What is ANPR?

Automatic number plate recognition is a mass surveillance method that performs optical character recognition on images to read the license plates on vehicles. ANPR can be used with either existing closed-circuit television or road-rule enforcement cameras, or ones specifically designed for the task.

ANPR is the “heart” of any ITS system. The technology is 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 violence in intersections.

ANPR is also known as:
- Automatic License Plate Recognition (ALPR)
- License Plate Recognition (LPR)
- Car Plate Recognition (CPR)
- Automatic Vehicle identification (AVI)

Why to use ANPR?

1. Faster traffic management at parking areas.
2. Easy usage of toll highways, bridges or tunnels.
4. Ability to automate access control systems.
5. Allowing new and more effective law enforcement.
How does ANPR work?

1-2. Detection of the vehicle and image capture
When no hardware trigger is installed, FXCAM cameras and CARMEN software are capable to detect the vehicle and create the image in one step. The other solution is the usage of a hardware trigger. In this case a sensor initiates the image creation. IR illuminator allows image capturing day & night. Any camera type can be used but special ANPR cameras provide better image quality.

3. License plate recognition
Special ANPR / ALPR software reads the license plate characters from the camera image. The result is the ASCII or Unicode text of the plate.

4. Further processing
A computer system can process the number plate data automatically. To mention few examples: based on the ANPR result, the system can open a barrier at a highway toll or an immediate warning can be sent to the police about a stolen car.
Main CARMEN® benefits

1. High accuracy and speed
CARMEN® is recognized as an ANPR software engine with exceptionally high read rate (accuracy). The fast processing speed allows real time usage even at freeflow mode.

2. Build your own ANPR system
CARMEN® SDK is available for system integrator companies planning to build their own ANPR system. OEM/ODM versions are available as well.

3. Country independent OCR technology
CARMEN® is able to read any license plates including American, European, Arabic, Chinese, Korean, Thai characters and much more... Plate color, country recognition and special personalized plate reading are features of CARMEN®.

4. Hardware independent technology
CARMEN® runs with any type of camera at any PC platform. Dedicated ANPR cameras are recommended to achieve highest accuracy.

5. Worldwide success
CARMEN® ANPR development has been started back in 1991. Since then, over 2000 satisfied partners in around 200 countries worldwide are using ARH software and cameras. Installations are working successfully for years, day and night even at extreme weather conditions.

CARMEN® system integrator partners
ARH Inc. technology partners are constructing innovative systems for their clients by incorporating the state-of-the-art CARMEN® software. System integrators understand the needs of their customer and they build complete systems exactly according to the expectations. ANPR, ACCR and ADR Software Development Kits (SDK) makes integration of OCR and image processing functionality easy, fast and cost effective.
CARMEN® ACCR

(Automatic Container Code Recognition)

Automatic Container Code Recognition is a leading edge technology which is able to recognize unique freight container codes automatically and pass to a computer system for further processing. Special container camera system is available to produce optimal images for high reading accuracy.

More and more ACCR technology based automatic system is used at harbors, logistic centers, ports and rail terminals. Usage of RFID based tracking system are also growing nut in many cases together with optical reading for improved security.

Recognition of UIC wagon/coach numbers

Coach numbers (wagon numbers) are key data for railway operations. This number enables a railway wagon to be positively identified and forms a common language between railway operators, infrastructure companies and the responsible state authorities.

CARMEN® ADR

(Dangerous Goods Sign Recognition)

Transport units and vehicles carrying dangerous goods should be supervised. The ADR Hazard Identification Number HIN, also known as the Kemler Code, is carried on placards on tank cars and tank containers running by road under international ADR regulations.
CARMEN® ANPR at a Police Station application

A typical architecture is when lanes are monitored with fixed positioned ANPR cameras. The passing cars **license plates are recognized** on the industrial PC which sends the recognition result, camera location, image capturing time and an image to the central server.

The central server **checks the license plate** in the up-to-date National Blacklist Database.

In case of a blacklisted car **the server can send an SMS or radio alert** to the police cars near to the location where the image was captured.

At location 1 the architecture is different. At this point a “smart” camera is used. The number plate reading (ANPR) function is **performed within the camera CPU**. The camera send the plate number text, related image and timestamp to the central server. **No separate controller PC is needed** at this location.
About ARH Inc.

ARH develops intelligent image processing hardware and software technologies for security and traffic control. ARH clients are system integration companies who construct outstanding innovative technological systems for their partners by incorporating the state-of-the-art technology. Since 1990, over 2000 satisfied partners in around 200 countries are using the know-how of ARH.

Automatic Number Plate Recognition (ANPR/LPR/ALPR)

The latest CARMEN® license plate recognition software engine is able to read vehicle plates from most countries of the world. Container code recognition (ACCR), Dangerous Sign reading (ADR) and UIC code recognition (railway) are additional available CARMEN® abilities.

ARH offers FXCAM ANPR camera series for vehicle number plate reading and container code recognition. All camera models are equipped with a built-in infra-red illuminator unit to provide optimal image quality in various operating environments night and day.

SpeedCAM is an All-in-One solution for speed enforcement. The unit includes a smart camera with speed detector, ANPR processing unit and IR illuminator.

All-in-one solution for document reading

ARH passport readers (PRMc series) authenticate quickly and accurately the electronic and printed data in all ICAO standard travel documents. PRMc multireaders are designed to ensure hands-free operation. Regardless of the chip position electronic data can be read in a one-step process.

ARH’s Fingerprint Scanners exceptional optical quality ensures perfect fingerprint scans in all cases. The AFS510 Fingerprint Scanner is able to scan ten fingers and its intelligent indicator system drive users how to place their fingers on the scanning window for optimal results.
Over 2000 CARMEN ANPR and FXCAM technology partners

ARH technology partners are using the Carmen® ANPR software engine and the FXCAM cameras at all continents. The number of installations must be well over 50,000 cameras.

ARH document readers at the world’s busiest crossing points

ARH’s advanced travel document readers effectively improve the level of security and speed up processing in various applications like border control, airport, hotel, car rental offices, banks and mobile communications.
It is a usual requirement in today ANPR / LPR systems to achieve recognition accuracy close to 100%.

The camera itself is a key element from system performance point of view. The quality of the captured image has got a major effect in the read-rate of the complete application.

Industry experience shows that maximum OCR performance can not be achieved with general purpose cameras – or not even with devices simply modified for ANPR purposes.

The FXCAM advanced camera technology specially developed for number plate reading applications.

**Main benefits**

- FXCAM cameras for continuous 24/7/365 outdoor usage
- Special versions for freeflow traffic environment: motorways, red-light enforcement, congestion, etc. Other models for access control systems: car parks, tolling, parking management, etc.
- All-in-One FXCAM design: camera module, powerful illuminator and synchronizer unit, all in a single weatherproof housing
- Optimal image quality in various extreme operating environments: sunlight reflections and glare or exposure due to car headlights
- Heavy duty and robust design for continuous outdoor usage (IP67 rated)
- Integrated high-power IR illuminator enables to recognize the license plates clearly without disturbing the driver. Easy setup and remote control adjustment ability, motorized zoom and iris.
Specific models are available for different application environments. Several FreeFlow type cameras were designed according to ITS systems and cost effective versions are available for access control and parking applications. Overview and Speed Control versions are included in the FXCAM family. Lenses are available with motorized zoom and iris or fixed versions.

### For FreeFlow ANPR systems

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Resolution</th>
<th>Color</th>
<th>LED</th>
<th>Lens</th>
<th>Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>BASIC</td>
<td>For basic traffic highway applications - One camera per lane - ANPR functionality</td>
<td>WVGA</td>
<td>B&amp;W</td>
<td>IR</td>
<td>Zoom</td>
<td>IP</td>
</tr>
<tr>
<td>COMPLEX</td>
<td>For complex traffic highway applications - Wider viewing area - Overview image</td>
<td>1.3 MP</td>
<td>B&amp;W</td>
<td>IR</td>
<td>Fix</td>
<td>IP</td>
</tr>
</tbody>
</table>

### For access control ANPR systems

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Resolution</th>
<th>Color</th>
<th>LED</th>
<th>Lens</th>
<th>Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>BASIC</td>
<td>For basic parking applications - One camera per lane</td>
<td>PAL</td>
<td>B&amp;W</td>
<td>IR</td>
<td>Fix</td>
<td>Analogue</td>
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<tr>
<td></td>
<td></td>
<td>WVGA</td>
<td>B&amp;W</td>
<td>IR</td>
<td>Zoom</td>
<td>IP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>WVGA</td>
<td>B&amp;W</td>
<td>IR</td>
<td>Zoom</td>
<td>USB</td>
</tr>
<tr>
<td>SPECIAL</td>
<td>For special access control systems - Color plate reading - Overview image - Multi lane screening</td>
<td>WVGA</td>
<td>Color</td>
<td>IR</td>
<td>Zoom</td>
<td>IP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>WVGA</td>
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<td>White</td>
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<tr>
<td></td>
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<td>MP</td>
<td>Color</td>
<td>IR</td>
<td>Zoom</td>
<td>IP</td>
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</table>

### Customized (OEM) cameras

ARH is dedicated to meet all the customer needs and ready to design modified product versions to meet specific project requirements.

Available options: color or B&W sensor, IR or white light, wide range of LED selection (15-60 degrees), customized housing.

Feel free to contact ARH.
FXCAMd digital ANPR cameras

All-in-One FXCAM design means outstanding camera module, powerful illuminator and synchronizer unit, all in a single weatherproof housing. The FXCAM provides optimal image quality in various extreme operating environments like sunlight reflections and glare or exposure due to car headlights.

Key advantages:
- Ideal both for moving traffic (motorways, enforcement, congestion, etc.) and access control (parking management) applications
- Smart shutter software technology to make an adaptive and automated image capturing system
- Heavy duty and robust design for continuous outdoor usage
- Easy and quick installation and startup
- High illuminating power and low consumption
- Remote control

ParkIT access control camera

The unit was designed for parking and other access control ANPR systems. Ideal cost effective camera from smaller systems to large projects.

Key advantages:
- Integrated IR illuminator and synchronizer unit
- Attractive design and small size
- Built with the proven FXCAMd software technology and smart shutter technology
- Color and B&W versions
- Adjustable global shutter for high ANPR accuracy
- IP interface (RJ45)
- Remote control
FXCAMd smart camera

Smart camera means embedded PC with OCR software within the camera housing. There is no need for on-site setting after installation, due to its full remote control feature. The applied world leader CARMEN® license plate recognition technology covers over 200 countries.

Full processing is performed inside the unit (like time stamp application). Images, license plate texts and time are stored in the camera database with easy access through a built-in web-server. System developers can to upload their own software to the camera PC.

This unit is specially useful at low infrastructure locations. There is no need for separate PC close to the camera. FXCAMd Smart camera is able to send only the plate number text using extremely low network bandwidth.

SpeedCAM camera

The All-in-One solution for speed enforcement. The unit includes a smart camera with speed detector, ANPR processing unit and IR illuminator to allow night and day usage.

As a result, the camera output is the image of the speeding vehicle with all relevant data:
- number plate text,
- speed,
- time, etc.

There is no need for on-site setting after installation, due to its full remote control feature.

Extra illuminator option is available for quality overview image or larger distances.
Technology partners
Carmen® SDK is available with full programming documentation and technical support. System integrators are using the SDK to build the ANPR/LPR functionality into their actual project. OEM partners are integrating Carmen® into their application. The complete final system is offered by the partner. FXCAM cameras are available for partners at customized or OEM versions specifically designed for the needs of our partner project.

Application areas of CARMEN® software and FXCAM cameras

Intelligent Traffic Systems
- Flexible and automatic highway toll collection systems
- Effective law enforcement (speed, red light, etc.)
- Automation of weight-in-motion systems
- Automated Container Code Recognition (ACCR)
- Dangerous Goods Sign Reading (ADR)
- Railway UIC Code Reading

Parking management or other access control systems
- Flexible and automatic vehicle entry and exit in car parks
- Highest efficiency for border control systems, etc.
- Improved security and faster traffic flow during peak periods
- Automation and simplicity of airport and harbor logistics
- Prevention of non-payment at gas stations, drive-in restaurants, etc.

Countless additional application and usage types...