Air University Multan Campus,

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Software Requirements

**Smart License Plate Reader**

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# Functional Requirements (FRs):

## FR01: Car Detection:

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| --- | --- |
| FR01-01 | The system shall detect the car from the input dataset. |
| FR01-02 | The system shall take image as well as video frame input. |
| FR01-03 | The system shall take the correct coordinates of the car. |

## FR02: Number Plate Detection:

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| --- | --- |
| FR02-01 | The system shall convert image to greyscale |
| FR02-02 | The system shall crop number plate from image. |
| FR02-03 | The system shall add threshold to the cropped image. |

## FR03: Image Clarification:

|  |  |
| --- | --- |
| FR03-01 | The system shall clarify Image by using Evade & Dilate Method |
| FR03-02 | The system shall remove extra blobs and grains |
| FR03-03 | The system shall run OCR (Google API) on final image |

## FR04: showing Information:

|  |  |
| --- | --- |
| FR04-01 | The system shall get String Result. |
| FR04-02 | The system shall store the string result in database |
| FR04-03 | The system shall save record via query. |
| FR04-04 | The system shall show data when requested by the user. |

# Non Functional Requirements (NFRs):

## NFR01: Interface Requirements:

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| --- | --- |
| NFR01-01 | The interface of the system would be simple and easy for the user to identify and understand. |
| NFR01-02 | The interface of the system will be made in python, C++ and Sqlite. |

## NFR02: Performance Requirements:

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| --- | --- |
| NFR02-01 | The system needs minimum time to save record in the database. |
| NFR02-02 | The system can handle one input at a time. |
| NFR02-03 | The system can handle one instance at a time. |
| NFR02-04 | The system won’t affect the performance of the user’s PC. |

## NFR03: Operating Requirements:

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| --- | --- |
| NFR03-01 | The system shall require a stable internet connection. |
| NFR03-02 | The system shall require clearer images and frame. |
| NFR03-03 | The clarity of the results depends on the clarity of the image. |
| NFR03-04 | The system shall provide guide to all users. |
| NFR03-05 | The system shall run on Windows Operating Systems. |
| NFR03-06 | The system can run on any Internet Explorer. |

## NFR04: Security:

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| --- | --- |
| NFR04-01 | The system is not password protected. |
| NFR04-02 | The system will not cause any lag or glitches |

# Actors:

## Primary Actor:

User (Security Department).

## Secondary Actor:

Excise Department Database.

# User requirements:

* User should provide the video or image for the number plate reading.
* Extract the car from any video frame and read its license plate number.
* Cross matching the number with the Excise and Taxation Department Database to find the complete details of Vehicle.
* The software will be helpful for security.

# Project description:

In the early days we had to keep the records manually of who met whom at what time but being the part of 21st Century we should automate the things and use the human resources in a productive direction. First of all we sorted what we have and what we have to find the stubs are mentioned below:

**WHAT WE HAVE:**

(A computer that can do any job, Car Records in Excise Database, Machine Learning Algorithms)

**WHAT WE DON’T HAVE:**

(License number of Car, Respective Details, and Log of visitors)

By now we know what we have to find so we started working on it. We decided to work with **Machine Learning Algorithm using Supervised Machine Learning, OpenCV library, Tesseract OCR Library and Sqlite.**

Our Aim is to extract the car from any video frame and read its license plate number. And cross match it with the Excise and Taxation Department Database to find the complete details of Vehicle. This software will be helpful for security as well as sale and purchase purposes.

# USE CASES:

## **Car Detection:**

|  |  |
| --- | --- |
| Use Case Name | Car Detection |
| Participating Actors | HD Camera |
| Goal | To Capture image with car in it |
| Trigger | Camera detects car |
| Pre-Condition | The image will be captured in real time |
| Post Condition | Images are saved and run via algorithm |
| Basic Flow | 1. User will take image via Camera 2. System shall get input from dataset 3. System will detect car and give positive feedback 4. System will proceed with next algorithm |
| Exceptions | 1. There is no car in the image 2. Image quality is not that good 3. File entered is corrupted |
| Constraints | Video input |
| Extends | Detect Number Plate |

## **Number Plate Detection:**

|  |  |
| --- | --- |
| Use Case Name | Number Plate Detection |
| Participating Actors | System |
| Goal | To detect Nameplate from Car |
| Trigger | System crops bumper area from image |
| Pre-Condition | The image with Car should be available |
| Post Condition | Image is ready for clarification |
| Basic Flow | 1. The system shall convert image to greyscale 2. System shall identify correct coordinates 3. System shall crop image on given coordinates to get number plate |
| Exceptions | 1. The image is too dark 2. Number plate is not available. |
| Constraints | Car detection |
| Extends | Reading image |

## **Image Clarification:**

|  |  |
| --- | --- |
| Use Case Name | Image Clarification |
| Participating Actors | 1. System 2. OCR |
| Goal | System processes image to get clarified images |
| Trigger | System runs processes on image to remove garbage |
| Pre-Condition | Image is cropped and in greyscale |
| Post Condition | Image is ready for OCR |
| Basic Flow | 1. The system shall add threshold to given image 2. The system shall remove extra blobs and grains 3. The system shall apply Erode and Dilate Method 4. The system will run OCR on final image. |
| Exceptions | 1. The system might remove essential blobs 2. The image might be too grainy |

## **Reading image:**

|  |  |
| --- | --- |
| Use Case Name | Reading image |
| Participating Actors | OCR |
| Goal | System processes to extract characters from number plate |
| Trigger | System runs tessrect.exe files |
| Pre-Condition | Filtered number plate |
| Post Condition | System gets the string value from number plate |
| Basic Flow | System calls the tessrect.exe file. |
| Exceptions | The filtered image is unreadable. |
| Includes | Image Clarification |
| Extends | Saving Records |

## **Storing Information:**

|  |  |
| --- | --- |
| Use Case Name | Storing Information |
| Participating Actors | 1. System 2. Excise Database |
| Goal | Get string result from OCR |
| Trigger | OCR returns string result |
| Pre-Condition | The system should have already run OCR on the clarified image |
| Post Condition | The result is accurate and ready to show to the user |
| Basic Flow | 1. The system will get String Result 2. The system shall get result from Excise website via query |
| Exceptions | 1. The string result is inaccurate 2. The number is wrong |

## **Showing Information:**

|  |  |
| --- | --- |
| Use Case Name | Showing Information |
| Participating Actors | System |
| Goal | To display final result to the user |
| Trigger | The data from the Excise will be collected by the system |
| Pre-Condition | The system will get the data from the Excise database |
| Post Condition | The user will get the requested data |
| Basic Flow | 1. The system will respond to the given query 2. The system shall display the data requested by the user 3. The system shall await next record |
| Exceptions | 1. Network is down 2. Query provided by the user is incorrect |

# Business requirements:

The business requirements are as followings:

* The main business requirement for this software is providing the security.
* Another requirement is the information of vehicles with their owner’s information.
* Implementation of Govt. assigned license number plates.