Dissertation on

Vehicle Price Prediction through Automatic Licence Plate Recognition System

Submitted in partial fulfilment of the requirements for the award of degree of

Bachelor of Technology
in
Computer Science & Engineering

UE18CS390A – Capstone Project Phase - 1

Submitted by:

PES2201800069	**Arpit Nigam**
PES2201800048	**Yukti Gupta**
PES2201800152	**Jill Hansalia**
PES2201800608	**Varshit Singh Yadav**

Under the guidance of

Jeny Jijo
Assistant Professor
PES University

January - May 2021

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
FACULTY OF ENGINEERING
PES UNIVERSITY
(Established under Karnataka Act No. 16 of 2013)

Electronic City, Hosur Road, Bengaluru – 560 100, Karnataka, India

PES UNIVERSITY

(Established under Karnataka Act No. 16 of 2013)
Electronic City, Hosur Road, Bengaluru – 560 100, Karnataka, India

FACULTY OF ENGINEERING

CERTIFICATE

This is to certify that the dissertation entitled

Vehicle Price Prediction through Automatic Licence Plate Recognition System

is a bonafide work carried out by

PES2201800069	**Arpit Nigam**
PES2201800048	**Yukti Gupta**
PES2201800152	**Jill Hansalia**
PES2201800608	**Varshit Singh Yadav**

In partial fulfillment for the completion of sixth-semester Capstone Project Phase - 1 (UE18CS390A) in the Program of Study -Bachelor of Technology in Computer Science and Engineering under rules and regulations of PES University, Bengaluru during the period Jan. 2021 – May. 2021. It is certified that all corrections/suggestions indicated for internal assessment have been incorporated in the report. The dissertation has been approved as it satisfies the 6th-semester academic requirements in respect of project work.

Jeny Jijo Assistant Professor	Dr. Sandesh B J Chairperson	Dr. B K Keshavan Dean of Faculty

External Viva

Name of the Examiners	**Signature with Date**
1. _____	_____
2. _____	_____

DECLARATION

We hereby declare that the Capstone Project Phase - 1 entitled **"Vehicle Price Prediction through Automatic Licence Plate Recognition System"** has been carried out by us under the guidance of Jeny Jijo, Assistant Professor, and submitted in partial fulfillment of the course requirements for the award of the degree of **Bachelor of Technology** in **Computer Science and Engineering** of **PES University, Bengaluru** during the academic semester January – May 2021. The matter embodied in this report has not been submitted to any other university or institution for the award of any degree.

PES2201800069	**Arpit Nigam**	_____
PES2201800048	**Yukti Gupta**	_____
PES2201800152	**Jill Hansalia**	_____
PES2201800608	**Varshit Singh Yadav**	_____

ACKNOWLEDGEMENT

I would like to express my gratitude to Prof. Jeny Jijo, Department of Computer Science and Engineering, PES University, for her continuous guidance, assistance, and encouragement throughout the development of this UE18CS390A - Capstone Project Phase – 1.

I am grateful to the Capstone Project Coordinator, Dr.Sarasvathi V, Associate Professor, for organizing, managing, and helping with the entire process.

I take this opportunity to thank Dr. Sandesh B J, Chairperson, Professor, Department of Computer Science and Engineering, PES University, for all the knowledge and support I have received from the department. I would like to thank Dr. B.K. Keshavan, Dean of Faculty, PES University for his help.

I am deeply grateful to Dr. M. R. Doreswamy, Chancellor, PES University, Prof. Jawahar Doreswamy, Pro-Chancellor – PES University, Dr. Suryaprasad J, Vice-Chancellor, PES University for providing to me various opportunities and enlightenment every step of the way. Finally, this Capstone Project could not have been completed without the continual support and encouragement I have received from my family and friends.

ABSTRACT

Automatic number-plate recognition (ANPR) is a utility that makes use of advanced optical scanning, segmentation and identification on pictures to scan vehicle registration plates to form the registered information of the vehicle.For the scope of the project it will use the customers' camera to provide input to the system. ANPR is already being employed by police and other security forces all over the world for enforcement operations, together with to envision if a vehicle is registered or not this helps in controlling theft. It's additionally being used for the purpose of e-toll assortment on pay as you use roads and through a way of monitoring the traffic movements, for instance by agencies in control of national highway for the scope of this project we will use an ANPR system to predict the price of a vehicle.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER-1

INTRODUCTION

Vehicle value Prediction is a vital element at intervals any transportation system has been seen from the very fact that the Indian Used automobile Market accounted for USD 24.4 billion in 2019, and is anticipated to grow by fifteen.12% throughout the forecast amount (2020-2025).

ANPR seems to have made its entry only in the last century because it was fictional in 1976 in the UK at what was then called the Police Scientific Development Branch (PSDB).There are multiple use cases of ANPR already in existence, it is used by the traffic police to issue online traffic bills against rash driving, the police uses ANPR to identify stolen vehicles, the parking agencies use it to issue parking charge receipt. With the introduction of FASTAG the scope and importance of ANPR has drastically increased, for the scope of this project we will use an ANPR system to predict the price of a vehicle.

1.1 Project Scope

- Licence Plate Recognition System majorly consists of the four major processes :Acquiring the image, Localizing the number plate, Segmenting and Recognizing Characters.
- The digits recognized are processed to extract the vehicle's registered information with the e-pravahan agency.
- Retrieving the information such as Chassis No.,◈ Engine No.,◈ Owner Name,◈ Vehicle Class,◈ Fuel Type,◈ Vehicle Maker/Model,◈ Registration Upto and ◈ Insurance expiry date.
- Feature extraction of the vehicle price prediction dataset.
- Predicting the price of the vehicle with a high accuracy.

1.2 Research Objectives

- To Investigate the automatic number plate recognition methodologies.
- To design for vehicle details extraction process using webscrabing technologies/API's
- To Investigate the price prediction methodologies.
- To test the functionality of the Automatic Number Plate Recognition System

CHAPTER-2

PROBLEM DEFINITION

We come up with an approach to develop an Android application that allows to recognize the license plate of a vehicle quickly and easily with the camera of a smartphone or tablet, the app recognizes license plate within the camera image and uses the information to extract the registered details of the vehicle with the Regional Transport Office through web scraping and processes these details to predict the current price of the vehicle.

CHAPTER-3

LITERATURE SURVEY

Paper-1

Objectives:

- The objective was to recognize numbers on the license plate. Techniques and algorithms that are used in this paper are Binary Processing of Image, Gray-level processing of image, Color-processing, and character-recognition using template matching.Few methods to increase the quality of image are Adaptive threshold, Contrast extension, and Median filtering

Advantages:

- Results show that binary image processing produces 98% recognition for around 10,000 images.
- Methods to increase the quality of the image while processing helps a lot while recognition.
- Character segmentation produces better accuracy than clustering.

Limitations:

- Results show that binary image processing produces 98% recognition for around 10,000 images.
- Methods to increase the quality of the image while processing helps a lot while recognition.
- Character segmentation produces better accuracy than clustering.
- Generally the model failed to identify principally motion blurred images or the images that were overlapped by unlike vehicle bodies.

Paper-2

Objectives:

The objective of this paper was to estimate the price of second-hand vehicles by the use of supervised learning model such as KNN
(k-nearest neighbors) has been used to estimate the price of in use cars.

Advantages:

- The proposed KNN model provided an accuracy of 85%.
- The proposed model is validated with five & ten folds by using the K cross fold technique to validate the model better over unseen data and gives the accuracy of 82% for ten folds with a K value of four which was identified by the elbow method.

Limitations:

- The proposed KNN model does not work very well for large dataset.
- Since the dataset used by the authors was not too large ,therefore it gave them accuracy of 85% but it is difficult to work with KNN for large Datasets.

Paper 3

Objectives:

- This work tries to deal with ALPR mistreatment by using the Deep CNN ways for periodic time-traffic videos. By extracting registration number plate, candidates from every time frame mistreatment by edge data and geometrical properties, guaranteeing high evaluation metrics. These proposals are passed to a Convolutional classifier for registration number

plate detection getting good preciseness.Then use a CNN based classifier trained for characters in conjunction with a spacial electrical device for character recognition.

Advantages:

- Performing a eighty-twenty split of dataset testing. we tend to get a check set accuracy of approx 99%. Positive sample accuracy is more than 98% and negative sample accuracy is almost 99% maybe as a result of the quantity of negative samples area units additional within the coaching set.
- Therefore CNN based mostly false-positive rejection provides terribly high check accuracy guaranteeing high preciseness. Thus cumulative time required for record extraction per frame is 180ms.
- So the record detection algorithmic program is quick and correct. In this work, we tend to adopt record edge features based mostly on schemes to come up with candidate proposals for the record regions.
- The false positives area-unit decreased by employing a convolution neural net-work that performs binary classification on the candidate plate regions. This integration of calculating and learning approaches ensures high recall and preciseness. It has been shown that incorporating a special electrical device layer provides higher illustration of information for recognition.

Limitations:

- With the present frame-work, this system cannot accommodate records of 2 wheelers and maintaining a dataset for two wheelers is something for the longer term.
- Further, we tend to conjointly need to include video based mostly data like visual flow

of data and data in temporal form in our work for generating higher and lower candidate area for record purpose.

Paper 4

Objectives:

- To determine the cost of used cars a model was developed with the help of 3 machine learning methods such as Artificial Neural Network, Support Vector Machine and Random Forest Algorithm.

Advantages:

- By proposing multiple machine learning algorithms for more accuracy and 93% proficiency.
- This comparison of one or more groups of the machine learning algorithm is significant. And also it overcomes the pitfall possessed by single machine algorithm which was used earlier.

Limitations:

- Predictability performance should be enhanced through data purification techniques. But in this study, an inadequate set of complex data is back here.
- We will get only fifty percent results using a single ML algorithm. Therefore, it was proposed to make use of several groups of machine learning algorithms i.e ensemble technique to gain more accuracy and achieve an accuracy of above ninety percent. This when compared to the earlier techniques showed a vast improvement.

Paper-5

Objectives:

- The main ambition of this thesis was to capture the image of the vehicle and recognise the license plate number.This paper focused on building an effective mass surveillance system . The technique used to do the same was “feature-based number plate localization“ . The study mainly targeted on the following algorithms : Edge Method and Window Filtering Method for an enhanced system.

Advantages:

- This paper focused on image processing. With the proper image capture one can get the desired output. It is one of the best ways to process and recognise license number which can be further used for many applications.

Limitations:

- The result is highly dependable on the quality of image . The complex and noisy pictures containing a lot of detail can severely degrade the result of the system. Distance and speed of the car are also the major factors affecting the result of the system.

Paper-6

Objectives:

- This paper contains a study of the various ways of looking at distance plates. Character classification strategies The local unit was tested and discussed in terms of character

identification strategies. This paper concludes with a discussion of the non-compulsory and what a peaceful analysis is possible on ANPR.

Advantages:

- ANPR may be used to identify vehicle owners, vehicle class identification, vehicle speed management and vehicle tracking.
- The system can be expanded to support multiple languages ANPR to make an universal system to see computer-assisted character training training information It will provide a variety of benefits such as traffic safety controls, safety - just in case of suspicious vehicles, straightforward use, quick access information - like compare and check car owner registration details manually which country.

Limitations:

- ANPR can be a complicated process as 100% complete accuracy is not available as the whole component depends on the previous component. Definitive features such as completely different lighting conditions, vehicle shadow and unequal size of car parts, completely different font and background color affect ANPR performance.

Paper-7

Objectives:

- For this study, an outlook is projected for ANPR from vitiate and caliber pictures that is the bad quality pictures for which the current ANPR systems fail. The slant is predicated

on sweetening of received image and identification and rearrangement of variety plate symbols. to observe the intensity variations, slippy coaxial windows (SCW) area units used. harrow-shaped filters (HSF),Path-finding algorithm program area made use for character segmentation. ANN is employed for character recognition .

Advantages:

- The techniques achieve smart accuracy in bad or poor resolution pictures whereas different existing approaches are unable to observe the license plates in low resolution pictures.
- The perspective achieves cent percent accuracy in character segmentation and ninety six.2% accuracy in character recognition. The projected approach is often an honest alternative for the third world nations wherever poor quality CCTV cameras are still in existence for the manual security purposes along the cross roads.

Limitations

- The approach during this paper is intended to identify the one lined registration code and therefore there still exists some an issue in the recognition of multi line license plates.
- In future, The approach is would be extended for the recognition of multilined license plates. The projected approach does need some enhancement in registration code detection.

Paper-8

Objective:

- Objective of this paper is to predict the value of a second hand automotive exploitation regression. Every model is trained exploitation using automotive market information collected from the German e-commerce web site. Machine learning models employed in this paper for worth prediction are unit random forest regression, gradient boosted regression tree and multiple simple regression.

Advantages:

- All the 3 models were evaluated for exploitation constant check dataset.
- The results compared by mean absolute error as criteria shows that gradient boosted regression tree gave highest performance followed by random forest regression and MLR. As the iteration will increase, prediction worth becomes considerably nearer and nearer to the particular worth.

Limitations:

- Large amount of your time is required to be endowed in preprocessing of information as a result of duplicate values or skew values that don't give correct results.

CHAPTER-4

DATA

4.1 Overview

Android application has 2 python modules i.e. for character recognition from cardinal plate and acclimated car price prediction. For character recognition we are going to use MNIST Dataset which contains about 10,000 training examples of handwritten digits. It is a small part of the NIST dataset. The digits are then length-normalized and centered in a constant length image.

For the price prediction module we scrape data from cardeksho.com website which contains data about acclimated cars sold on site. And to extract data from e-parivahan website we will use API named vehicle info india. This API obtains information about all types of vehicles registered in India from Licence Plate Number. To obtain the appropriate details we charge to append licence cardinal to a link. Received data will be in JSON containing information about Owner and other details such as Fuel Type, Chassis number etc.

4.2 Dataset

The MNIST info of written digits, accessible from this page, has a training set of sixty thousand examples, and a look at set of 10,000 examples. It's a set of larger datasets. The digits are a constant-length image. It contains four files, two training take a look at and two take a look at datasets. The original images i.e black and white from NIST have been size normalized to slot in slot in ratio. The occurrence stages as effects of consequences of results via the normalization algorithm. The images were centered in a 28x28 photograph by means of the usage of computing the middle the center of the pixels, and translating the image to because we want to position this particular point at the center of the above describes 28x28 field. NIST SD-3 will be the training set and SD-1 is the

remaining dataset. However, SD-3 is much better to recognize when compared to SD-1. The reason why SD-3 is better is that it was formed by Census Bureau employees, however SD-1 was formed from high-school college students. Drawing smart learning experiments goals the quit end result which is independent of the coaching set and is kind of a substitute of the entire samples. Therefore it was necessary to construct new info by means of the usage of admixture NISTs dataunits.

The MNIST coaching set is compass of 30,000 ornamentations of SD-3 and 30,000 ornamentations from SD-1. Our take a look at the set was compass of 5,000 ornamentations of SD-3 and 5,000 ornamentations of SD-1. The 60,000 sample specimens coaching set accumulated samples from around 250 writers. SD-1 contains fifty 8,527 digit images written with the aid of 5 hundred completely one-of-a-kind writers. In distinction to SD-3, anyplace blocks of knowledge of knowledge in sequence, the data in SD-1 is scrambled. Author identities for SD-1 sq. are measure of meapositive we have a tendency to use this data to unscramble the writers. We have a tendency to then divides SD-1 in two, first characters written with the aid of the primary 250 writers goes into the new training dataset. The rest 250 writers have been replaced to look at a new set.. Therefore we have a tendency to units with nearly 30,000 examples.

The Cardekho dataset contains data concerning used cars. This dataset is going to be used for value prediction. Value predictions on this dataset are going to be finished using machine learning model multi-linear regression. The columns within the given dataset sq.are me certain as follows:

1. name
2. year
3. selling_price
4. km_driven
5. fuel
6. seller_type
7. transmission

8. Owner

CHAPTER-5

SOFTWARE REQUIREMENT SPECIFICATIONS

5.1. Functional Requirement

5.1.1. General Requirement

- The system shall contain camera equipment/system for capturing number plates on vehicles that are standing still.
- Mobile systems should have access to the internet as web scrapers are going to be used to extract data from the web.

5.1.2. Licence Plate Recognition

- The system must be capable of reading and interpreting different sizes of fonts in the English language.
- Number plate recognition must function equally well, irrespective of light conditions, for example, daylight, dusk, darkness at night. Any accompanying light equipment for the camera system may be used for better scanning quality.
- The quality of number plate recognition must not be affected in varying weather conditions, such as rain or mist (it is assumed here that the number plate is not dirty or does not have any anomaly).
- The number plate recognition quality must have a high tolerance for the use of different camera angles.
- The application should process the image and extract the characters.
- If the application does not recognize the number correctly it must have the option to go back.

5.1.3. Price Prediction

- Kilometers are to be entered manually by users and the number entered should be below 1,50,000km.

5.1.4. Sequence of Operation

Step1: The camera takes a picture of a vehicle containing a number plate.

Step2: Deep Learning models isolate the plate, adjust the brightness and contrasts and segment it into characters.

Step3: The pattern of each character is analyzed to convert the picture into text(Character recognition).

Step4: Web Scraper uses license plate details to extract vehicle details from E-parivahan website.

Step5: User further provides kilometers.

Step6: This data is used by machine learning model to predict the price of a vehicle.

5.1.5. Error handling and recovery

- If the text scanned by the scanner is not accurate the user can delete the scan and go back to again scan the license plate.
- The application will check that the kilometers entered by the user is realistic compared to the real world (max limit will be 1,50,000kms).

5.2. External Interface Requirement

5.2.1. User Interfaces

Homepage: The user is taken to the homepage as he opens up the application where he gets the option to go to the Capture Page.

Capture Page: It is the camera page where a user is asked to capture the number plate of a vehicle on capturing and confirming the image he will be taken to the Price Prediction Page.

Price Prediction Page: Here the user will get to see the recognised no. if the recognised digits are correct he can enter the no. of kms for the prediction and will be navigated to the Results Page otherwise back to the capture page to recapture the image.

Result Page :Here the predicted price results will be shown

5.2.2. Hardware Requirement

Hardware:

Android Device

High Quality Camera

Operating System: Android Version 7.0+

5.2.3. Software Requirement

Built With :-

Python,

OpenCV library (we will input image of a vehicle using open CV),

Scikit-learn is probably the most useful library for machine learning in Python.),

Numpy, Scipy (Python libraries used for used mathematical and numerical analysis)

Getting Started:

This application is targeted for windows and will work on other operating systems with some slight modifications. You will need:

Python (>=3.6)

OpenCV(>=4.0)

5.3. Non-Functional Requirements

5.3.1. Performance Requirement

Usability

The application will be user- friendly and easy to operate and will have functions which can be easily understood.

Reliability

The application will have a high degree of fault tolerance.

Maintainability

The application will be designed so that it can be easily maintained by the user and can easily incorporate new requirements in the individual modules.

Portability

The application will be easily portable and handy customer can know the price of the vehicle which he is intended to buy and sell with just a camera click.

Robustness

The application will be robust enough to tolerate perturbations that might affect the system's functional body.

Availability

The application will be available to the user as long as he/she has proper internet connection.

5.3.2. Safety Requirement

The product will have consumer safety as a focus during all stages so that one can avoid future problems. No personal information of the customer will be compromised. Application will predict the price of the vehicle with utmost accuracy so that it does not lead to any customer dissatisfaction.

5.3.3. Security Requirement

Though the application will not have any login and password ,it will be perfectly secure for the users using it. It will not compromise any personal details of the car owner. The application will be secure in all of its aspects.

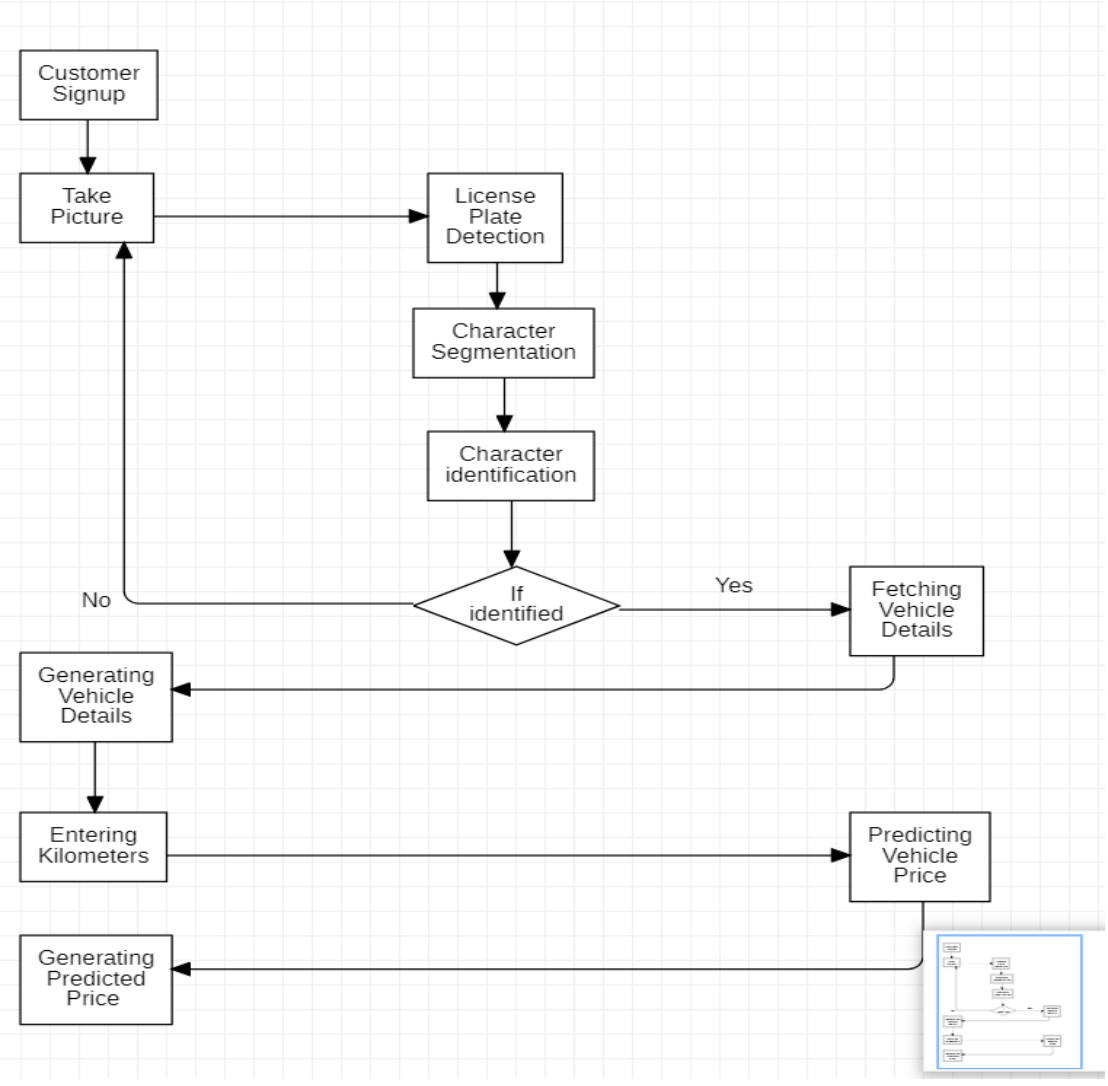
5.4. Other Requirements

This project will require basic ameneties such as a stable internet connection to run the application, a decent mobile camera to take the picture of the number plate. One should be careful of the distance between camera and number plate while taking the picture of the number plate.

CHAPTER-6

SYSTEM DESIGN

Figure 1. System Workflow Diagram



The above flowchart diagram describes the entire workflow of our ALPR system from start to end.

Figure 2. Project Management and Code Organization

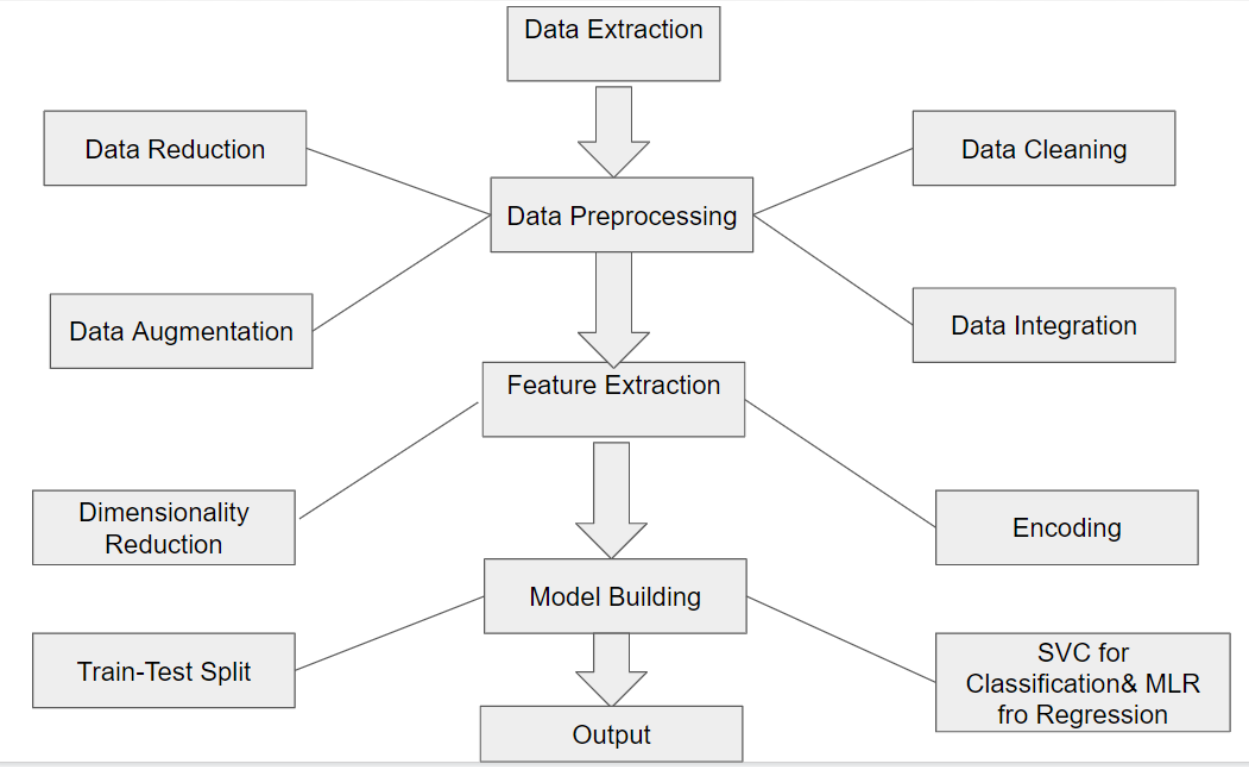


Figure 3. Use Case Diagram

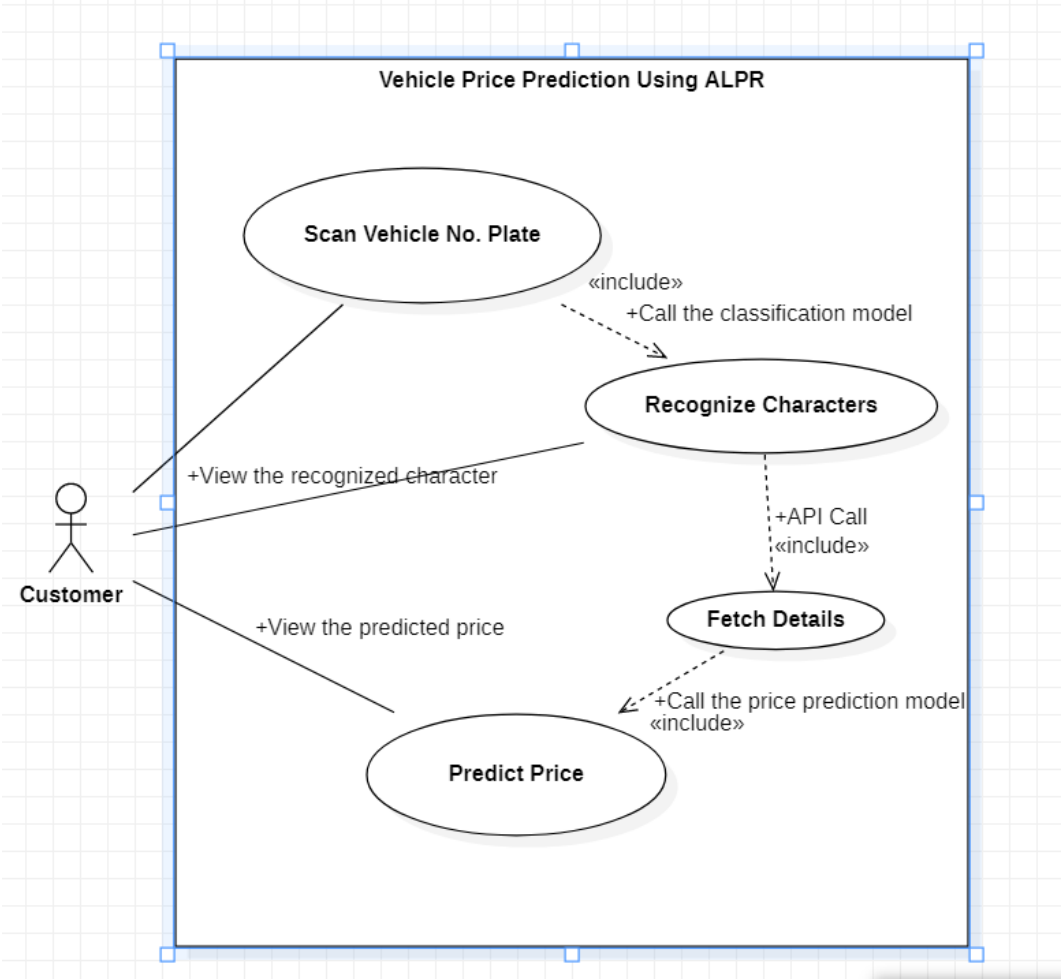
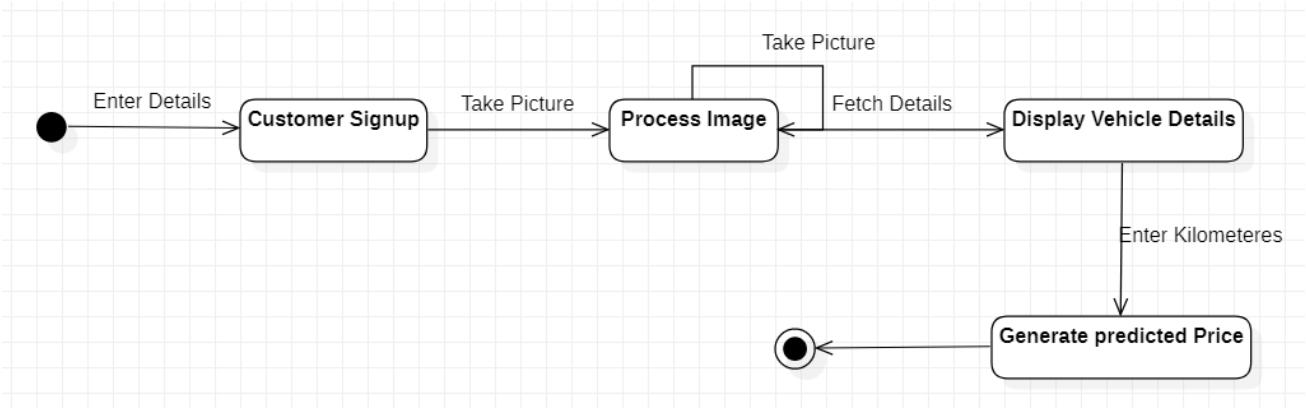


Table 1. Use Case Table

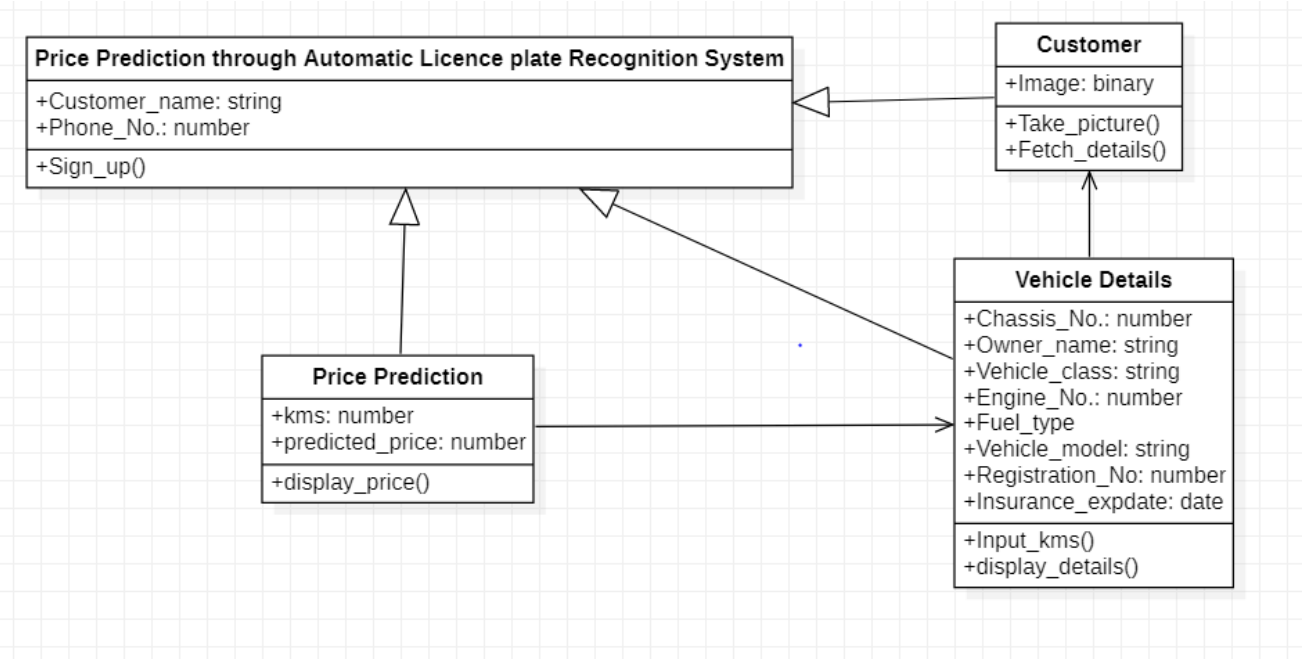
Stakeholders and Interests 1)A Potential Buyer 2)A Potential Seller	The customer wants an efficient and effective way of looking up the prices of the vehicle to make a deal or to put up an advertisement.
Primary Actor	Customer
Success Guarantee	The Vehicle Number Plate is accurately predicted by the system
Main Success Scenario	i)A Vehicle is parked in a suitable location with apt lighting. ii)The potential Customer Points the mobile device scanner onto the vehicle's number plate iii)The Application Captures the Image iv)The System Extracts The Number Plate from the Image v)The Captured no. is passed to a web API in a plain text format. vi)The Vehicle Details are correctly Received vii)The Price of the vehicle is accurately predicted

Figure 4. State Transition Diagram



The above state diagram represents the various states and state transitions taking place in the ALPR System.

Figure 5. Master Class Diagram



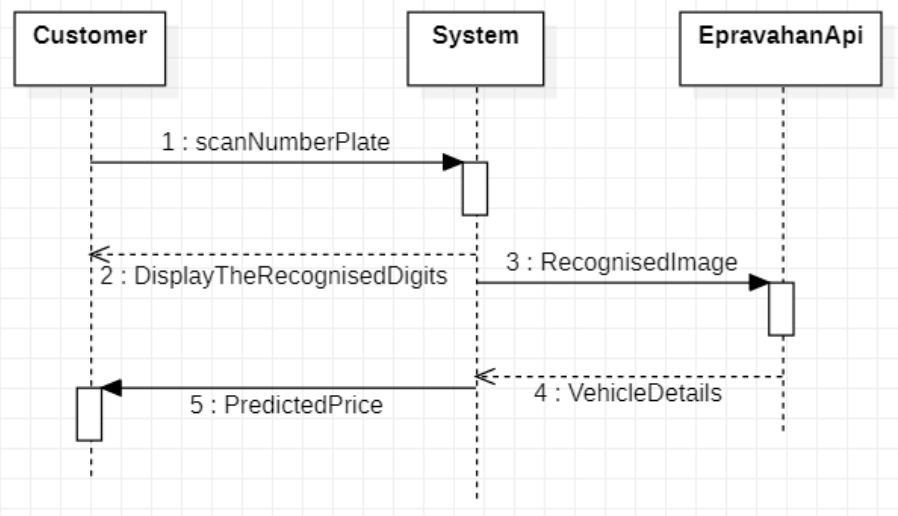
Price Prediction through Automatic Licence plate Recognition System: This class will be responsible for taking customer details and signing up the user to the application.

Its subclasses are :

- **Customer:** This class will be responsible for reading vehicle image scanned by the user through **Take_picture()** function.The function **Fetch_details()** will be responsible for fetching customer details using a support vector classifier.
- **Vehicle Details:** This class will **display_details()** of the vehicle to the user and ask the user to input kilometers traversed by the vehicle through **Input_kms()** function to predict the price of the interested vehicle .

- **Price Prediction:** This class will be responsible for displaying predicted prices calculated using the MLR model .

Figure 6. Run Time View OF The System



The above diagram represents the system when in action after the model has been trained and its parameters have been finalized.

Figure 7. External Interface

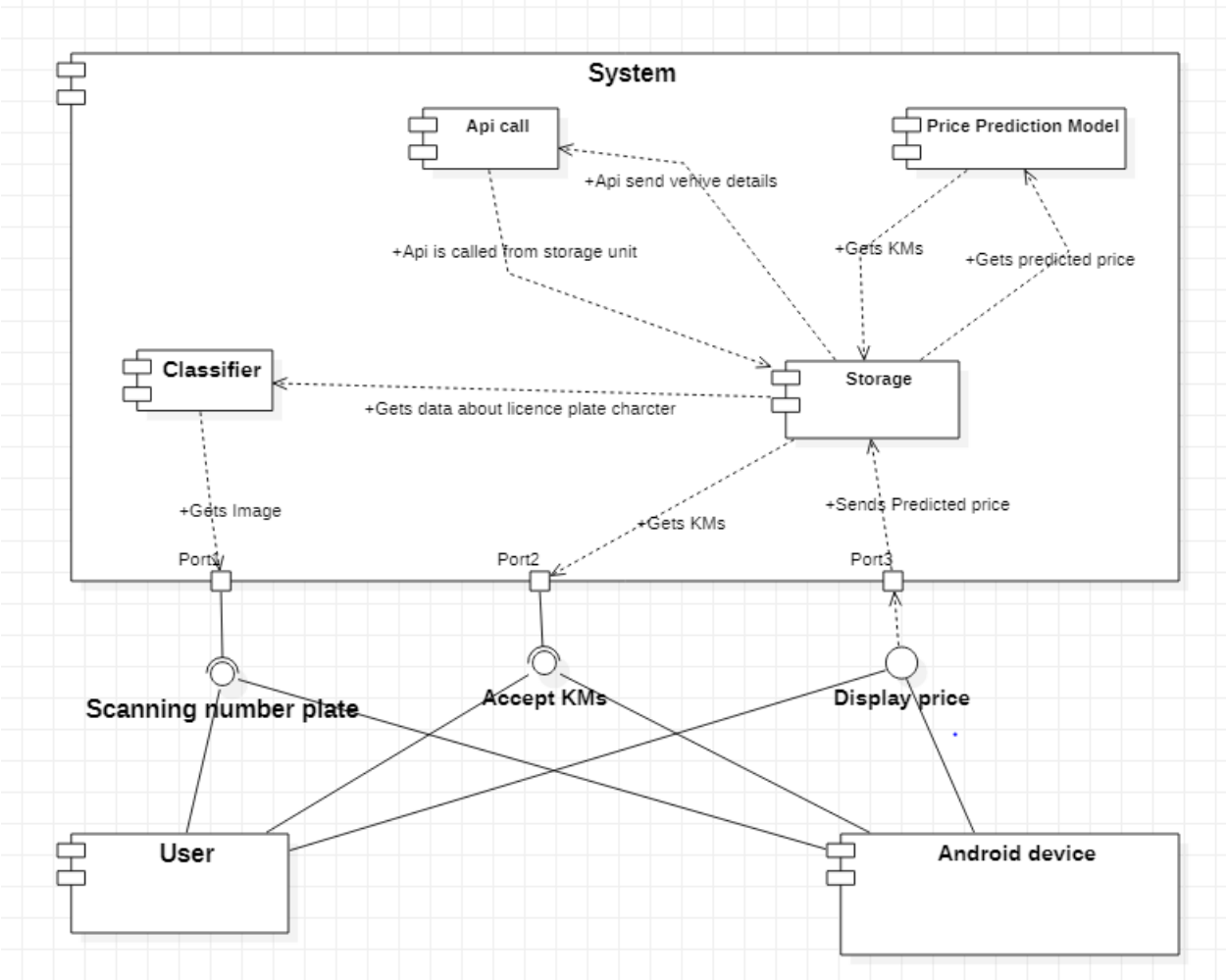
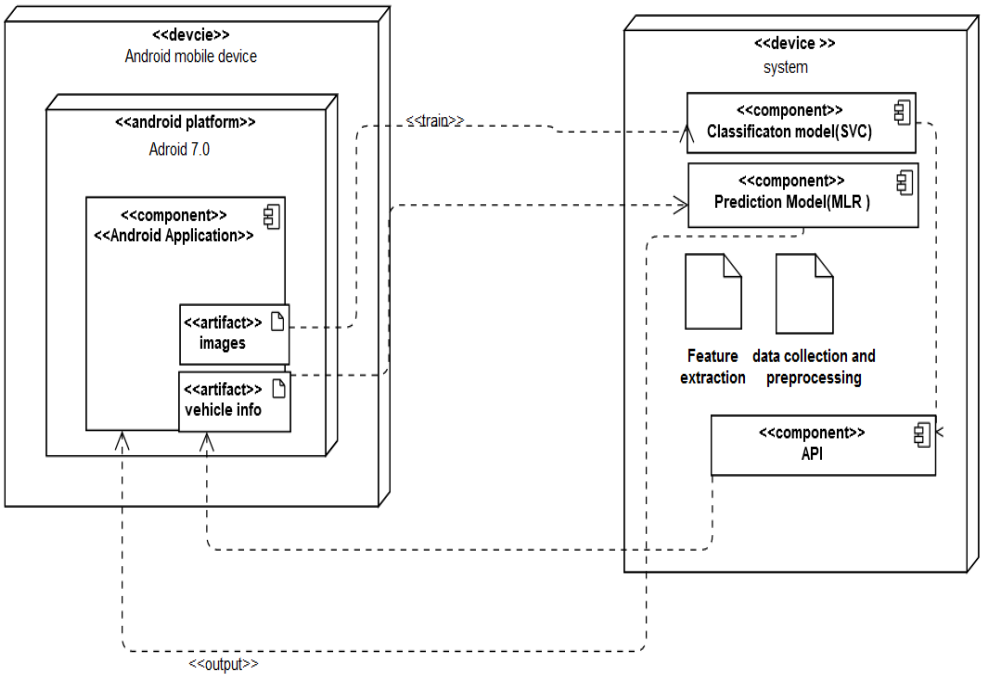


Figure 8. Packaging and Deployment Diagram



1.1. Reusability Considerations

- Vehicle_info_India - An API to obtain details about vehicles in India from their License Plate Number.
- https://www.kaggle.com/nehalbirla/vehicle-dataset-from-cardekho :Kaggle Dataset to train the model to predict the price of the vehicle.

- https://www.kaggle.com/c/digit-recognizer :Kaggle Dataset to train the model to recognise the image.

CHAPTER-7

IMPLEMENTATION AND PSEUDOCODE

The ALPR system will consist of multiple modules and certainly many python libraries will be imported such as pandas , numpy etc. to support the system.

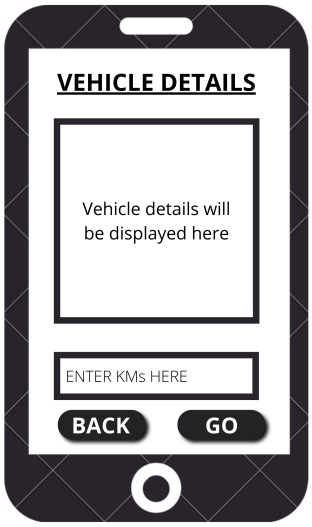
The API (Vehicle_info_India) will be used to obtain vehicle details on scanning the licence plate of the vehicle.

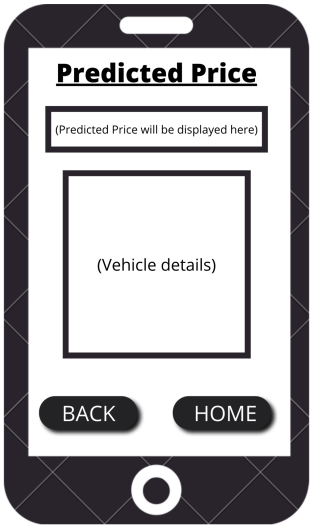
Machine learning models such as SVM and MLR will be used as a classifier for License plate recognition and to predict vehicle price respectively.

We will create our android application using **android studio .**

OUTER LAYOUT OF THE APPLICATION

Screen1 Screen2 Screen3





CHAPTER -8

CONCLUSION FOR CAPSTONE PROJECT PHASE -1

As we reach the conclusion of the phase 1 of the capstone project we realise that this phase encompassed deciding the problem statement which we would work upon and improve our understanding in the field. It also involved thorough review of multiple literatures that had been released previously regarding this topic which gave us an insight into the process of character recognition from number plate and used car price prediction, its various algorithms and approaches undertaken by researchers of the same field by reading such research papers published by accomplished and capable individuals. This also led us to realise the feasibility of the project and its various implementations or features. Progressing in the project we have identified the technologies (Android Studio and Firebase) and algorithms(Support Vector Classifier and Multi linear Regression) which will be used during the implementation phase. At each stage of the project, we enhanced our

knowledge by the vast amount of resources present on the internet to ensure optimum output and compatibility with real-life implementations.

CHAPTER-9

PLAN OF WORK FOR CAPSTONE PROJECT PHASE - 2

For the next juncture of the project, efforts would be made to build the actual model which will work as a standalone project, and integrate it with the android front-end as stated above. Overall the software will evolve from a computer code to a working product that will see its usefulness in the field. The research work done by the team will reflect on the upcoming product through the modifications in design choices and functionalities. The next phase will involve the implementation of the machine learning algorithms and produce fruitful results from the raw data collected in this phase. The backend of the system would be deployed on fire-base so when the user feeds the image, the API call would be made to retrieve the vehicle details then these details would be passed to the mode deployed on firebase and the response would be the predicted price. This flow will be succeeded by intensive testing, bug fixing, and optimizations according to needs.

References

1. Paper-1: Abhishek Kashyap, B. Suresh, Anukul Patil, Saksham Sharma, Ankit Jaiswal,Soma Biswas. “Automatic Number Plate Recognition” ISBN: 978-1-5386-4119-4/18/$31.00 2018 IEEE.

2. Paper2: Used Car Price Prediction using K-Nearest Neighbor Based Model By-K. Samruddhi, Dr R.Ashok KumarVol. 4 (3), September 2020, www.ijirase.com

3. Paper3: Vishal Jain, Zitha Sasindran, Anoop Rajagopal, Soma Biswas, Harish S Bharadwaj, K R Ramakrishnan.

   “Deep Automatic Licence Plate Recognition system” 2016 ACM. ISBN 978-1-4503-4753-2/16/12

4. Paper4: S.E.Viswapriya, Durbaka Sai Sandeep Sharma, Gandavarapu Sathya kiran. ”Vehicle Price Prediction using SVM Techniques”. International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075, Volume-9 Issue-8, June 2020

5. Paper5: S.Kranthi, K.Pranathi, A.Srisaila .“Automatic Number Plate Recognition” Vol 2, No 3 (July 2011) ©IJoAT International Journal of Advancements in Technology

6. Paper6: International Journal of Computer Applications (0975 – 8887) Volume 69– No.9, May 2013 21 Automatic Number Plate Recognition System (ANPR): A Survey by Dipti Shah, PhD. , Chirag Patel ,Atul Patel, PhD

7. Paper7: Nitish Monburinon, Prajak Chertchom, Thongchai Kaewkiriya, Suwat Rungpheung, Sabir Buya, Pitchayakit Boonpou. “Prediction of Prices for Used Car by Using Regression Models” ISBN:978-1-5386-5254-1/18/$31.00 2018 IEEE

8. Paper8: Tarun Kumar Dept. of CSE MNNIT, Suraj Gupta Dept. of CE NSIT Delhi An Efficient Approach for “Automatic Number Plate Recognition for Low Resolution Images”

Appendix A: Definitions, Acronyms, and Abbreviations

ALPR	-Automatic License Plate Reader
ANPR	-Automatic Number Plate Recognition System.
ASCII	- American Standard Code for Information Interchange
AVI	-Automatic Vehicle Identification
CPR	-Car Plate Recognition
IDE	-Integrated Development Environment.

Appendix B: User Manual

Steps to Follow :-

Homepage: The user is taken to the homepage as he opens up the application where he gets the option to go to the Capture Page.

Capture Page: It is the camera page where a user is asked to capture the number plate of a vehicle on capturing and confirming the image he will be taken to the Price Prediction Page.

Price Prediction Page: Here the user will get to see the recognized no. if the recognized digits are correct he can enter the no. of kms for the prediction and will be navigated to the Results Page otherwise back to the capture page to recapture the image.

Result Page: Here the predicted price results will be shown

➔ **Sequence of Operation**

Step1: The camera takes a picture of a vehicle containing a number plate.

Step2: Deep Learning models isolate the plate, adjust the brightness and contrasts and segment it into characters.

Step3: The pattern of each character is analyzed to convert the picture into text(Character recognition).

Step4: Web Scraper uses license plate details to extract vehicle details from E-parivahan website.

Step5: User further provides kilometers.

Step6: This data is used by a machine learning model to predict the price of a vehicle.