ANPR-TUTORIAL.COM

THE AUTOMATIC NUMBER PLATE RECOGNITION TUTORIAL

ANPR TECHNOLOGY

ANPR APPLICATIONS

ANPR TECHNOLOGY

1. Description, ANPR (Automatic number plate recognition) or LPR (License pl recognition)

It is the technical method of artificial vision **(OCR)** that allows the recognition of number plates i images of vehicles. Historically, it has been applied on security systems to control accesses of v and car parks.

Nowadays, the **ANPR technology** has improved its reliability, some systems are able to offer recognition rates between **95 and 98%**. Also, some **ANPR equipment** are able to recognize the number plate of vehicles that drive up tol **200km/h**.

Generally, the **ANPR** technology can be bought in two modalities :

- **The ANPR engyne**
- **The ANPR equipment (Hardware + recognition engine)**

The **ANPR engine** can recognize the number plate directly from the images stored in a hard dis type of software allows to take good use of images that have been obtained from other systems CCTV or cameras.

The **ANPR equipment** incorporates all the hardware necessary to capture the images of the ve and to recognize the number plate. Moreover, it incorporates the **ANPR engine**. The **ANPR equipment** are designed to offer the maximum reliability.

Depending on each case the **ANPR equipment** or **ANPR engine** will have different uses and advantages:

	To optain high reliability	To recognize number plates directly from images stored in a hard disc	To make a good u... CCTV and camera s...
ANPR engine	It is not recommended	It is a habitual use	It is a habitual u...
ANPR equipment	It is a habitual use	No	No

2. Parts of the generic system, Capture Unit (CU) + Process Unit (PU)

Although there already exist some **All-in-One equipment**, the great majority of systems are stil... **"CU+PU"** architecture:

- **(CU) Capture unit**
    - Camera housing
    - Camera
    - Infrared focus
- **(PU) Process unit**
    - Embeded computer
        - Framegraber
        - Recognition engine
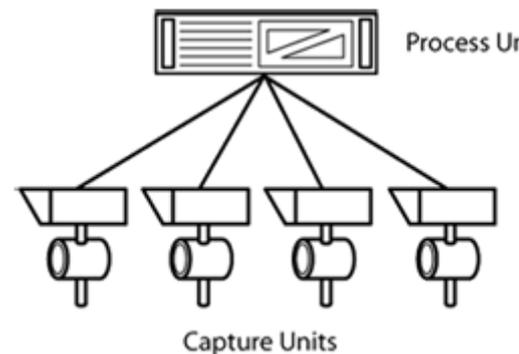
Operation of the system

The **"UC+UP"** system consists of two parts. The **Capture Unit** that takes the image of the vehic... the **Process Unit** that receive the image from the **Capture Unit** and makes the recognition of th... number plate. The **Process Units** can control one or more **Capture Units** simultaneously.

The quality of the solution depends on each manufacturer, although generally the **"CU+PU"** architecture has disadvantages respect the **ANPR All-in-One**, they are the following ones:

- **1º - Nonrobust architecture**
    - The **Capture Units** controlled from the one only **Process Unit** will fall if the **Proce...** **Unit** does not work

- **2º - Complex installation and start-up**
    - It is necessary to install video and control wire for each one of the cameras
    - Furthermore, it is necessary to provide power supply cable to the cameras, focus a... **Process Units**
    - If the distance between the lanes are too long, the signal of the cameras will not a... with clearness to the **Process Unit**. For example:
        - If we have to control 4 lanes gathered in groups of two and separated by a...

distance of 2 km, It will not be possible to control the 4 lanes with the same
Process Unit. Sometimes the cost of the installation may increase because
limitation of distances between the Capture Unit and the Process Unit (click
view example)

- o If the **Process Units** are installed directly on the lane it will be necessary to protec
  a weatherproof rack

- **3º - High cost**
  - o The wiring and the time of installation are mulplied
  - o The maintenance of the system is multiplied

3. Evolution to All-in-One equipment
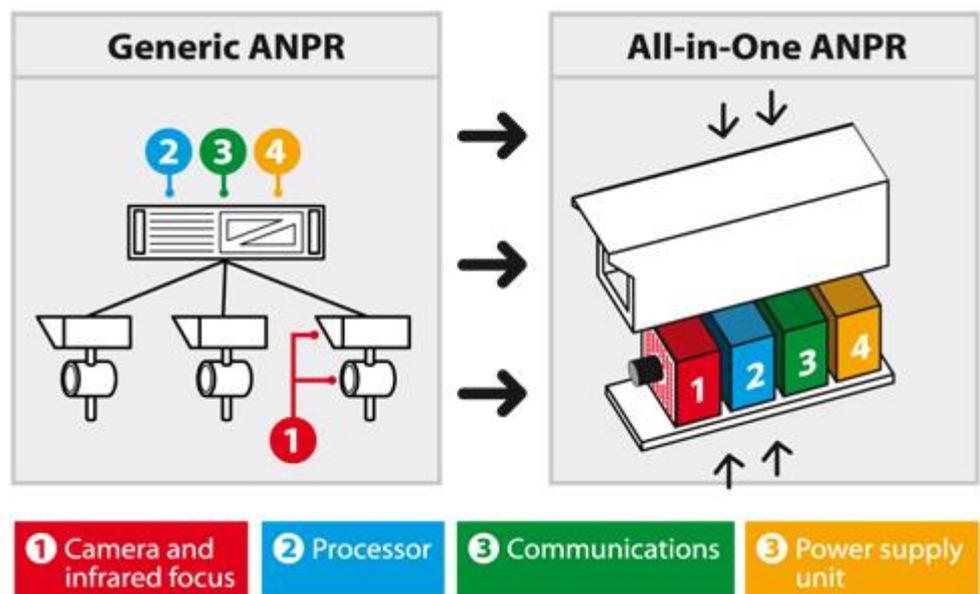
By contrast to the generic **ANPR**, the **ANPR equipment** integrates directly in the housing the ca
the processor, the communications and the power supply unit

4. Benefits of the ANPR equipment

The **ANPR equipment** with an **All-in-One architecture** deletes the disadvantages of the gener
ANPR equipments, these are the following ones:

- **It is more simple:** All the necessary elements for the **ANPR** process are integrated in th
  housing. Only one device is necessary for each lane to be controlled. The equipment ma

connected by Ethernet or serial communication with the client application

- **Modular architecture:** If an equipment with **All-in-One architecture** does not work, its f
  not affect to the other lanes, because the **Process Unit** are deleted

- **Installation and start-up is easier:**
    o It is only necessary to provide 220v, Ethernet network or serial communication to
      equipment
    o The instalation is as easy as to screw the equipment with the support, to identify A
      equipment with an IP and to adjust the optics
    o If one equipment falls, it is possible to replace it by another one

- **It reduces the cost:**
    o The wiring is reduced
    o The installation and start-up time is reduced
    o The maintenance of the system is reduced

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5. How does it work?

The **ANPR** process is divided into three steps. The detection of the vehicle, the capture of the in
and the process of recognition. Next, we will detail step by step how it works and depending on
case what the advantages and disadvantages are

- **Detection of the vehicle.** The first step is to take an image of the vehicle at the right tim
  Thus, the number plate of the vehicle will be visible in the image. Nowadays, three kind o
  control exist
    o **Hardware triger:** The **ANPR equipment** controls physically a sensor directly insta
      the lane. Whenever a vehicle has been detected by the sensor, the **ANPR equipm**
      know its presence, and then the process of the capture begins

    o **Software triger:** The **ANPR equipment** communicates with the client application,
      physically controls a sensor directlly installed in the lane. Whenever a vehicle has
      detected by the sensor, the client application knows the presence of the vehicle ar
      communicates it to the **ANPR equipment.** At this moment the process of the capt
      begins

    o **Free flow:** The **ANPR equipment** does not need to receive signal from any exter
      sensor. The **ANPR equipment** takes images continuously and it is able to detect
      vehicles automatically

- **Capture of the images**. Once the vehicle is detected, the following step is the capture o
  vehicle. In order to take a right image, the following points will have to be considered

- **Type of cameras:**

  - **Interlace camera**: The capture of the images is made in two steps. First un[...] lines and later the even lines ([click to see example](#)). This type of cameras a[...] cheaper but its use is not recommended for ANPR because if the vehicle is [...] movement, the number plate appears defocused

  - **Progressive cameras:** The capture of imagenes is made at once ([click to [...] example](#)). The use of this type of cameras is totally recommended because [...] vehicle is in movement the number plate always appears focused

- **Type of light.** Infrared light is used generally for the **ANPR equipment.** Although [...] **ANPR equipment** are able to use the daylight and the infrared light during the nig[...]

  - **Infrared light:** The **ANPR systems** uses infrared light because the human [...] cannot detect it without other devices. One infrared filter located in the cam[...] allows to emphasize the number plate, but, in the other hand, the rest of ele[...] of the image are darkened

  Examples

  -
  - **Daylight:** It is perceived by the human eye. It allows to take images in whic[...] vehicle is distinguished.

  Examples

  -

- **Light management:** The type of light is as important as how it is managed. It is p[...] to use any typical technique of photography, but the **ANPR manufacturers** have [...] two great ways:

  - **To control the light emitted by the focus**

- ▪ **To control the light that enters in the camera**

- **Number plate recognition process.** Each **ANPR** manufacturer has developed its own
  recognition algorithms, although, these are the main ones and the common ones

  - o To locate and to isolate the number plate in the image
  - o To correct the brightness and the contrast of the number plate
  - o To separate each character of the number plate
  - o To recognize each character of the number plate

ANPR APPLICATIONS

6. Car parks

In some countries like Spain or Greece, the law binds the recording of the number plate on the t
In this way, the number plate and the ticket number are linked. Thus, car parks improve their
management.

These are some direct benefits:

- **Number plate register.** The ticket number, day and the
  time, and the number plate are linked and registered in the
  management application

- **Finding a lost ticket.** Thanks to the registry of the number
  plates it is possible to find a lost ticket and to receive the
  correct amount

- **Ticket interchange is avoided.** It is possible to block the
  exit of a vehicle, if the number plate of the vehicle does not
  match with the number plate in the entrance ticket

7. Access control

The **ANPR equipment** has been used for the access control of vehicles, it was thought as one more tool that allows increasing the security. The client application could control users through personal cards, and the **ANPR** allows vehicles control.

Nowadays, the **ANPR equipment** are used for automatizing the accesses of vehicles.

These are the main advantages to incorporate **ANPR equipment** in access control:

- **Security increased:** Integrating the **ANPR technology** in access control aplications tog with the traditional control devices, allows vehicle and people control. Thanks to this conv the security is increased

- **Dynamic access of vehicles:** Automatizing vehicle access is possible through **ANPR equipment**. If the data base knows the vehicle, the client application will open the barrier automatically. By contrast, if the data base does not know the vehicle, it will not open the

- **Vehicle images:** It is possible to store the image used for the **ANPR equipment** during recognition process. It allows to have more information about the vehicle in the client application.

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8. Traffic Control

Some **ANPR equipment** are able to recognize the number plate of vehicles that circulate up to **km/h** with a reliability of **95%.** Thanks to this, the use of **ANPR equipment** for traffic control has increased significantly in the last years.

These are some examples of **ANPR application** on traffic control:

Detecting vehicles in a black list

It is possible to control vehicles that are in search and capture, throught the installation of the **ANPR equipment** in the main accesses to cities, such as highways and roads.
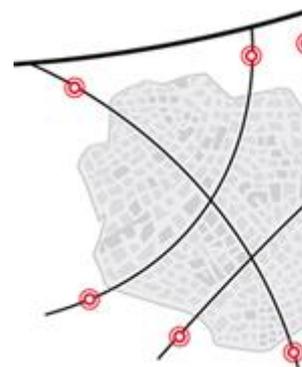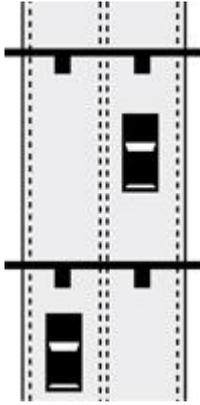
Average speed control

The majority of speed control devices, such as radars or speed traps, con
vehicle instantaneous speed. With the **ANPR equipment** it is possible to
the average speed during an itinerary. By means of the installation of two
equipment in different points in the same lane, it is possible to make two
consecutive recognitions of the number plate and to calculate the average
of the vehicle.

Traffic optimization

It is important to improve the vehicles mobility during rush hours
and traffic jam.

The installation of **ANPR equipment** allows to know how many
time a vehicle spends to coss an itinerary. This way, the
average time can be informed.

Urban toll p

This application solution has been succesfully experienc
proves that the mobility in the central zones of the city i
considerably. Another possibility of urban tolls is to ma
register of foreign vehicles using the public ways,
contributing in the r

Toll enforcement

Although the use of **ANPR equipment** in tolls is a logical application,
today, the **ANPR equipment** are only used to control the vehicles
that circulate in the toll, as a data base that increases the security

9. Red light control

To jump a red light is a really dangerous infraction with consequences for others drivers and pedestrians.

Nowadays, it is possible to control when a vehicle jumps a red light. This systems combinate sensors and image capture equipment, such as cameras or video recorders.

The **ANPR systems** reinforce the red light control systems. Thanks to **ANPR technology** the fine process ca be done automatically.

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Target information: ANPR, Automatic number plate recognition, LPR, License plate recognition, AVI, Automatic identification, CPR, Car plate recognition, CPR, Car plate reader, OCR, Optical character recognition, ANPR reco engine, ANPR equipment, ANPR parts of the system, ANPR All-IN-ONE, Benefits of ANPR All-in-One equipment, start-up, Modular architecture, Easy instalation and start-up, ANPR low cost, ANPR vehicle detection, ANPR imac capture, ANPR recognition of number plate, ANPR aplications, ANPR car parks, ANPR access control, ANPR traf control, Average speed control, urban toll, toll enforcement, ANPR red light control, ANPR police vehicle..