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SafeStreets project

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Requirement Analysis and Specification Document

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1 Introduction

1.1 Purpose

The purpose of this document is to provide a description of the SafeStreets system. A detailed explanation of the proposed solution is given, along with the requirements and assumptions made to achieve it.

SafeStreets is a crowd-sourced application that intends to provide users with the possibility to notify authorities when traffic violations occur, and in particular parking violations. With the amount of traffic we are seeing nowadays, it is hard to maintain order throughout the entire city, so the help of the community is more than welcome. The application allows users to report violations by sending pictures, along with important information, like the date, time and position. Examples of violations are vehicles parked in the middle of bike lanes or in places reserved for people with disabilities, double parking, and so on. The system also allows both end users and authorities to access the information gathered, with different levels of visibility depending on the roles. With the information provided, it is then possible for the municipality to integrate it with their traffic ticket system and automatically issue the corresponding ticket to a reported offender. This will accelerate the whole process, saving time and money to the state and could eventually result in a decrease in violations. At the same time, the ticketing system can provide information to SafeStreets, which presents the possibility of building statistics such as the most egregious offenders and analyse the effect of the application by looking at the trend in violations.

1.2 Scope

As already mentioned, the SafeStreets system is designed to provide users with the ability to report traffic violations through an application. In order to achieve this, the user needs to take and upload photos of the scene, which captures the license plate of the vehicle committing the violation and complete a form with information such as the license plate number and the type of violation. This data, along with metadata retrieved from the user's device (geographical position, date and time) is then sent to the system.

1.2.1 Goals

G1 - The user is able to report a traffic violation to authorities.

G2 - License plates can be recognized from the pictures of the violation report.

G3 - Roles with different levels of permission are assigned to users and authorities.

G4 - The information gathered from the reports is provided to users and authorities according to their role.

G5 - The system must protect the chain of custody of the reports.

G6 - Reports that had their integrity compromised and malicious reports will be detected and discarded.

G7 - Information about issued tickets provided by the municipality system can be cross referenced with the SafeStreets database and analysed.

1.2.2 Definitions, Acronyms, Abbreviations

1.2.3 Revision history

1.2.4 Reference documents

1.2.5 Document structure

2 Overall Description

2.1 Product perspective

As for the SafeStreets system, the domain model is described in the diagram shown in Figure 1. Note that the diagram is not a complete description of the system, but rather a simplified version for easier understanding.

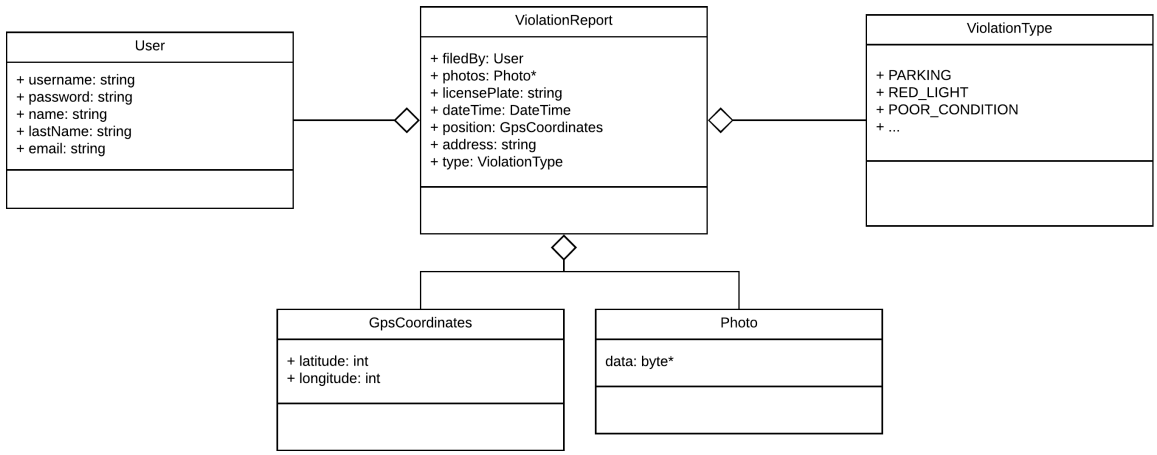

Figure 1: Class diagram.

Inspecting the class diagram, we can see that most of the system revolves around the violation reports and their processing, this is the core of the system. In the state diagram shown in Figure 2, the process of submitting a report is explained.

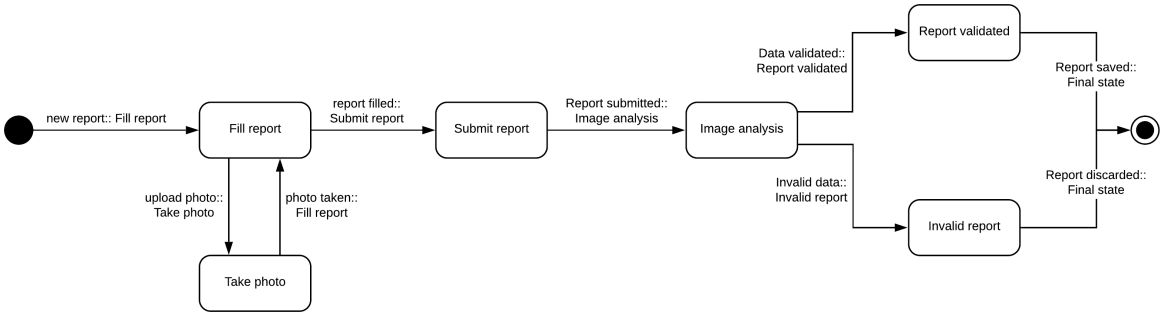

Figure 2: State diagram - Report submission.

As observed in the diagram, for submitting a report, the user is first required to fill a formulary with the required information and photo. After the submission, the SafeStreets system executes an analysis of the data, matching it with the provided image. This can result in either a invalid or a valid report. An invalid report is discarded, with possible measures taken against the account that submitted it. A valid report is saved in the database. When the report is saved, it is made available for the different users to query, either through the mobile application or through the public API.

2.2 Product functions

The functionality of the system can be divided into three groups. In the following section, these functions are listed and explained, taking into account the already specified goals of the system.

2.2.1 Violation report

The reporting of violations is the main functionality of the system. It allows its registered users to submit a traffic violation report. The user is required to provide data, such as a picture of the violation, the license plate of the vehicle committing the violation and the type of violation. On top of this information, the mobile application will provide the system with metadata which includes the gps location, date and time of the report. After the submission, the system analyses the provided information, checking its integrity. If the report is considered invalid or to have been compromised, it is discarded and the user is flagged as not trustworthy. Otherwise, the report is saved and made available to the rest of the system.

2.2.2 Image analysis

In order to confirm the validity of a report, the system performs an analysis of the submitted image. The picture is expected to show the vehicle committing the violation along with a clear view of its license plate. The analysis searches the image for this information and matches the detected license plate with the one provided in the report.

2.2.3 Data querying

Gathered information by SafeStreets can be accessed by all users. There are two ways in which the data can be accessed, via the mobile application or through the public API. In the first case, the mobile application provides users with the ability to see violations in a map, allowing the user to also filter these violations by date and type. On the other hand, the API allows for SafeStreets to be integrated with other third party systems. Users are able to query the available data according to their role and obtain the information in an analysis-friendly format.

2.3 User characteristics

The actors identified as the users of the application are:

- User: A person that has registered to SafeStreets and is capable of reporting violations.
- Municipality system: A system belonging to the municipality that communicates with SafeStreets through the exposed API. Capable of accessing more information than the standard user.
- Administrator: An employee of SafeStreets that maintains and updates the system.

2.4 Assumptions, dependencies and constraints

D1 - An accurate gps location can be acquired from the device the user is running SafeStreets on.

D2 - The device running SafeStreets has a camera.

D3 - A violation report cannot be canceled

D4 - The metadata of the picture in the violation report is accurate

D5 - There is a system available capable of connecting a license plate to characteristics of the car (make, model, color)

3 Specific Requirements

Organize this section according to the rules defined in the project description.

4 Formal Analysis Using Alloy

Organize this section according to the rules defined in the project description.

5 Effort Spent

Provide here information about how much effort each group member spent in working at this document. We would appreciate details here.

References

