

COMSATS University Islamabad, Wah Campus



Software Requirements Specification

Car Detection and Tracking System

Version 1.0

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1. Introduction

In today's world Car theft and car used in criminal activities is becoming very serious issue. Security authorities use many methods to find theft cars but these methods are not very successful. So there is a need of intelligent system that can find these cars using CCTV cameras and solve this issue.

1.1.Purpose

The main purpose of Software requirements specification document will provide the detailed overview of car detection and tracking system. This document describes the system's functional, non-functional requirements, user interfaces and hardware. It will cover all the intended features of the system and technical dependencies. Nonetheless, it helps any designer and developer to assist in software delivery lifecycle (SDLC) processes.

1.2. Scope of System

Car detection and tracking system is a Desktop application which is specifically for Security authorities like Police. This system will be developed to maximize the productivity by car detection and tracking using CCTV cameras, which would otherwise have to be performed manually. This will help to recover stolen cars and track down the criminals. This will also help to track the cars which are involved in suspicious and terrorism activities. Only authentic users can access this system.

2. Overall Description

Car detection and tracking system Detect and track the car using CCTV cameras and generate alert to security authorities. This app will compare the taken photo of CCTV camera to the photos of cars which is stored in database of application and will find the car and generate an Alert to connected security authorities. It will also read the registration No from No. plate of car and retrieve data against the registration No from Excise database. Fetching data from Excise database will be real-time. Authentic user enter the car details and system will go through all the image from CCTV of given location. We will be using a neural network to accomplish our goal .We are going to use the PyTorch Library to train the neural network .Deep learning method we use is Transfer Learning for training the image classifier and use pre-trained model based on imageNet . Learning process is faster, more accurate and requires less training data .We are going to use the car dataset of Stanford which is available online .This dataset consists of 16,185 images of 196 classes of cars. The label information for this dataset provides make, model and year for each of the 196 classes .In the end , we will test the Model on unseen data to check the validation and accuracy .Hardware used in this is Camera.

2.1 Functionalities of System

The main functions of our system are:

- **Admin**
 - a. Admin give access to authentic users.
 - b. Admin can add user details and assign ID and Password.
 - c. Admin can view user details.
 - d. Admin can edit user details.
 - e. Admin have authority to delete users.
- **Users**
 - a. User can Login to the system with authentic ID and Password.

- b. User can Enter the details of stolen cars.
- c. User can Edit the details of cars.
- d. User can track the car through the system.
- e. User can receive the location of the Car.
- f. User can receive the alert message generated by the system.
- g. User can have access to Excise database.
- h. User can fetch data from Excise database.
- i. User can generate alert message to the police station of that area.

2.2 User Characteristics

User need to have basic computer skills and basic Desktop application knowledge. User need to know how to input details, basic knowledge about cars and legal info.

2.3 Operating Environment

The system will be developed using Desktop application development tool PyQt. This system will be installed on Windows operating system on Computers.

2.4 General Constraints

Limitation of this application is that it requires CCTV cameras to cover all the highways but it is impossible to place CCTV cameras on every corner of the city. This system will not work if CCTV is not available in the area.

System is going trained in given dataset, if required car is not available in dataset then this application will not work.

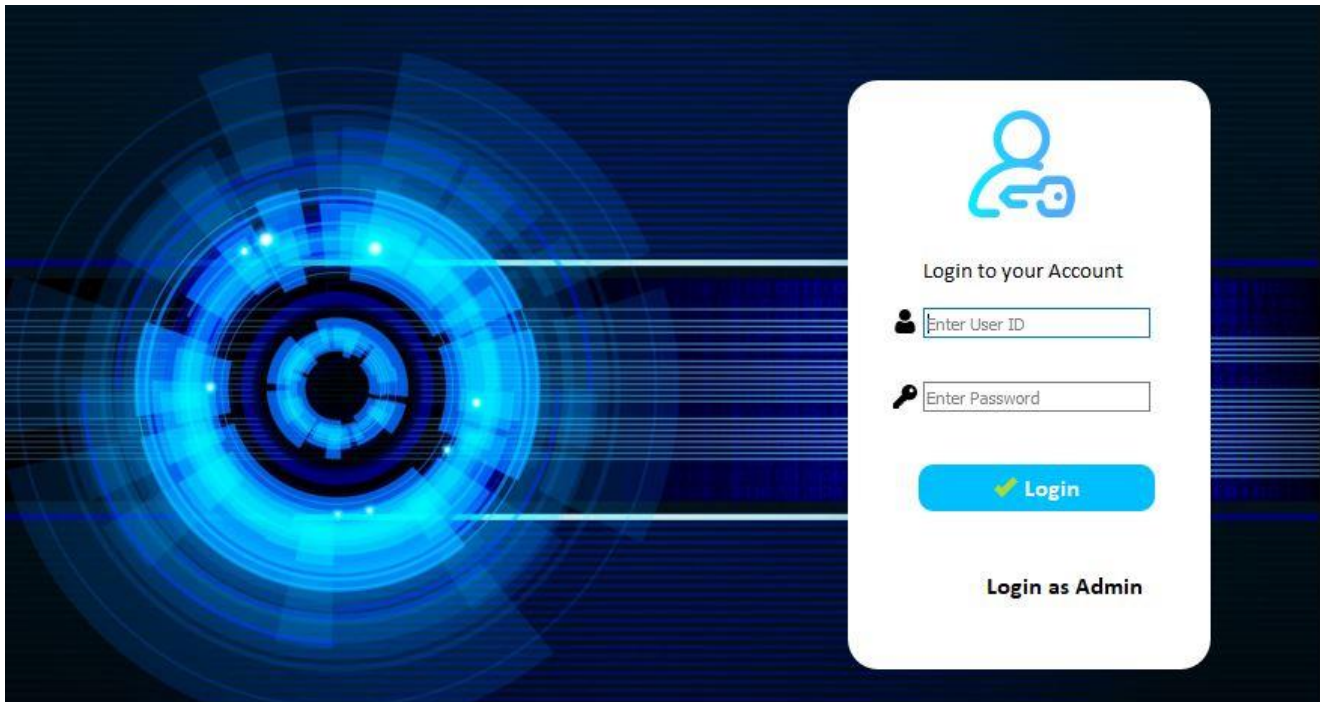
2.5 User Documentation

User manual will be provided to user to teach the user how to use Car detection and tracking system. There will be training classes of authentic users and there is also a feedback option from the user to improve the system performance.

3. External interface

3.1.User Interfaces

The “Car detection and tracking system” will consist of interactive and easy to use GUI’s designed. The users are provided with option to interact with the system to perform the roles.



4. Functional Requirements

- i- Login/Sign Up
- ii- Car details
- iii- Detect Number plate
- iv- Detect and Track Car
- v- Access data from Excise
- vi- Generate Alert

4.1.Functional Requirement 1

Table 4.1. Login or Signup

Title	Login or signup
Description	Login/signup will let the user to access the system
Criticality	Important Functionality
Technical Issues	Requires internet connection
Cost and Schedule	1 week
Risks	No
Dependencies with other requirement	-

4.2 Functional Requirement 2

Table 4.2. Car details

Title	Car details
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Description	Car details include Reg No, company, model and Color
Criticality	Critical Functionality
Technical Issues	Details must be valid
Cost and Schedule	1 week
Risks	No
Dependencies with other requirement	-

4.3 Functional Requirement 3

Table 4.3. Detect Number plate

Title	Detect Number plate
Description	Detect Number plate having unique reg No with standard format
Criticality	Important Functionality
Technical Issues	Requires visibility of Number plate
Cost and Schedule	1 week
Risks	No
Dependencies with other requirement	Car details

4.4 Functional Requirement 4

Table 4.4. Detect and Track Car

Title	Detect and Track Car
Description	Detect the car of given details and track the car last location from CCTV
Criticality	Critical Functionality
Technical Issues	Requires active CCTV cameras
Cost and Schedule	1 week
Risks	No
Dependencies with other requirement	Detect Number plate

4.5 Functional Requirement 5

Table 4.5. Access data from Excise

Title	Access data from Excise
Description	Access Excise data of detected number plate of car
Criticality	Important Functionality
Technical Issues	Requires internet connection

Cost and Schedule	1 week
Risks	No
Dependencies with other requirement	Number plate detection

4.6 Functional Requirement 6

Table 4.6. Generate Alert

Title	Generate Alert
Description	If car is detected then Alert is generated with location of car to police station
Criticality	Useful Functionality
Technical Issues	Requires internet connection
Cost and Schedule	1 week
Risks	No
Dependencies with other requirement	Detect and Track car , Detect Number plate

5. Other Non-functional Requirements

Non-functional requirements are the requirement that specifies criteria that can be used to judge the operation of a system, rather than specific behaviors.

5.1. Security:

Data security and email security is the part of the Car detection and tracking system. Data security is ensured with access security the user will have different login account and they can only access the data for which they have privileges.

5.2. Reliability:

Car detection and tracking system has less chance of data loss. The system will be more reliable than the manual system, due to its accurate, secure and timely decision making.

5.3. Maintainability:

Car detection and tracking system can go under changes and updating process in the future. The product will have SDLC and can be fixed if any failures occur. There will be evaluations of the system on quarterly basis and stringent performance enhancement measure will be inducted.

5.4. Extensibility:

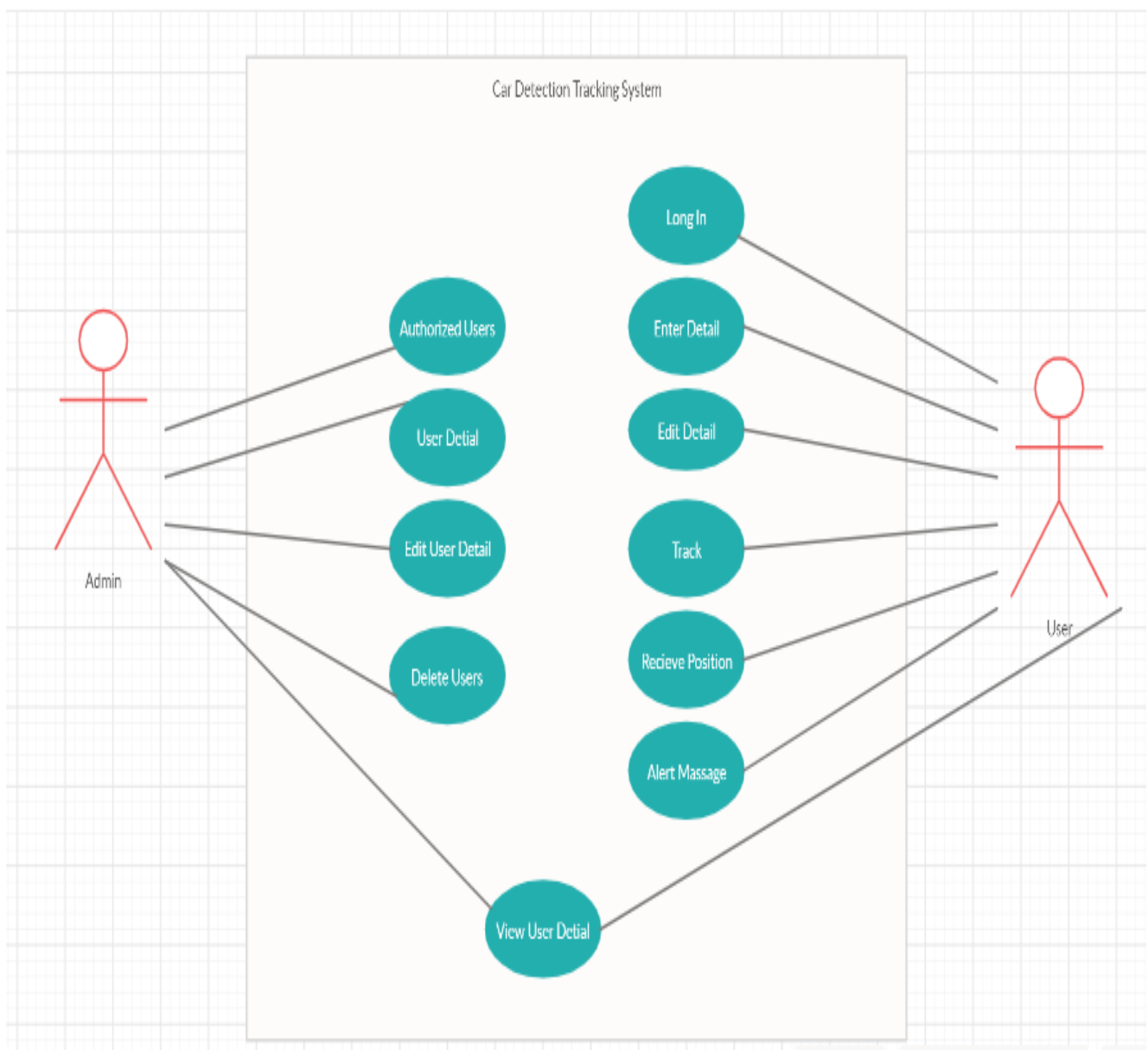
Car detection and tracking system can be extended later with other functionalities required.

5.5. Reusability:

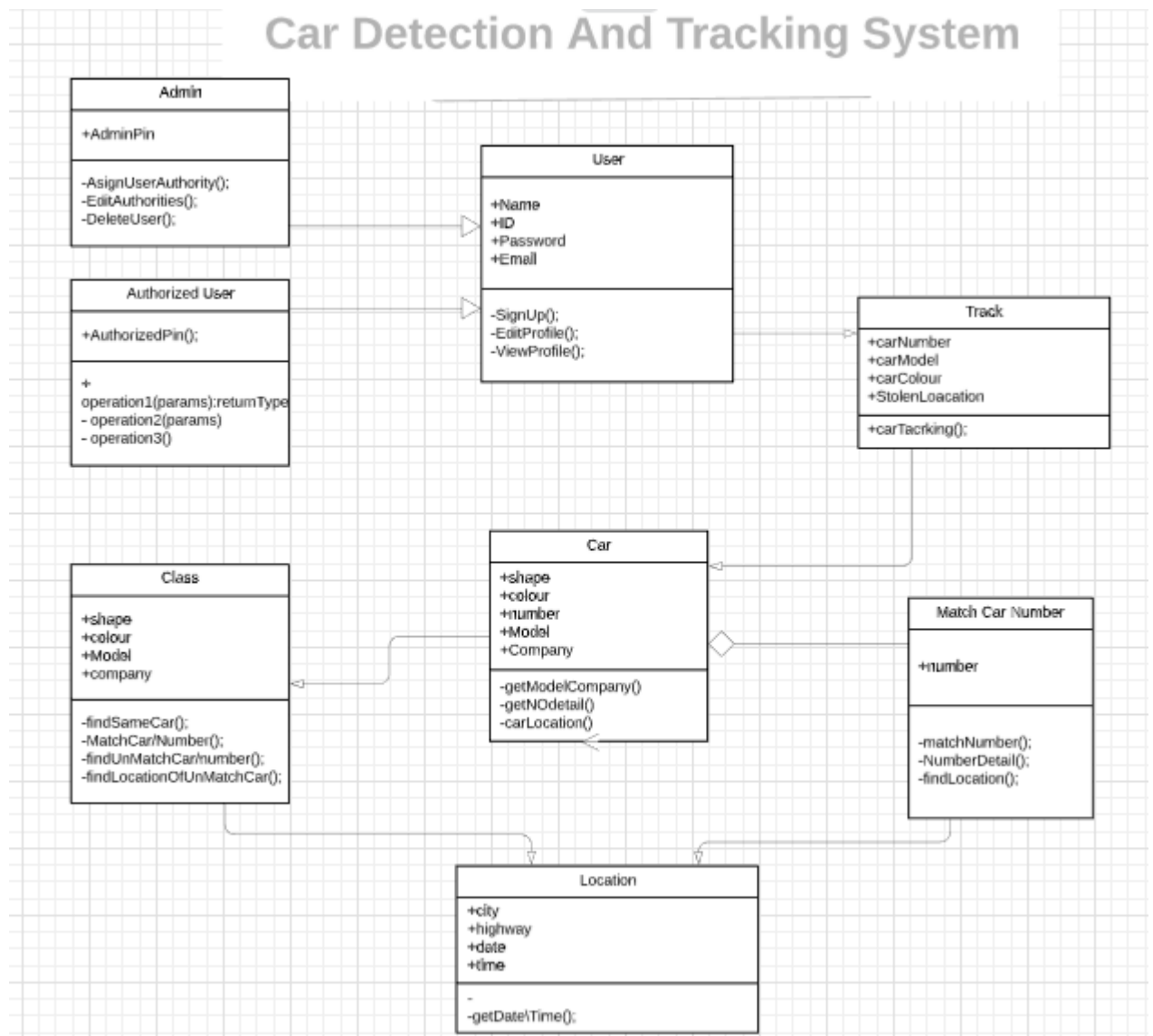
The system can be used by administration department with some changes to the existing system. The changes may add other features which in future will help other departments to join this system.

6. UML Diagrams

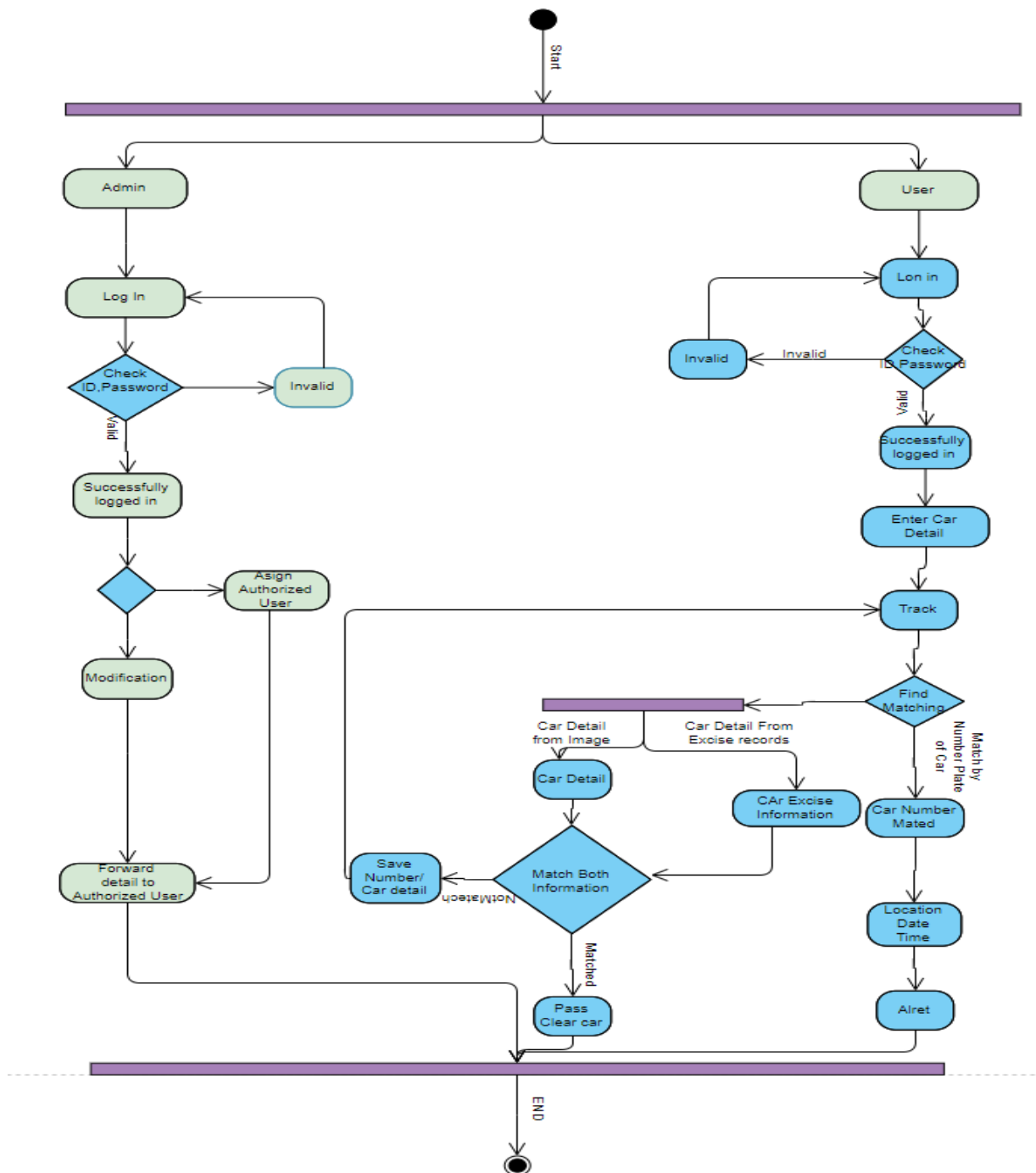
6.1 Use Case Diagram



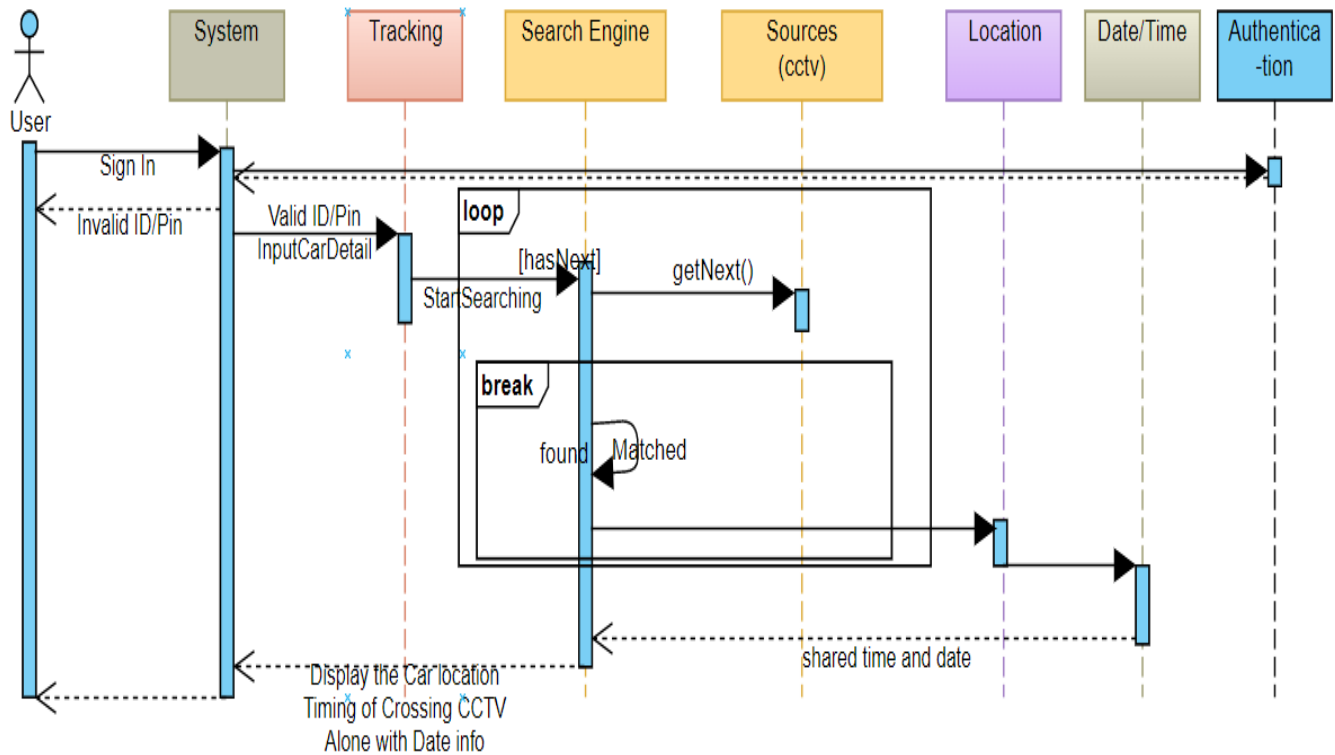
6.2 Class Diagram



6.3 Activity Diagram



6.4 Sequence Diagram



7. Risk Assessment

It is necessary to review at the risks that might be involved in our system. These risks must be documented as seen before the coding for the project is started. Majority of the risk components lie under the following categories.

- i. Performance Risk
- ii. Project Risk
- iii. Technical Risk

7.1 Performance Risk

Is the degree of uncertainty that the product will meet, its requirement will be fit for its intended use. Table 7.1 describes about performance risk according to criticality of the various aspect of the Performance.

Sr. No	RISK	Likelihood	Impact
1	Will the product not meet the specified standards?	Low	Critical
2	Will the software not satisfy user needs?	Very Low	Critical
3	Will the software degrade the performance of the client's system?	Low	Critical
4	Will the software have defects after release?	Low	Catastrophic

Table 7.1 – Performance Risk

7.2 Project Risk

Project risk will threaten the project plan. That is if project risk becomes real, it is likely that project schedule will slip and the cost will increase. Project risk identifies potential budgetary, schedule, personal (staffing and organization), resource, customer and requirement problem and their impact on software project. Table 7.2 describes about project risk according to various critical aspect of our system.

Table 7.2 – Project Risk

Sr. No	RISK	Likelihood	Impact
1	Will the project over-shoot pre define deadlines?	Low	Critical
2	Will resources for development of project be Scarce?	Low	Critical
3	Will customer requirements remain constant Throughout the development of project?	Low	Critical

7.3 Technical Risk

Technical risk will threaten the quality and timeliness of the software to be produced. If the technical risk becomes a reality; implementation will become difficult or impossible. Technical risk identifies potential design, implementation, interface, verification and maintenance problem. In addition, specification ambiguity, technical uncertainty and leading edge technology are also risk factors. Technical risk occurs because the problem is harder to solve than we thought it would be. Table 7.3 describes about technical risk of assessing.

Sr. No	RISK	Likelihood	Impact
1	Is support material for the development of project Available (Research papers, Documents of similar software etc.)?	Low	Catastrophic
2	Are the developer's incapable of developing the system?	Low	Catastrophic
3	Will the system be future compliant?	Low	Negligible
4	Is the existing technology is in capable of providing a Base to develop this software?	Very Low	Catastrophic

Table 7.3 – Technical Risk

8. Schedule

TASK NO.	TASK NAME	START DATE	END DATE OF TASK	TOTAL DAYS TO COMPLETE
1	Proposal Submission	Nov 28,2019	Dec 3,2019	6
2	SRS	Dec 15,2019	Dec 30,2019	15
3	Design Analysis	Dec 31,2019	Feb 12,2020	44
4	Executing	Feb 13,2020	March 30,2020	47
5	Testing	March 31,2020	Apr 30,2020	20
6	FYP Report	May 1,2020	May 30,2020	30

Figure7: Project Schedule

References

- [1] <https://towardsdatascience.com/vehicle-detection-and-tracking-using-machine-learning-and-hog-f4a8995fc30a>
- [2] https://github.com/andrewsobral/vehicle_detection_haarcascades
- [3] <https://app.creately.com/diagram/VAo8310b3T5/edit>
- [4] https://ai.stanford.edu/~jkrause/cars/car_dataset.html