

LICENSE PLATE RECOGNITION BEST PRACTICES

2023



THE ABC FOR A SUCCESSFUL LICENSE PLATE RECOGNITION

There are several key factors that can affect the final result of an OCR license plate recognition.

1

OCR Engine

2

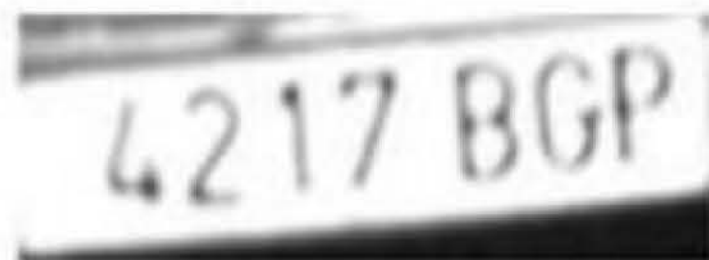
Camera Image Quality and Image Adjustment

3

Camera Location



CAMERA IMAGE QUALITY



- Over or Underexposed
- Blurred
- Unfocused
- Step angles
- Low contrast
- Extreme weather conditions



IMAGE QUALITY – GOOD IMAGE DAY AND NIGHT





CAMERA REQUIREMENTS

An ALPR camera is a specialized camera with embedded software that allows you to detect license plates both stationary as well as moving. The scenario where you are going to work will determine the requirements that you will need.

FRAME RATE

SHUTTER SPEED

RESOLUTION

FOCAL LENGTH

IR ILLUMINATION





CAMERA CONFIGURATION

FRAME RATE

The number of frames that the camera capture per second is called the frame rate.

BARRIER OR GATE

FRAME RATE > 5FPS

ROAD OR STREET

FRAME RATE >= 15FPS

FAST URBAN

FRAME RATE >= 20FPS

MOTORWAYS

FRAME RATE >= 25FPS





CAMERA CONFIGURATION

SHUTTER SPEED

The shutter speed should ideally be at 1/1000th sec (1 millisecond), – but if the traffic is moving slowly then this can be decreased to a slightly slower shutter speed while keeping the images sharp. This means that the plates will appear brighter without having to use gain (which introduces noise and can cause mis-reads). On cameras with manual irises, then these can be closed slightly. e.g., set to f8 reducing the size of the aperture and thereby increasing the depth of field – keeping the vehicle in focus for longer as it travels through the field of view.

BARRIER OR GATE

MINIMUM EXPOSURE TIME 1/250 SEC (4 MS)

ROAD OR STREET

MINIMUM EXPOSURE TIME 1/500 SEC (2 MS)

FAST URBAN

MINIMUM EXPOSURE TIME 1/1000 SEC (1 MS)

MOTORWAYS

MINIMUM EXPOSURE TIME 1/1000 SEC (1 MS)



CAMERA CONFIGURATION

RESOLUTION



Setting the resolution higher than necessary means larger images produced and more CPU power usage to process them.

The common resolutions are **1920x1080** for **6m wide** (dual lane) and **1280x960** for **3m wide** (single lane).

Select the correct lens for the read distance in addition to the proper resolution to achieve the correct plate character height.

EUROPE: 20-35 PX

USA: 25 - 35 PX

MIDDLE EAST: 30-40 PX

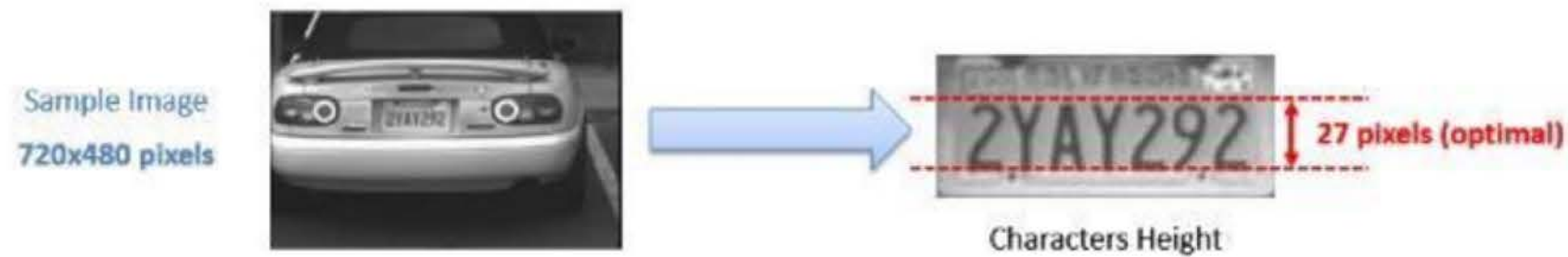
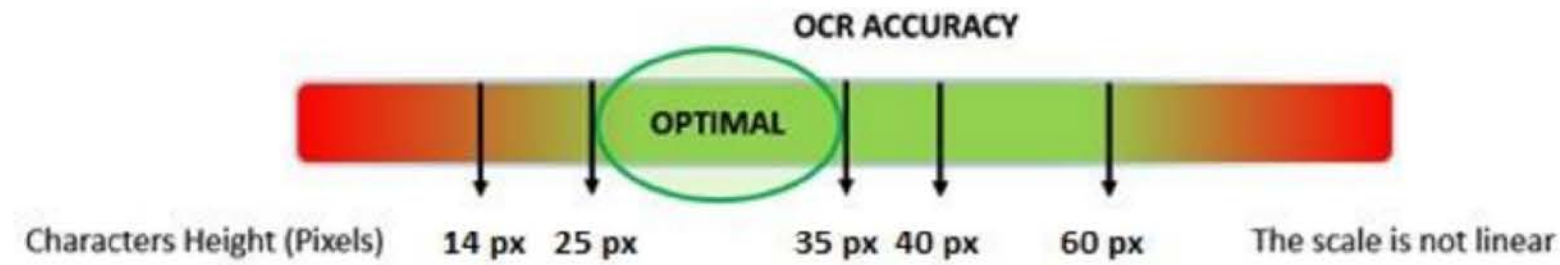
The camera should be setup so that the combination of the distance, the lens's focal length and the camera's resolution provide an image that can be accurately analyzed by the OCR.



CAMERA LOCATION

This is the single most important factor in achieving high recognition accuracy.

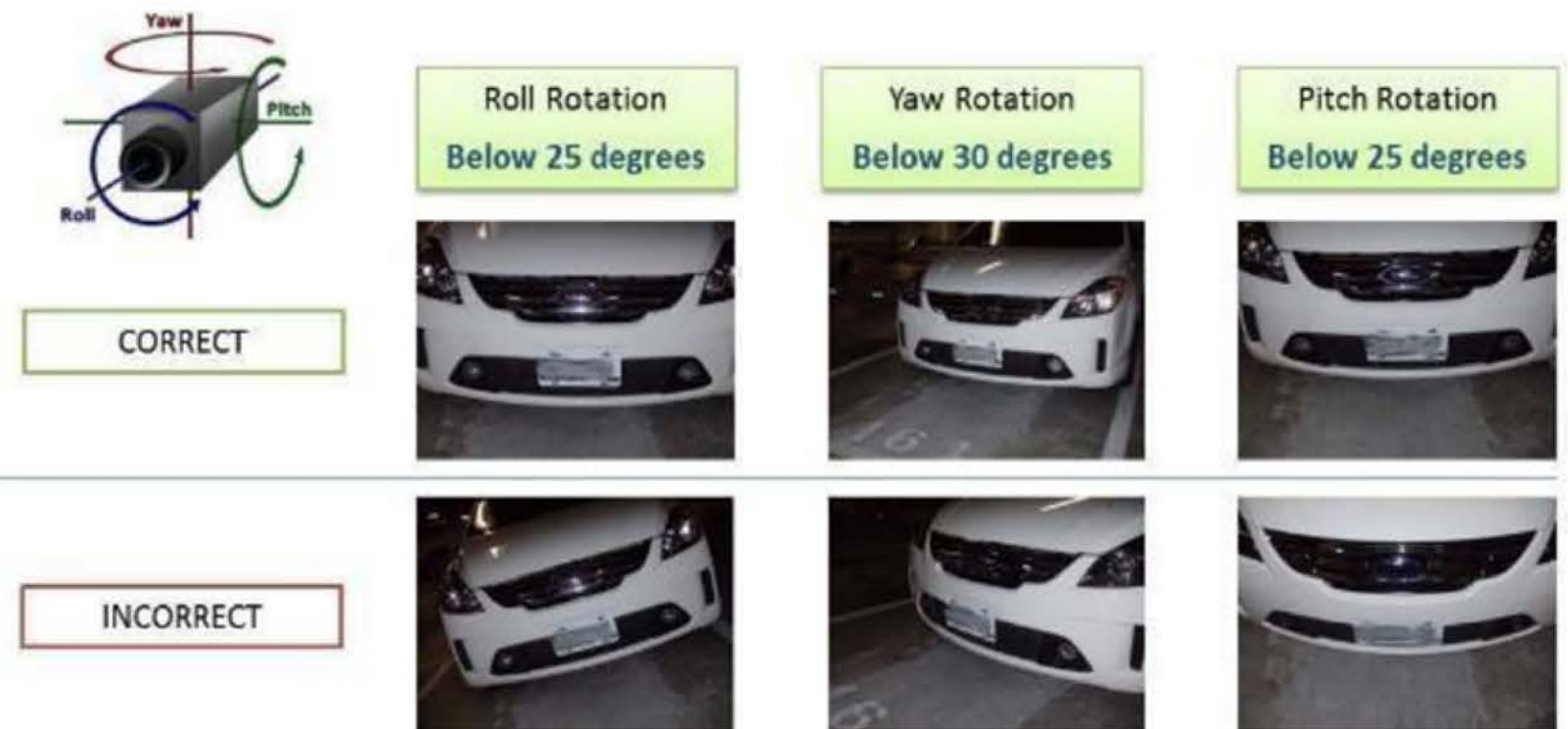




The location of the camera has a crucial role in the overall performance of the ALPR system and must be treated with the utmost care.

CAMERA LOCATION

The installer should optimize the license plate character height (in pixels) and the perspective and angle of the license plate within the camera's image.

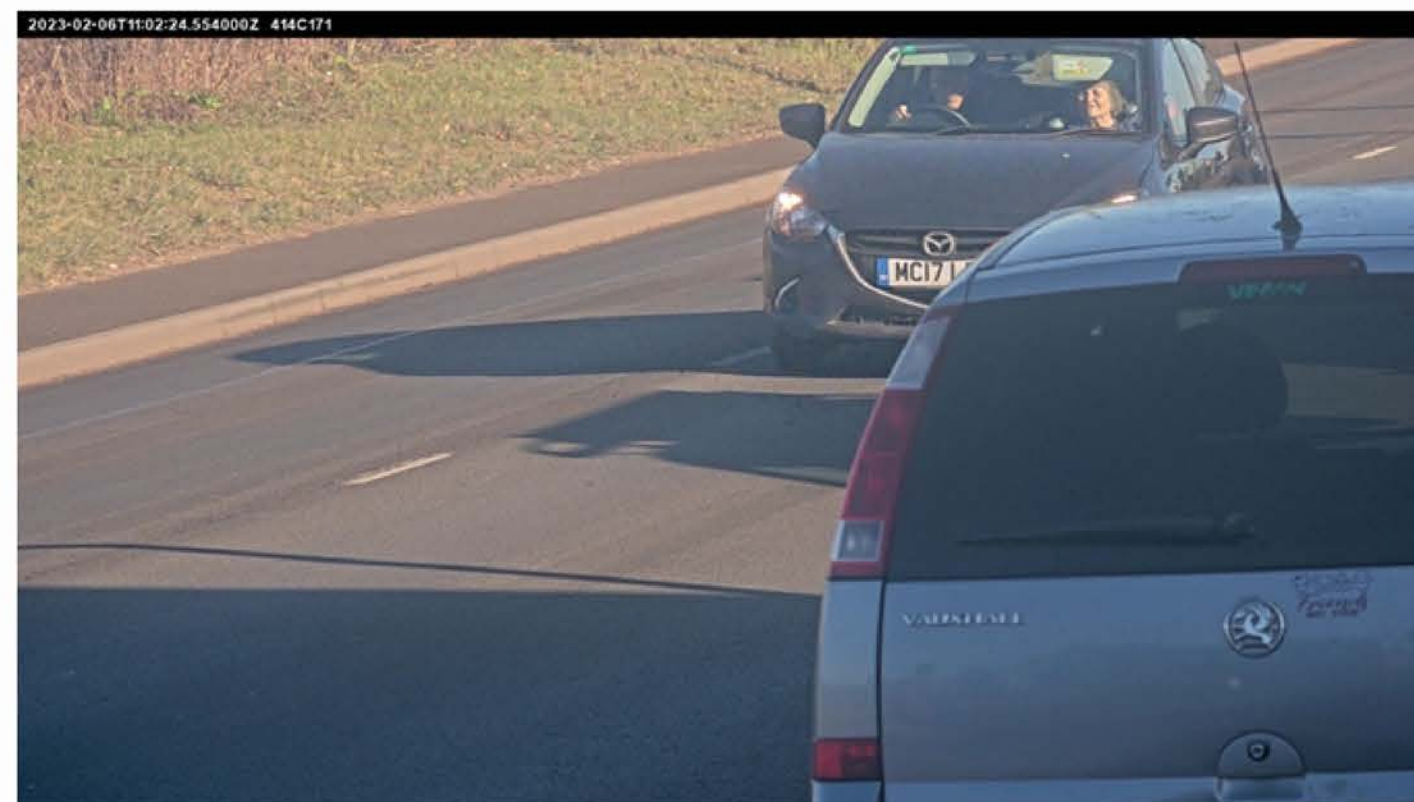




These objects may cause false triggering during recognition. Additionally, the camera should not be pointed directly at light sources such as the sun, bright streetlights, or reflective surfaces such as road-signs.

CAMERA LOCATION - MINIMIZING FALSE TRIGGERING DURING RECOGNITION

It is important to install the camera in a way that no high-contrast objects (e.g. billboards, wire fences, trees, windows in buildings, parked vehicles, etc.) are visible in the image frame.



TYPICAL SCENARIOS

1

Gate or barrier



Short distance read (4 mts)

Stop&Go / Slow Speed

Single Lane Recognition

2

Roadside - Urban



Medium Distance read (12 mts)

Medium Speed

Single or Double Lane Recognition

3

Gantry - Highway



Long distance read (18 mts)

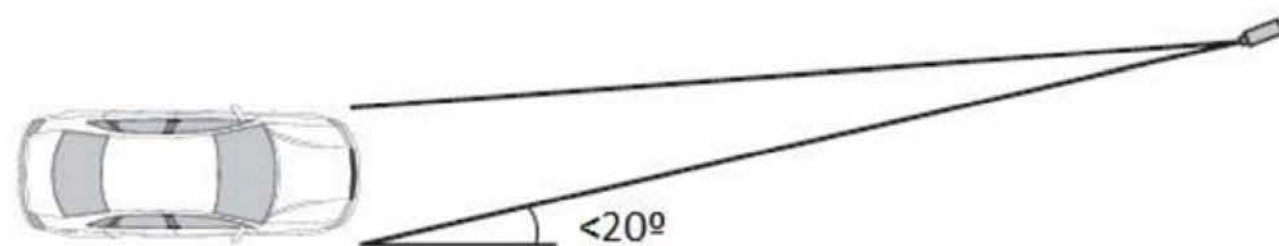
Medium – High Speed

Single or Double Lane Recognition

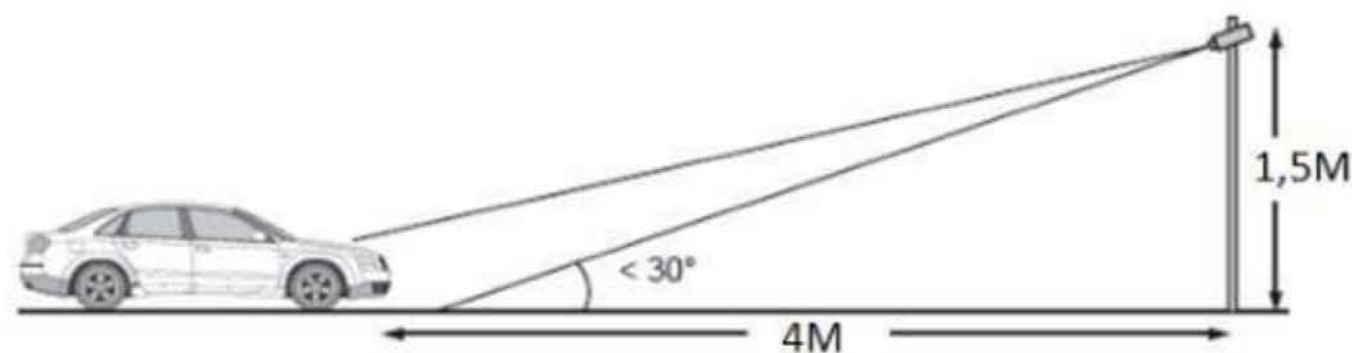


01

GATE OR BARRIER



Maximum recommended angle on the horizontal axis

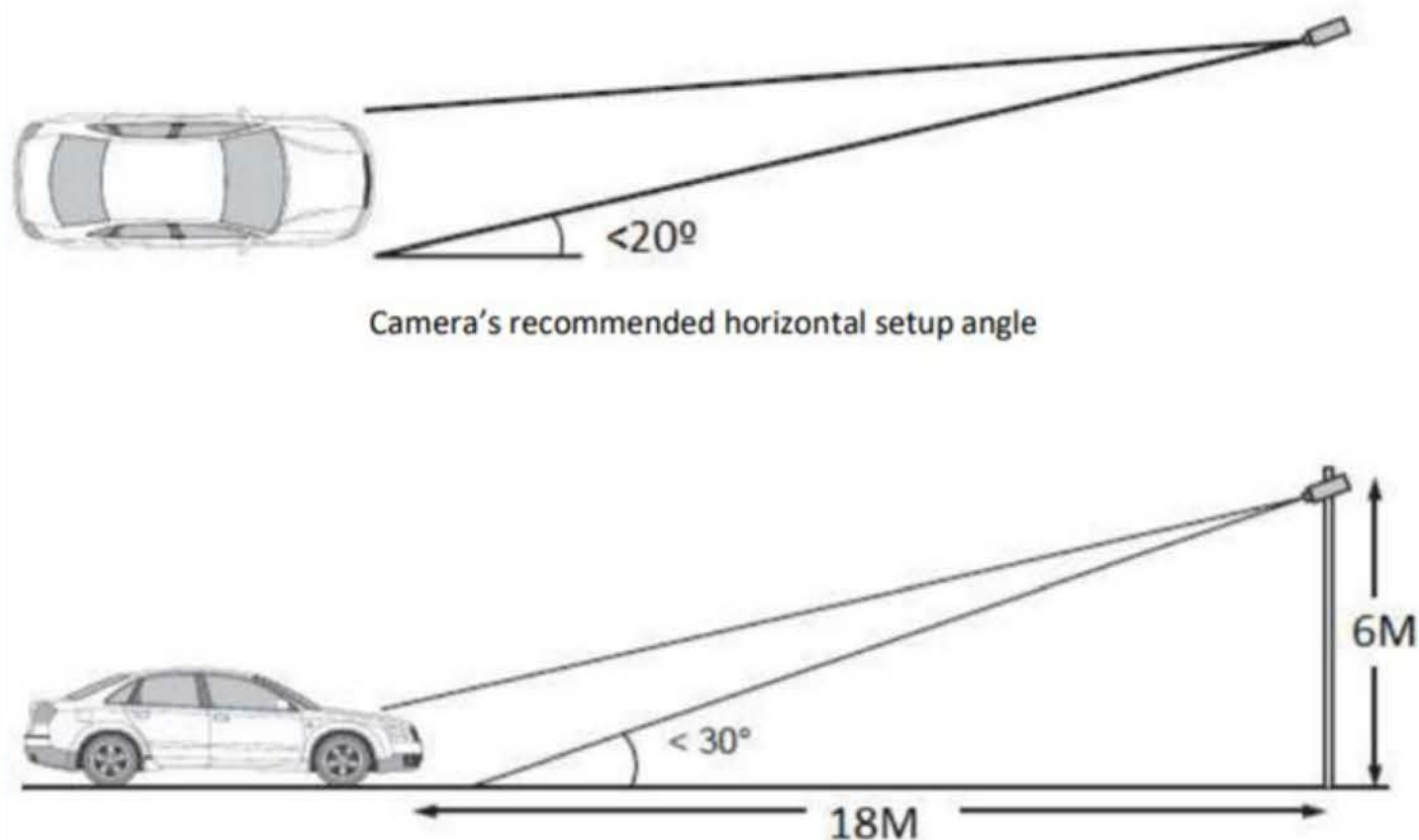


Maximum recommended angle on the vertical axis

Distance	Between 2 and 6 mts
Camera height	Between 1,5 and 2 mts
Vertical angle	Below 30°
Horizontal angle	Below 20°
Lanes	1
Lens aperture	The smaller the lens aperture, the more "in-focus" objects will be at varying distances.
IR	Not much IR power is needed.

02

ROADSIDE - URBAN

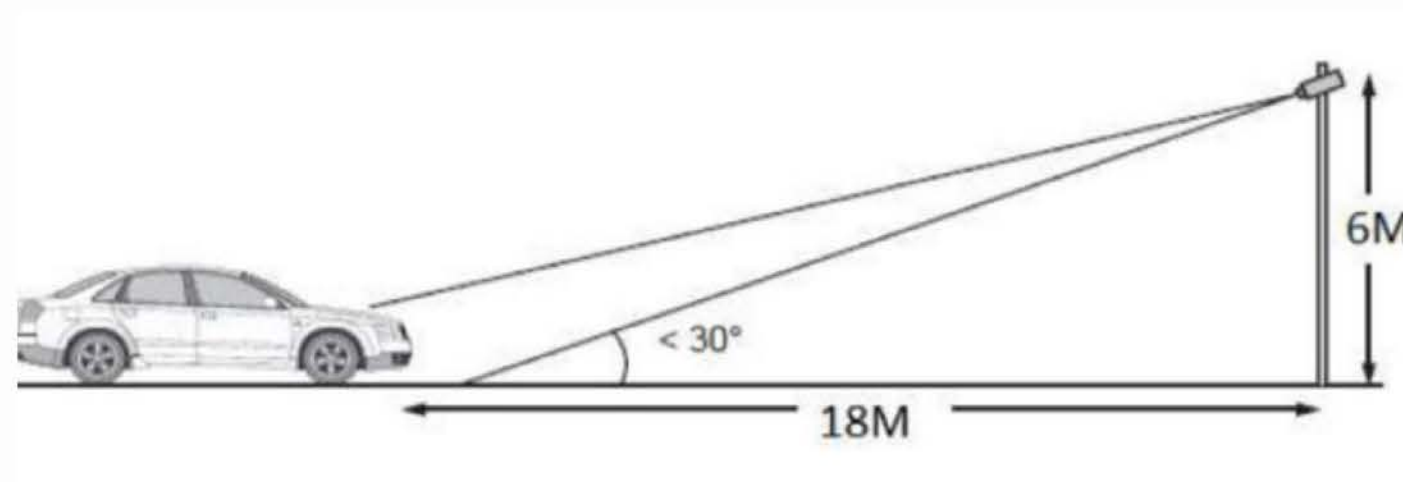
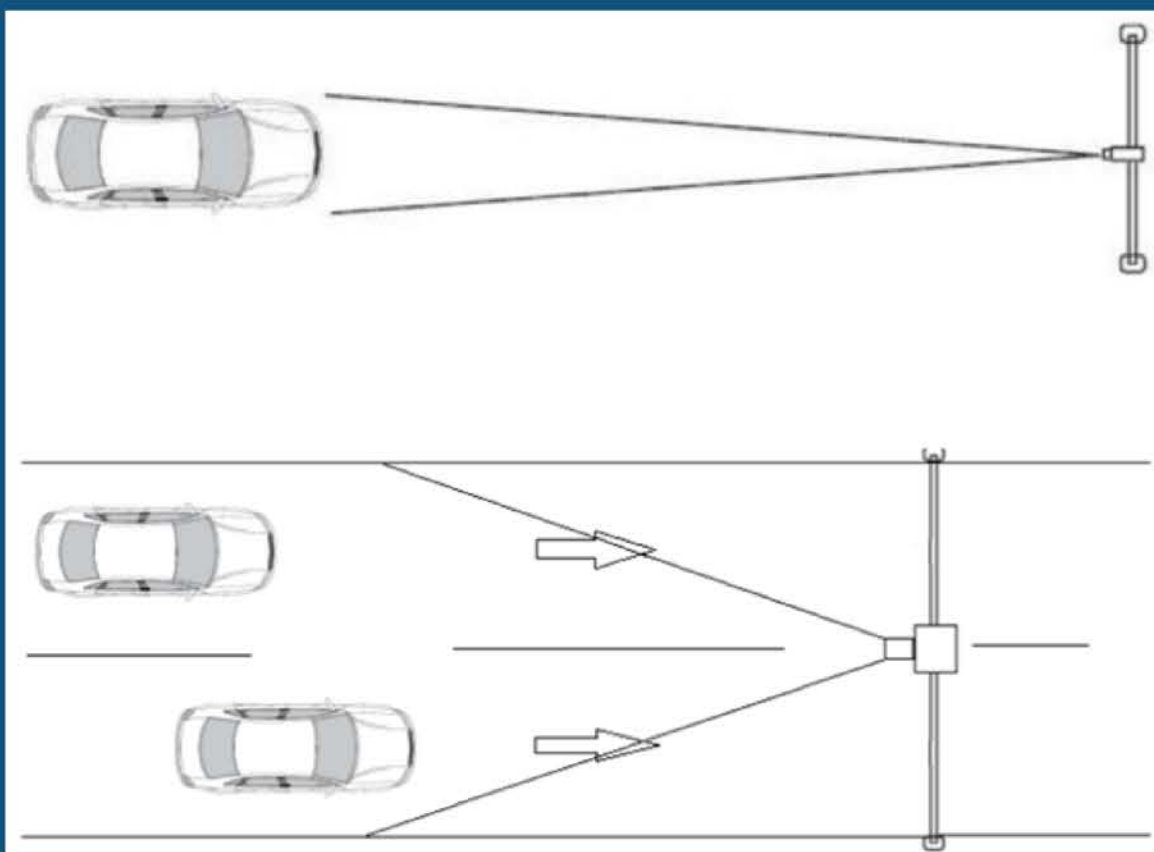


Distance	Between 12 and 20 mts
Camera height	Between 3,5 and 6 mts
Vertical angle	Below 30°
Horizontal angle	Below 20°
Lanes	1 or 2
Lens aperture	The smaller the lens aperture, the more "in-focus" objects will be at varying distances.
IR	Medium IR power is needed

03

GANTRY - HIGHWAY

Distance	Between 15 and 30 mts
Camera height	~ 6 mts
Vertical angle	Below 30°
Horizontal angle	Set in the centre of the lane or lanes
Lanes	1 or 2
Lens aperture	The smaller the lens aperture, the more "in-focus" objects will be at varying distances.
IR	High IR power is needed





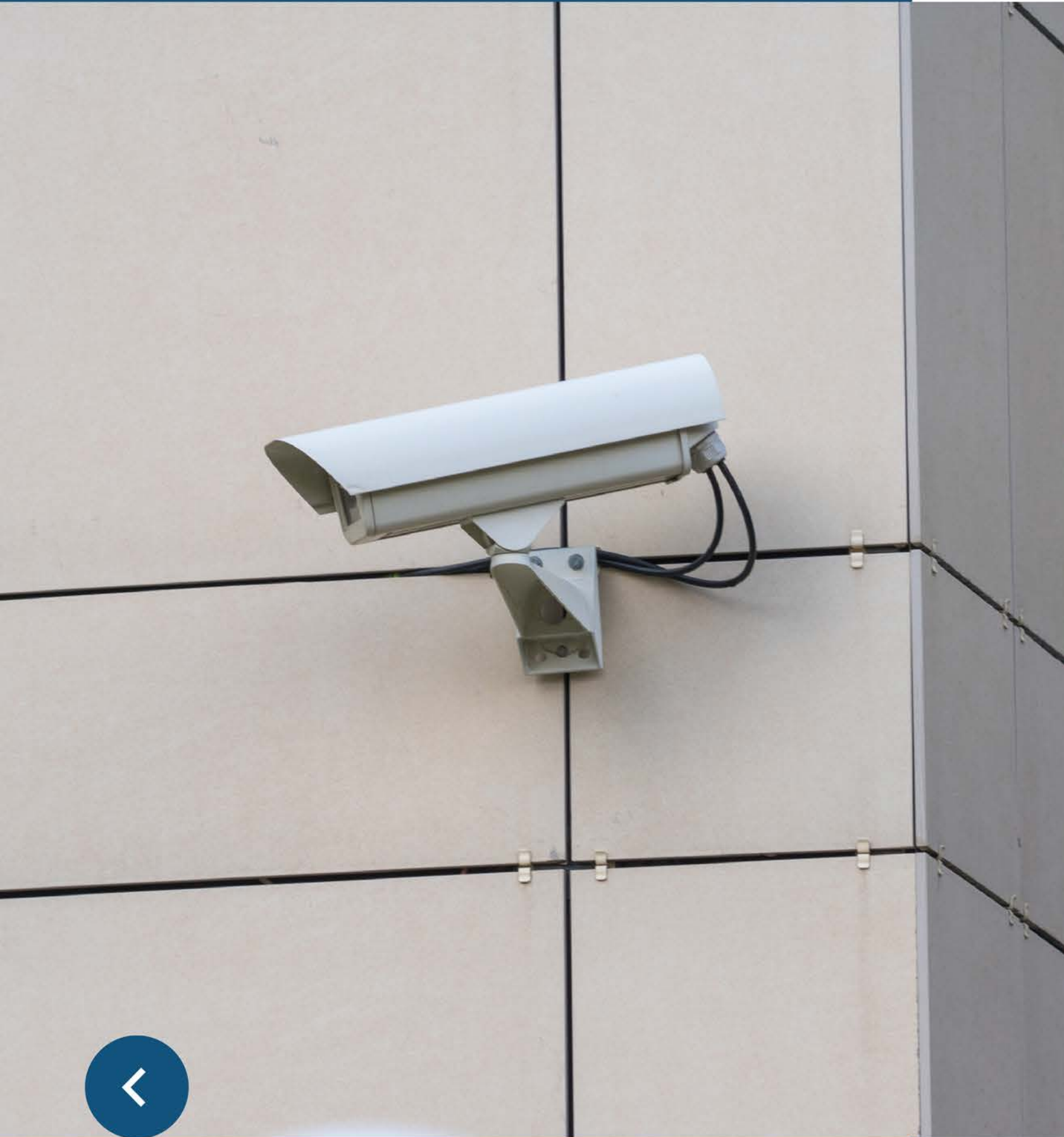
SCENARIO KEYS

- On a motorway or highway bridge above the traffic, then a height-to-distance ratio of about 1:3 is fine. So, at a height of 6m, aim to capture plates at about 18-24m down the road. For single-lane applications, the camera is fine at the side of the road. Try to minimize the angles as always. If vehicles turn as they approach the camera – then try to minimize the angles.
- At a barrier, use a low-mounted camera looking below the barrier arm – or a higher-mounted camera looking over the barrier arm – but beware that a rising arm can partially obscure the plate and sometimes cause an extra partial plate to be read
- At site entrances, sometimes cameras can be ceiling mounted to get an unobscured view of the approaching plate – but bear in mind the 1:3 ratio. Vehicles approaching a site entrance can tailgate and if not separated then the tailgating plate will not be read. Separate cars using speed bumps.
- Very wide lanes can cause problems. Insist on some traffic management to guide vehicles into the camera's field of view.

Others Factors Affecting Recognition

- Bad weather can affect accuracy. Plates covered with snow or road salt will cause severe problems.
- Dirty, illegal or plates that have been tampered with can cause misreads.
- Plate carriers that touch the edge or characters can cause misreads.

- Plate carriers with Perspex can cause light to be reflected or refracted and characters can be misread.
- Front plates are normally cleaner than rear ones as dirt vortexes are created behind a vehicle.
- All this is common sense, and a bit of practical experience will make all this obvious.



TO SUM UP

Image resolution

Always use the minimum resolution that does the job properly, the more image size the more processing time the analytic requires, in some cases it will affect the detection rate. Do not use more resolution than you need.

Camera intrinsic parameters

Carefully check the shutter speed, WDR status, gain value... those parameters affect the image quality specially in high-speed motion or low lighting environments.

Camera horizontal angle (yaw)

Keep the horizontal angle as low as possible. The countries with lower text font width / height ratio are more sensitive to this. If the angle is high the OCR will lose accuracy.

Camera vertical angle (pitch)

Do not exceed the 30 degrees and never mount the camera underneath the license plate as rain will then collect on the lens. High angles affect the OCR accuracy.

Wide Dynamic Range

This can have a detrimental effect on the image especially at night where frames are combined to produce a more evenly lit image which can cause artifacts.



IMAGES SAMPLES



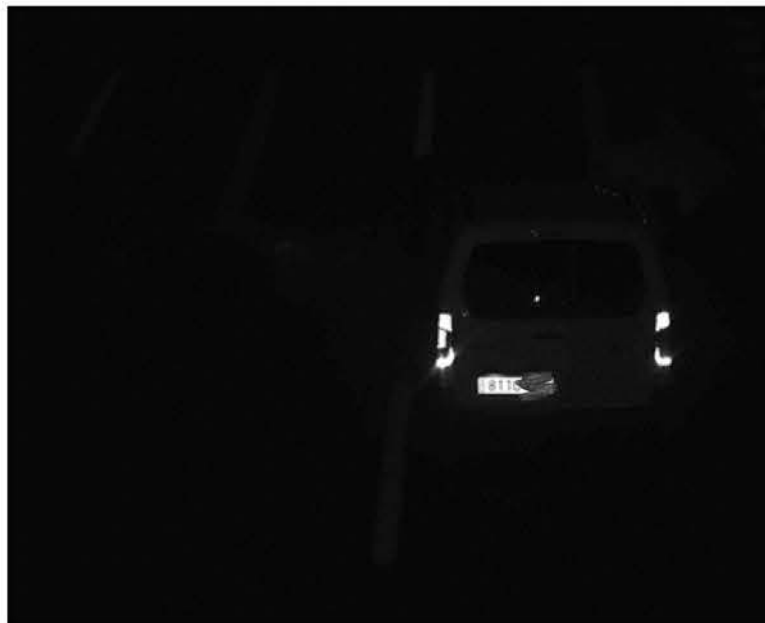
WDR ON – Artifacts at night



IMAGES SAMPLES



IMAGES SAMPLES



THANK YOU!



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