

# Automatic Number Plate Recognition System

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**ABSTRACT:** Automatic number plate recognition is a large scrutiny method that uses optical character recognition on images to study the license plates on vehicles. As of 2006, systems can scan number plates at one per second on vehicles travelling up to 100 mph (160 km/h). They can use present closed-circuit television or road-rule adjustment cameras, or ones specifically made for the task. That they are used by various police forces and as a method of electronic toll collection on pay-per-use roads, and monitoring traffic activity such as red light adherence in an area. ANPR can be used to store the images captured by the cameras as well as the written text from the license plate, with some configurable to store an image of the drivers. Systems commonly use infrared lighting to let the camera to take the picture at any time of day. A effective flash is included in at least one version of the intersection-monitoring cameras, serving to both illuminate the picture and make the culprit aware about his or her mistake. ANPR technology seems to be region specific, because of plate variation from location to location.

## I. INTRODUCTION

Being capable of identifying car number plates quickly and robotically is of great advantage to many agencies and organizations for a wide variety of applications including protection, crime detection, traffic management and even computerized fee systems (e.g. for automobile parks). It is far most effective recently that the generation has virtually come of age, however the systems AC Controls now install no longer only offer noticeably reliable consequences, however it can also be achieved at acute angles, in any lighting circumstance and most significantly at high velocity.

The ANPR was invented in 1976 at the Police Scientific Development Branch in the UK. Prototype systems were working by 1979 and contracts had been allow providing business systems, first at EMI Electronics then at Computer Recognition Systems (CRS) in Wokingham, UK. Early trial systems had been deployed at the A1 road and at the Dartford Tunnel. The primary arrest due to a detected stolen car was made in 1981.

Large integration of information technologies into all factors of present day existence brought about call for processing vehicles as conceptual resources in information systems. Due to the fact a standalone information system without any data has no sense; there was also a additional need to transform data about vehicles between the reality and information systems. This can be completed with aid of a human agent, or with the aid of unique smart equipment that is capable of recognizing vehicles by their number plates in a real environment and reflect it into conceptual resources. Due to this, numerous recognition techniques were developed and wide varieties such as traffic and security applications, such as parking, access and border control, or tracking of stolen cars are utilized today.

In parking, number plates are used to calculate duration of the parking. When a car enters an input gate, number plate is automatically recognized and stored in database. When a car later exits the parking area through an output gate, number plate is identified again and matched with the first-one saved within the database. The difference in time is used to calculate the parking fee. Automatic number plate recognition systems can be used in access control. As an instance, this technology is used in lots of companies to provide access only to vehicles of authorized personnel.

In some nations, ANPR systems mounted on country borders automatically detect and monitor border crossings. Each vehicle can be registered in a central database and compared to a black list of stolen vehicles. In traffic control, motors can be directed to unique lanes for a better congestion control in busy city communications during the rush hours.

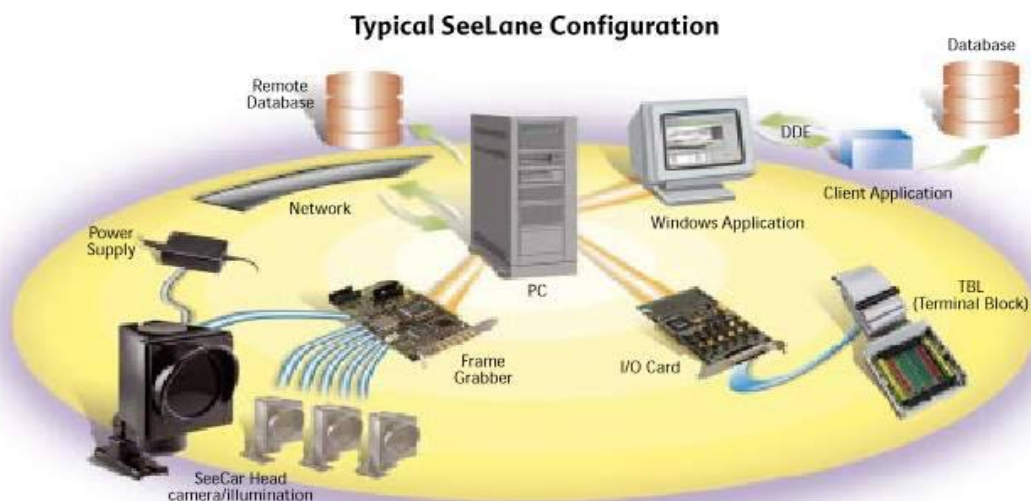
## II. MATHEMATICAL ASPECTS OF NUMBER PLATE RECOGNITION SYSTEMS

In most instances, automobiles are identified by their number plates, which are easily readable for people, but no longer for machines. For machine, a number plate is only a grey photo defined as a two-dimensional function,  $(y \times x, f)$ , in which  $x$  and  $y$  are spatial coordinates, and  $f$  is a light intensity at that point. Due to this, it is important to layout robust mathematical machinery, which will be able to extract semantics from spatial domain of the captured picture. These functions are applied in so-referred to as "ANPR systems", where the acronym "ANPR" stands for an "Automatic Number Plate Recognition". ANPR system means transformation of data between the real surroundings and information systems.

The design of ANPR systems is a discipline of studies in artificial intelligence, machine vision, pattern recognition and neural networks. Because of this, the principle aim of this thesis is to examine algorithmic and mathematical ideas of automatic number plate recognition systems.

Human beings define the number plate in a natural language as a "small plastic or metallic plate attached to a vehicle for legitimate identity functions", however machines do no longer recognize this definition. Due to this, there's a need to discover an alternative definition of the number plate based on descriptors, in an effort to be understandable for machines are segmented using the horizontal projection of a pre-processed number plate, however occasionally these principles can fail, specifically if detected number plates are too warped or skewed. Then, extra sophisticated segmentation algorithms need to be used.

## III. SYSTEM ARCHITECTURE



SeeLane is a turn-key system comprises of the following elements:

- o A PC Pentium running Windows 2K/WinXP Pro SeeCar DLL – that is used to analyse the images and extract license number plate.

- Camera/Illumination unit to capture the images (SeeCarHead – Hi-Tech Solution’s LPR camera and illumination unit)
- A Frame Grabber(s) - which capture(s) the images from the digital camera devices (handles multiple camera inputs)
- I/O card – input/output board with multiple I/O discrete on line. This board helps the sensors, illumination control and optional gate-open signal. It’s connected via a cable to a terminal interface board with simple connections and indicator lights.
- Sensors to suggest the presence of the car (a sensor for each lane)
- SeeLane– The SeeLane Windows application interfaces the hardware elements (frame grabber, camera/illumination unit(s), IO card and sensor). It controls the illumination, studies the video inputs and passes the photographs to the DLL if you want to attain the recognition results. The application shows the picture and recognition results. It then exports the results using serial communication, messages or disk documents. Its man-machine interface helps on-line setting control, that could easily adapt the application to numerous varieties of configurations.

#### IV. WORKING OF ANPR

The following example shows how a typical access-control system works. It follows the order of the animation above.

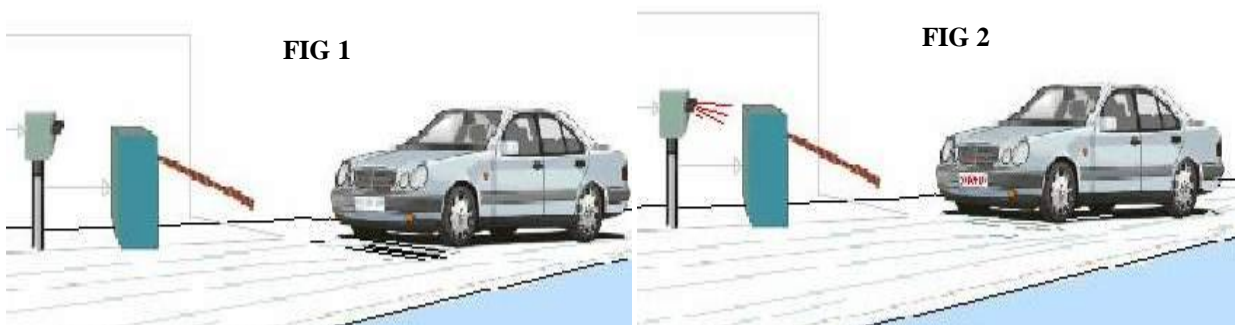


Fig 1. The vehicle approached the secured area, and as soon as the vehicle is detected the cycle starts by stepping over a magnetic loop detector (which is the most popular vehicle sensor). The loop detector senses the car and its presence is signaled to the LPR unit.

Fig 2. The LPR unit takes the pictures of the front or rear plates from the LPR camera (shown at the left side of the gate) by activating the illumination (invisible Infra-red in most cases). The images of the vehicle include the plate and the pixel information is read by the LPR unit's image processing hardware (the frame grabber).

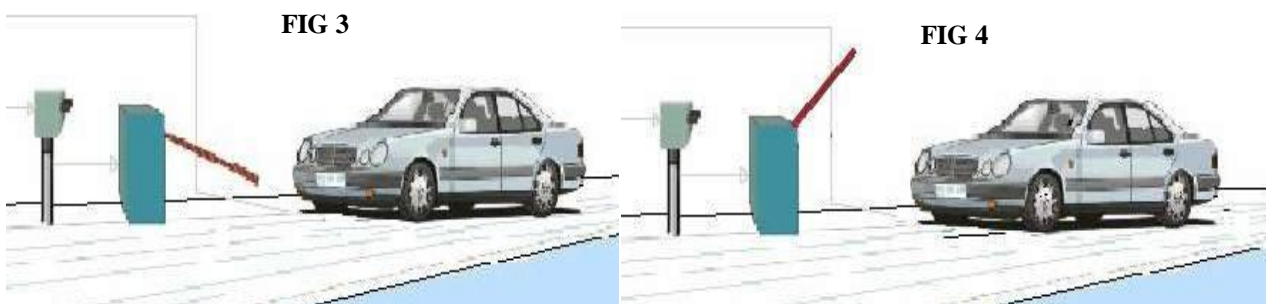


Fig 3. The LPR unit uses different image processing software algorithms for analyzing the image, the algorithms enhance the image, identifies the plate position, extracts the plate string, and recognizes the fonts using special artificial intelligence methods (such as Neural Networks). Most LPR units are based on an application running on PC under Windows.

Fig 4. The LPR unit checks if the vehicle is already defined in the list of authorized cars, and if found - it signals to open the gate by activating its relay. The unit can also switch on a green "go-ahead" light or red "stop" light. The unit may also display a Welcome! message with personalized data.



**FIG 5**

Fig 5 The authorized vehicle enters into the secured area. After passing the gate its detector closes the gate. Now the system waits for the next vehicle to approach the secured area.

Other types of applications use the information gathered from the image for different purposes. For example, to prepare a speed or red-light violation ticket. All depend on automatic image understanding process performed by the LPR unit, which actually imitates the human mind.

## V. CONCLUSION

Automatic number plate recognition (ANPR) is a mass surveillance method that makes use of optical character recognition on pictures to study the license plates on automobiles. As of 2006 systems can scan number plates one per second on cars travelling up to 100 mph (160 km/h). They could use present closed-circuit television or road-rule enforcement cameras, or ones specifically designed for the mission. They may be utilized by numerous police forces and as a method of electronic toll collection on pay-per-use roads, and monitoring traffic activity such as red light adherence in an intersection.

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