table which provide further details such as: involved actors, entry conditions, ow of events, exit conditions and exceptional conditions.

- **ID:** up Use Case

Name: Sign-Up

Actor: Guest

Entry conditions:

- (a) A citizen who wants to use the service

Event flow:

- (a) The guest reaches the registration page containing the relative form
- (b) The guest lls up the form and clicks on "Sign up" to complete the process
- (c) The system redirects the user to his prole page and sends a conrmation email

Exit conditions:

- The guest has successfully registered in the system.

Exceptions:

- (a) The guest left an empty eld or typed something wrong an error message is displayed and the user is asked to ll the form again.

- **ID:** Use Case

Name: Login

Actor: User

Entry conditions:

- (a) The user has already registered.

Event flow:

- (a) The user reaches the login page containing the relative form
- (b) The user types the username and password in the login form and click on "Login" button.
- (c) The system redirects the user to the application homepage.

Exit conditions:

- The user has access to the application functionalities

Exceptions:

- (a) Username and password didn't correspond or the username didn't exist, an error message is displayed and the user is asked to ll the login form again.

- **ID:** Password

Name: Login

Actor: User

Entry conditions:

- (a) The user has already registered.

Event flow:

- (a) The user reaches the login page containing the relative form
- (b) The user clicks on "Password recovery" button and is redirected to the password recovery page.
- (c) The user inserts his email and clicks on "reset password".
- (d) The system sends an email to the user with a link and instruction to reset the password.
- (e) The user chooses and types a new password and confirms.
- (f) The application checks whether the entered password is strong enough or not.
- (g) The system redirects the user to the login page.

Exit conditions:

- The user has changed his password

Exceptions:

- (a) The inserted email doesn't match any user in the database, it is displayed an error message and the user is asked to retype a valid email.

ID: [UC3]

Name: Mine information - streets

Actor: User

Entry conditions:

- (a) User is logged in

Event flow:

- (a) User enters the section "Explore data"
- (b) The system asks which kind of data the user wants to know
- (c) The user chooses to get the data about streets with highest frequency of violations
- (d) The system queries in descending order the table where for each street is associated the count of violations
- (e) The system will report in a tabular way the name of streets and the count of occurred violations
- (f) If the user scrolls down the system will offer the chance to load more rows

Exit conditions:

- User wants to go back to "Explore data" area **Exceptions:**
 - (a) If there are no records the app will report no data available message

ID: [UC3a]

Name: Mine information - offenders

Actor: Users

Entry conditions:

- (a) User is logged in

Event flow:

- (a) User enters the section "Explore data"
- (b) The system asks which kind of data the user wants to know
- (c) The User chooses to get the data about vehicles that committed the highest number of violations
- (d) The system queries the table where for each licence plate is associated the count of violations

- (e) The system will report in a tabular way an anonymized identifier of the vehicle and the count of violations committed if the request comes from a Regular User
- (f) The system will report in a tabular way the plate of the vehicle and the count of violations committed if the request comes from an Authority User
- (g) If the User scrolls down the system will offer the chance to load more rows

Exit conditions:

- (a) User wants to go back to "Explore data" area

Exceptions:

- (a) If there are no records the app will report no data available message

ID: [UC4]

Name: Ticket approval

Actor: AuthorityUser

Entry conditions:

- (a) A new violation is inserted in database
- (b) AuthorityUser logged in

Event flow:

- (a) Every time a new violation is created by a EndUser the system will create automatically a ticket to be approved
- (b) AuthorityUser enters the section "Tickets"
- (c) AuthorityUser enters the section "Approve Tickets"
- (d) The System will show the list of tickets available for approval
- (e) AuthorityUser checks the data about ticket

Exit conditions:

- (a) User wants to go back to "Ticket" area
- (b) AuthorityUser approves the ticket
- (c) AuthorityUser doesn't approve the ticket

Exceptions:

- (a) If there are no tickets pending, the app will report no data available message

ID: [UC5]

Name: Ticket statistics

Actor: AuthorityUser

Entry conditions:

- (a)
- (b) AuthorityUser logged in

Event flow:

Exit conditions:

Exceptions:

- (a) If there are no tickets pending, the app will report no data available message
-

3.2.2 User

3.2.3 Third party

3.2.4 Requirements

Requirements in order to satisfy the goals

1 test

3.3 Performance Requirements

3.4 Design Constraints

3.4.1 Standards compliance

The app should be available for the two main operating systems of smartphones: Android OS and Apple iOS.

The traffic violations which can be reported should be compliant to the local traffic code where the app will be used.

For an use in Italy the app should be compliant to the "Codice della Strada", in particular parking violations are reported in Art. 157.

3.4.2 Hardware limitations

The app will have a server side and a client side (smartphone). On server side limitations can be the size of available storage and the bandwidth. On smartphone side we have the network connectivity (3G/4G connection) and GPS limitations in some areas.

3.4.3 Any other constraint

Application should be compliant to European GDPR and don't track users.

3.5 Software System Attributes

3.5.1 Simple User Interface

The user interface has to be as simple and intuitive as possible, the application should allow an average user to set up an account and start using the application understanding its functionality in no more than a dozen minutes. In addition there should be a complete tutorial to make it easy using the application.

3.5.2 Reliability

The application provides a reliable service in which individual users can easily log in and report the violations in the most optimal way. Furthermore it warrants that the chain of custody of the information coming from the users is never broken, and the information is never altered. This would provide a secure and reliable system. In addition, if the license plate is not readable from the picture the application should warn the user to send another photo.

3.5.3 Availability

The application must offer the maximum availability, granting its service every day at any time (24/7). The lack of service must be minimal. Reporting violation and taking the information about the violation coming from SafeStreets must be active every day at any time. The lack of service is acceptable only if it is due to maintenance. In this case, users must receive a warning 48 hours before.

3.5.4 Security

The application need to be safe and it does not have particular security concerns except the ones related to unauthorized login. The login of Users and especially of authorities must be very safe to avoid reporting. Moreover, the means of communication must be encrypted to save the confidentiality of information sent to SafeStreets.

3.5.5 Maintainability

The application will be maintained and designed in such a way it makes it easier to maintain and it should be understandable for both the users and the authorities. Furthermore, the system will put effort in keeping the live data services (such as highlighting the streets with the highest frequency of violations or the vehicles that commit the most violation) always online.

3.5.6 Portability

Portability of user data from a device to another is possible by entering personal login data. Also the application will be able to run for devices with different operating systems. Trackme wants to focus on the both Android iOS market and Apple iOS, because Android is the largest OS in the world and it is expected that the market share of Apple iOS will increase in the coming years.

4 Formal Analysis Using Alloy

5 Effort Spent

References