Purpose

This RASD (Requirement Analysis and Specification Document) document aims to give a complete and rigorous description of the system “SafeStreets”. In particular, this will be done through a deep analysis of the customer’s needs, so identifying the main goals of the project, describing the functional and non-functional requirements and then proposing a solution able to fulfill all of them. This document is addressed to clients, but not only, in fact it is meant to be used as a contractual basis to which all the members of the team designed to create “SafeStreets” have to refer.

Description of the problem

SafeStreets is a crowd-source application that aims to give users the opportunity and responsibility of contributing to road regulation, with more attention to parking violations. In particular, the system offers functionalities which allow users reporting infringements, describing when, where and how they have been perpetrated. In order to certify the reporting, the user has also to attach a picture of the violation, making sure to include the license plate of the vehicle, so that the system can have a guarantee of the truthfulness of the information and at the same time identify the transgressor. So, for example, if a citizen, while walking through via Golgi, sees a car with license plate XXX parked in the middle of the bike lane, he can open SafeStreets, take a photo of the vehicle location, insert the date and the time and then send the report to the system. Once received the information, the application reads the license plate from the picture and store it together with the other data provided by the user. So, in the example previously shown, SafeStreets would memorize a parking violation of the type “car on bike lane” in via Golgi, with license plate XXX.

Citizens are not the only type of users of the application, also authorities, in fact, can use it in different ways. In first place, they can consult SafeStreet in order to retrieve information about the situation of streets which are under their jurisdiction. The system, in addition to providing individual violations, in fact, once received one of them, elaborates it and combines it with the other data already stored, creating statistics on which streets are characterized by the highest number of infringements, or on which vehicles commit violations most frequently, or, again, on which type of violation is most perpetrated.

Secondly, authorities can also collaborate with SafeStreets with the aim of making roads safer through prevention. In particular, if municipality provides information about accidents that occur on its territory, the system can merge this data with those coming from violations and in this way identify the most dangerous areas, such that interventions can be suggested.

(manca forse da dire che anche i cittadini possono vedere i dati elaborati)

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Product perspective

In order to describe more precisely phenomena which are shared by the machine, so by SafeStreets, and the world, a domain model is now proposed and illustrated with the support of class diagrams and statecharts.

In this first class diagram three shared phenomena are described: the user takes a photo of the violation, the user inserts the description of it and the user sends the information to the application. In all these cases the phenomenon is observed by the machine and controlled by the world, because, in fact, is always the user the active part in the situation, while the application only waits for the his next action.

Product functions

Traffic violations reporting

This function represents the core of the application, because, in fact, without it all the other functionalities offered by SafeStreets would be useless. The application, in particular, must allow any end user to easily report a violation in the instant in which he sees it. Going in further details, SafeStreets mobile app firstly has to allow citizens to take a picture of the violation, remembering them to include in the photo also the license plate of the transgressor. Then it has to let user select a traffic violation type and also insert a brief description of the situation, so that they can express all the inconveniences originated by the abuse. While providing the information, the application software must check for the correctness of them. In particular, it must make sure of the legibility of the license plate from the picture, and, if it is not so, SafeStreet must warn the user, making him choose between taking another photo or writing the license plate number himself. Once provided all the information, the citizen can send the violation data, and in this instant the application detects from the user device the date, the time and also the position in which the violation has been sent. In case that it is not able to detect one or some of this data SafeStreet has to notify again the user so that he can fix the problem (for example enabling geolocation).  
Once received the complete information, SafeStreet dispatching software searches for the nearest authority users to the place of the violation and notifies them of the occurrence of it, showing all the details. After receiving it they can decide to go there to solve the problem, so the software system allows them to warn of that their colleagues who have been notified of the same violation, so that not too many authorities are going to be busy to solve the same problem. Authority users can also request the list of all the reported violations, and read the details of each one.

Statistics elaboration

Another fundamental service offered by SafeStreets is the possibility of mining traffic violations information from the data sent by the end users. In more details, each time the system receives a violation, this is analyzed, and some information are extracted, elaborated and used to create statistics reports. In particular, SafeStreets calculates the places with the highest number of infringements, the most common type of infringements and the period of time in which they are more frequent. This can be very useful for all the types of users, in fact end users can be aware of the most dangerous areas and try to avoid them, while authorities and municipality can exploit this data to improve road regulations by enforcing controls where violations are more frequent. For this reasons, SafeStreets must keep statistics always updated and provide them to each user who request them.

Unsafe area detection and intervention suggestions

In parallel with the elaboration of the statistics, SafeStreets must offer a function, this time dedicated only to municipality (but somehow linked also to citizens), that allows to insert data regarding accidents occurred in their region, such that the system can cross them with information related to traffic violations received by end users and provide a report on the safeness condition of the territory under the jurisdiction of that municipality. At the same time, SafeStreets has to analyze the elaborated data itself and by evaluating which type of events are more common in a specific area, it has to suggest the best interventions that can be done to make that area safer. In further details, the system first checks the type of the violations that frequently occur in a definite place and then, for those which happen really often, it also takes under consideration the description of them. In this way, if the problem mostly affects a particular category of citizens, SafeStreets can provide a more precise recommendation. As an example, if there is a specific bike lane on which drivers often park, the cyclists that uses to go biking there can report it each time this happens describing the situation, so that SafeStreets notices that and reports it to the municipality, with the suggestion of adding a barrier between the bike lane and the part of the road dedicated to motorized vehicles.

Functional requirements

End user

Scenarios

Scenario 1

Andrea, a very sporty and competitive guy, each Sunday morning wakes up early so that he can go bike riding without any disturbance. During these morning training sessions, however, it’s really common for him to brake sharply for car parked in the middle of the bike lane or to go in the middle of the road for motorized vehicles because of double parking. This week, however, his friend Samuele talked about SafeStreets and about the traffic violation statistics reporting service that this application offers. So, Andrea installed it on his device, opened the application, signed up and accessed to the statistics page. By looking to the data provided by the application he has found that there is a bike lane near Como lake in which traffic infringements are really rare. After trusting the application, he discovered he could not do without it anymore, because he was able, for the first time in a long time, to take a bike ride without annoying interruptions.

Scenario 2

Mr. Fanelli has just had a bad injury while playing a rugby match with his team. Since he broke his left elbow and his right knee, he can’t use crutches, so he is obliged to use a wheelchair for a couple of months. During this period, he really likes being outdoors, but one day, he is forced to stop his morning tour because of a car parked immediately after a tight curve in the middle of the sidewalk. For this reason, in order to be able to resume his ride, he is obliged to pass in the middle of the road reserved to motorized vehicles, exposing himself to the danger of being hit by a car. At that moment, he remembers of having SafeStreets application installed on his smartphone, so he extracts the device, opens the application, logs in and starts creating the violation report. So, he takes a picture of the car with its license plate and sends it together with the type and the description of the violation to SafeStreets, which detects date, time and position of the infringement and stores it.

Scenario 3

Luca is a very civilized businessman who is really annoyed by who does not respect the rules, so after learning about the existence of SafeStreets he installed it on his device and each time he is in the city he always pay attention that traffic violations do not occur around him.  
One day, being late for work he was rushing to the office and while crossing the street he noticed that a scooter was parked just on the pedestrian crossing. Even if he was really in a hurry he decided to report the violation to SafeStreets, so he took a picture of the vehicle and after having filled out the other fields he tried to send the report, but just after having clicked the “Send” button the application warned him that the photo was not clear enough to allow the reading of the license plate. Luca had no time to take another picture because he was really late. However, fortunately, SafeStreets allows to choose between taking the picture again or write the license plate manually, so the businessman had had the time to arrive in his office, calmly write down the information in the proper field and send the violation report to the system.

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| Name | Report traffic violation |
| Actor | End user |
| Entry condition | The user sees a traffic violation and wants to report it to authorities. |
| Event flow | 1. In the homepage, the End User clicks on the "Create Violation" button entering in the violation creation page. 2. The Application requests to the End User to take a picture of the violation (remembering him to include the license plate of the car). 3. The End User takes a picture of the violation and inserts it in the application. 4. The Application requests to the End User to select the type of the violation. 5. The End User selects the type of the violation. 6. The Application requests to the End User to insert a description of the violation. 7. The End User inserts the description of the violation. 8. The End User clicks on the “Send violation” button. 9. The Application detect date, time and position from the device and then stores the violation report. |
| Exit condition | The violation report is created and sent to SafeStreets. |
| Exception | The Application can’t read the license plate from the provided picture, so it notifies the End User asking him to take another picture or to insert the license plate manually.  The Application can’t detect the position from the device, so it notifies the End User asking him to activate the geolocation. |

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| Name | Check traffic violation statistics |
| Actor | User |
| Entry condition | The User wants to know information about traffic violation statistics. |
| Event flow | 1. In the homepage, the User clicks on the "Check Statistics" button entering in the statistics page. 2. The User select which type of statistic he wants to see. 3. The Application elaborates stored data and extracts the requested statistics from them. 4. The Application shows the statistics to the User. |
| Exit condition | The User has checked the statistics and closes the statistics page. |
| Exception | There are too few traffic violation reports, so the System is not able to elaborate reliable statistics, so the Application notifies the User of it. |

Municipality

Scenario 5

Roberto, wise mayor always careful of his citizens needs, noticed that in the last few months, traffic violations and accidents have become more frequent, growing together in their number. He immediately understands that there must be a correlation between the two, but at the same time he realizes that he has only data regarding accidents. Doing some researches, he discovers SafeStreets and installs it on municipal computers. Opening the software, he registers as a municipality and through the use of the service offered by the system which allows to insert accidents data, he begins to insert these types of information. After inserting enough data, the system crosses them with information deriving from violations reported by end users, elaborates possible suggestions and sends them to Roberto. The mayor, watching at the interventions proposed, discovers that there are two unsafe areas, in fact, in a couple of streets drivers used to leave the car in double parking creating traffic jams that lead to an increase in rear-end collisions, and that to solve the problem it is enough to augment the controls on those areas.

Giovanni, an employee of the municipality of Como, has the task of understanding why every morning an endless queue is formed along “Via Castelnuovo”. His municipality has recently joined SafeStreets project by installing SafeStreets software on its computers, so he opens the application, logs in with the municipality credentials and select the function that permits to see the traffic violation statistics of the territory. As soon as the system shows it to him, Giovanni sees that the highest number of traffic violations of type “No parking zone” occurs just in that street between 8:00 and 9:00 am. Once noticed this, he remembers that exactly in the position where infringements concentrates, there is the high school and understand that the principal cause of the problem is that parents, in order to bring their children to school, stop by the side of the road, hindering the passage of other cars. After becoming aware of this, he communicates the results obtained from his analysis to the mayor of his municipality, who can now decide the best solution for the problem.

So, at this point, Giovanni goes in the section dedicated to the suggestions and he discover that there are two possible interventions that he can do, firstly create a new rest area and secondly put a traffic auxiliary in that time slot. In this way, thanks to SafeStreets he solved a problem of primary importance regarding the viability in few minutes.

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| Name | Insert accidents data |
| Actor | Municipality user |
| Entry condition | Municipality has data about accidents occurred in its territory and wants to insert them in the System so that SafeStreets can cross all his data. |
| Event flow | 1. In the homepage, the Municipality User clicks on the "Insert Accidents Data" button entering in the accident creation page. 2. The Software requests to the Municipality User to insert data about accidents. 3. The Municipality User groups all the accidents data in a single file. 4. The Municipality User inserts the created file into the System. 5. The Municipality User clicks on the “Send” button. |
| Exit condition | Data on accidents are sent to Safestreets and the Municipality User goes out of the "Insert Accidents Data" page. |

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| Name | Check suggested interventions and unsafe areas |
| Actor | Municipality User |
| Entry condition | Municipality User wants to know the most unsafe areas and possible interventions he can apply to get it safer. |
| Event flow | 1. SafeStreets has crossed accidents information with those deriving from violation reporting. 2. SafeStreets elaborated possible interventions to make unsafe areas safer. 3. In the homepage, the Municipality User clicks on the "Unsafe Areas and Suggestions" button entering in the interventions page. 4. SafeStreets supplication shows to the Municipality User the most unsafe areas and the possible interventions to get them safer. |
| Exit condition | Municipality User has checked the most usafe areas and the possible interventions to get them safer and close the interventions page. |
| Exception | SafeStreets software is not able to read the provided accidents data and to extract information from them, so it notifies the Municipality User asking him to reinsert those data with a different format, explaining which format.  There are too few traffic violation reports or to few accidents data, so the System is not able to elaborate reliable suggestions, so the Application notifies the Municipality User of it. |

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| Name | Check traffic violation statistics |
| Actor | User |
| Entry condition | The User wants to know information about traffic violation statistics. |
| Event flow | 1. In the homepage, the User clicks on the "Check Statistics" button entering in the statistics page. 2. The User select which type of statistic he wants to see. 3. The Application requests to the System the type of statistics selected by the Municipality User. 4. The System sends the statistics to the application. 5. The Application shows the statistics to the Municipality User. |
| Exit condition | The Municipality User has checked the statistics and closes the statistics page. |
| Exception | There are too few traffic violation reports, so the System is not able to elaborate reliable statistics, so the Application notifies the Municipality User of it. |

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| Name | Receive traffic violation notifications |
| Actor | Authority |
| Entry condition | 1. A traffic violation has been reported. 2. An Authority in near the traffic violation. |
| Event flow | 1. SafeStreets notify the Authority of the occurrence of a traffic violation near him. 2. The Authority open the Application and goes in the “Traffic violations” section. 3. The Authority checks the violation data reported (photo, type and description). 4. The Authority decides whether to go in the violation place to check it. 5. (If yes) The Authority click on the “Warn” button in order to warn other authorities that received the same notification that he is taking care of it. |
| Exit condition | The Authority has checked the violation report notified. |
| Exception | The Authority is not logged in the application.  The System is not able to detect the position of the Authority. |

Previously