

**TRIBHUVAN UNIVERSITY**

**INSTITUTE OF SCIENCE AND TECHNOLOGY**

A Project Report on

“**Automatic Number Plate Recognition System**”

*For the partial fulfillment of the requirement for the degree of*

Bachelor of Science in Computer Science and Information Technology

**(BSc.CSIT)**

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# DECLARATION

This report has been prepared on the basis of my work where other published and unpublished source materials have been used, these have been acknowledged.

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Date of submission:

# BONA FIDE CERTIFICATE

This is certified that this project report “Automatic Number Plate Recognition System” is the bona fide work of **Prem Karki(071/5717), Santosh Rana(071/5728) and Darshan Lamichhane(071/5705)** who carried out the project work under my supervision.

……………………………….

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Our sincere thanks goes to our parents and family members, who have always supported us and to all friends who directly or indirectly helped us in the accomplishment of the project.

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# ABSTRACT

This report is submitted in the fulfillment of the requirement for CSIT, Texas International College. This report is regarding the development of **“Automatic Number Plate Recognition system”** a surveillance engine.

ANPR system have become increasingly popular in recent years, and are utilized in a variety of areas including highway, college, parking place, highly restricted area likemilitary zones and area around top government offices e.g.Parliament, Supreme Court etc. Not only this system recognizes the number plate of vehicles but also display the information about vehicles owner, type, address etc. and also the diver license information. ANPR became a very important in our daily life because of the unlimited increase of cars and transportation systems which make it impossible to be fully managed and monitored by humans, examples are so many like traffic monitoring, tracking stolen cars, managing parking toll, red-light violation enforcement, border and customs checkpoints. Yet it’s a very challenging problem, due to the diversity of plate formats, different scales, rotations and non-uniform illumination conditions during image acquisition.

The following document discusses on Automatic Number Plates Recognition System using number plate dataset obtained from Kaggle. In addition, the ANPR system uses image processing technique for identifying the number plate.

Keywords- Number Plate Recognition; vehicle identification;

# LIST OF ABBREVIATIONS

ANPR: Automictic Number Plate Recognition

GUI: Graphical User Interface

API: Application Programming Interface

UI: User Interface

REST: Representational State Transfer

JSON: JavaScript Object Notation

DOM: Document Object Model

HTML: Hypertext Markup Language

DFD: Data Flow Diagram

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# CHAPTER 1: INTRODUCTION

## Introduction

There are application and implementations of ANPR system in the many country already. It gained much interest during the last decade along with the improvement of digital camera and the increase in computational capacity. It is simply the ability to automatically extract and recognition a vehicle number plate’s characters from an image.

ANPR system is an important image processing technology used to recognize number plates of vehicles. Traffic control and vehicle owner identification has become major problem in our country. Sometimes it becomes difficult to identify vehicle owner who violates traffic rules and drives too fast. Therefore, it is not possible to catch and punish those kinds of people because the traffic personal might not be able to retrieve vehicle number from the moving vehicle because of the speed of the vehicle. Therefore, there is a need to develop Automatic Number Plate Recognition (ANPR) system as a one of the solutions to this problem. There are also increased insecurity challenges including terrorism which call for increased surveillance.

In most academic institutions and car parks, the ongoing car park entry registration process for visitors, staff or students entering the institution involves a security guard having to confirm membership details by checking for membership sticker on the windscreen of the vehicle or by checking the driver's identification card. This process of writing is tedious and time consuming and is prone to inaccurate recordings, furthermore the backup and sharing of this vehicle information is difficult because the data is hard copy. We propose the adoption of a mobile based software solution that has ANPR capabilities to aid in vehicle identification and vehicle registration.

We are using various image processing algorithms are to detect number plate and to extract individual characters from it.

## Problem Definition

The conventional way of keeping information has severe limitations in terms of  
accuracy, limited knowledge, unreliable, not always accurate and precise. There have been many application and implementation of ANPR system in many countries. However, the concept of using ANPR system in the context of our country is new because there are very few researches conducted so far and no any system is developed and used fully for the automatic recognition of number plate.

## Objective

* To automatically extract and recognition a vehicle number plate's characters from an image.

## Scope and Limitation

License Plate recognition is one of the techniques used for vehicle identification purposes. The sole intention of this project is to find the most efficient way to recognize the registration information from the digital image (obtained from the camera). Thus, this project uncovers the fundamental idea of various algorithms required to accomplish character recognition from the license plate. character recognition consists of steps like Image processing, Defragmentation, Resizing and Character localization that are required to be performed on the image.

Some limitations of the project are as follows:

* Use of third party dataset
* It cannot detect the far distance vehicles number plate.
* Non-standard number plates or deliberate countermeasures on some vehicles prevent the ANPR system from accurately reading those plates.

## Report Organization

This report is organized as follows:

* Title Page
* Abstract
* Table of contents

Preliminary

Section

* Background
* Problem definition
* Objectives
* Scope and limitation

Introduction

Section

* Implementation
* Description of major classes
* Testing

Implementation and

Testing Section

* Methodology
* Algorithm
* System Design
* Literature Review
* Requirement Analysis
* Feasibility Analysis

System Design

Section

Requirement and

Feasibility

Analysis Section

* Maintenance and Support plan

Maintenance and Support

Plan Section

* Conclusion
* Recommendation

Conclusion and

Recommendation Section

Figure 1: Outline of Document

# CHAPTER 2: REQUIREMENT ANALYSIS AND FEASIBILITY ANALYSIS

## Literature Review

### Importance of ANPR Systems

ANPR System are successfully used by the may developed county like America, China, Australia, Japan etc. for the transportation management and surveillance. ANPR systems is also used for automatic traffic control, electronic toll collection,  
vehicle tracking and monitoring, border crossing, security and many more.

Recent interests of ANPR systems include sophisticated machine learning techniques (like deep learning, neural networks, SVMs) along with good plate localization and character segmentation algorithms. Localization of license plate refers to extracting the region in an image that contains the plate and some of the widely used techniques for localization include scale shape analysis, edge detection, mathematical morphology [1], connected component analysis [2], regional segmentation [3], and statistical classification [4]. Different algorithms have claimed their accuracy for localization from 80% to 96%. The segmentation phase extracts the region of individual characters from the plate. Frequently used algorithms for segmentation include region merging and splitting, edge gradient analysis and region analysis. Coordinate of window enclosing each character is ascertained by segmentation. Template matching and statistical classification were widely used for number plate character recognition in the past.

But with the advent of technology and machine learning algorithms, Artificial Neural Networks, Support Vector Machines, Hidden Markov Models are some of the widely used techniques in the current scenario. These algorithms claim to offer accuracy of up to 98% for tasks like character recognition even under different environmental variations. [5] presented quite some good results in different inclination and exposure conditions.

## Requirement Analysis

The main purpose of Requirement Analysis/Specification document is to describe the  
functional and nonfunctional requirement of the Project. All the requirements specified  
here are high priority and has been specified according to the requirement analysis. This  
document is intended to clarify the actual need of the system and verify its functionality  
with other member involved to design the system.

### Functional Requirements

* Set security Guard Preferences
* Change Security Guard Preferences
* Capture image
* Verify Vehicle
* Identify Number

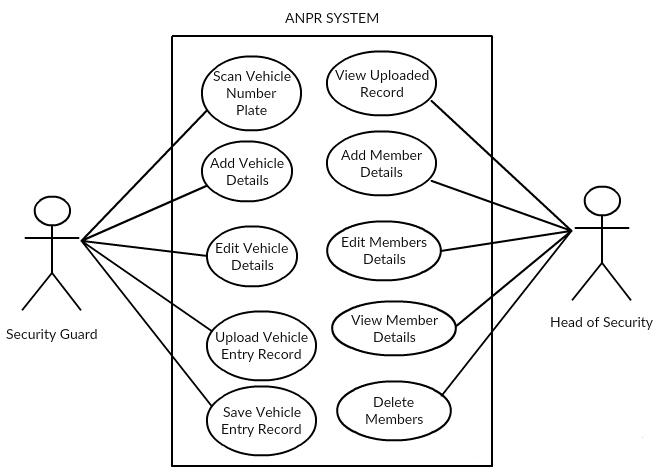


Figure 2: Use Case Diagram

### Non-functional Requirements

The non-functional requirement of the system is divided into three categories:

#### Performance Requirements

* The application provides the features of real world scenario.
* The system shall perform its function by retrieving, storing and processing data within few milliseconds.
* Performance depends upon the availability the internet.
* The system even displays error message if any error occurred during  
  performing any task in system by the user

1. **Security Requirements**

* There is authentication login and registration to the application.
* The application user must have access to the internet.
* The users can get the required information through application.

1. **User friendly**

* The system is user friendly with easy to use navigation and other features.

## Feasibility Analysis

### Economic Feasibility

Since the project is purely rooted to the software development and machine learning which are free to use. Unlike some other projects where any software is required to be purchased no such purchase is required on the Project. Hence the project is economically feasible.

### Operational Feasibility

The operational feasibility is to check the level of acceptance of the system by the user.  
This includes the process of training the user to use the system efficiently. The user  
must not feel threatened by the system, instead must accept it as a necessity. There must be sufficient support for application resources.

The level of acceptance by the users solely depends on the methods that are employed  
to educate the user about the system and to make him familiar with it. His level of  
confidence must be raised so that he is also able to make some constructive criticism,  
which is welcomed, as he is the final user of the system. The system should be able to  
be used and work properly if it is being developed and implemented.

### Technical Feasibility

The backend of web and mobile application is interfaced using REST API. The data format for the communication is in JSON format. The recommendation part of movies is done by the use of the machine learning algorithms. No additional software/hardware is required for the development of subsequent functioning of the application. Hence, the project is technically feasible.

## Structuring System Requirements

## Data modeling

An Entity Relationship Diagram is a visual representation of different entities within a system and how they relate to each other. They are widely used to design relational database schema. Since they can be used to visualize database tables and their relationship it’s commonly used for database troubleshooting as well.

With regard to this project we have four basic entities User, Person, license and vehicles that interact with each other.