MEASURING LICENSE PLATE RECOGNITION ACCURACY

This document identifies how to properly measure LPR performance accuracy using simple math, clarifying readable and nonreadable plate criteria.

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License Plate Recognition systems (LPR), have been around for over 30 years. One misconception, often falsely claimed, is the ability of LPR systems to read 100% of license plates 100% of the time. Although ideal, it is simply not possible. End-users and manufacturers often have different ways of stating their LPR system claims, which ultimately leads to customer dissatisfaction or mistrust about manufacturer's accuracy claims. The savvy customer looking to buy an LPR system should be aware of the factors out-lined in this article.

Customers understandably want the highest levels of accuracy for a variety of reasons. Whether it be for throughput or helping officers keep their eyes on the situation rather than typing plate numbers, accu-racy plays a critical role in selecting the proper LPR. Since accuracy is so critical we're going to take a look at what factors contribute to LPR accuracy and how to avoid many of the mistakes companies make in selecting a solution.

Readable vs. Non-Readable Plates

At Perceptics, we like to say, "If you can see it, we can read it." Here are some obvious reasons a plate cannot be read:

- License plate missing from the vehicle
- License plate outside of the camera's field of view
- Damaged license plates:
  - Portions of the plate are missing
  - Plate is bent or otherwise distorted in a manner that alters the shape of characters that constitute the registration number or identify the plate origin
- Plates mounted in a manner inconsistent with the law of the state en-tered, i.e. plate is displayed in the rear window of a passenger vehicle
- Obstructed plates
  - An object, such as a trailer hitch, prevents a clear view of the origin or the registration number
  - Any object that obscures the outline of the origin or the registration number, such as a license plate frame

> "A common misconception about LPR is the ability to read 100% of license plates 100% of the time."

EXAMPLES OF NONREADABLE PLATES

Figure 1 - Obstructed Plate

Figure 2 - Bent Plate

Figure 3 - Damaged Plate
(worn & broken characters)

Figure 4 - Obstructed Plate
(vehicle in tow)

Doing the Right Math

In order to do the math right, you've got to do the right math. Unfortunately, not every LPR manufacturer measures accuracy the same way, so having a clear definition of accuracy is a good way to hold your LPR provider accountable. Below is a simple equation to help define accuracy.

Simple Accuracy Measurements

$$\frac{\text{No. of vehicles detected}}{\text{Actual No. of vehicles}} \times 100 = \% \text{ Vehicle Detection Rate}$$

$$\frac{\text{No. of plates read}}{\text{No. of readable plates}} \times 100 = \% \text{ Plate Read Accuracy}$$

But what constitutes a "plate read"? What is meant by "readable plates"? This is where your definition and your supplier's definition may be worlds apart, which can translate into a bad LPR purchase experience.

Let's start with what constitutes a plate read. A license plate is made up of a series of alphanumeric characters and an origin (state, province or country). In order to say a plate was successfully read, the LPR system should correctly identify each alphanumeric character. For example, if a registration number on a plate is QD5 E37, the LPR should report QD5 E37. Be careful of LPR providers read rates which are based on individual characters. Misleading statements such as "we read the letter Q correctly 99% of the time, the letter D correctly 90% of the time", and so on. Looking at things like this can quickly result in the overall accuracy being very low. When comparing read rates/accuracy between LPR companies, it is important to cite specific examples to see how their responses will differ one from another.

Identifying the plate origin can also be very important. Find out if the LPR provider's accuracy statement also means correctly identifying the state or province ID. Knowing the origin of a plate is often times critical to accessing government and local databases. Don't forget to ask yourself if knowing plate origin is critical to achieving your goals.

Other Components Aiding Accuracy

Below are other things that have an impact on overall accuracy and should be considered when making a selection.

- Trigger mechanism: A device that recognizes the presence of a plate or vehicle to initiate the read process. There are a wide variety of sensors that can be used to tell the system when to capture an image and each type has an impact on overall system accuracy.
  - Through Beams – Ideal for passenger only vehicle's and controlled traffic at access points.
  - Laser sensors – No road construction is required for lasers and their accuracy is nearly 100% accurate, however inclimate weather can have a negative impact on their ability to perform consistently.
  - Video Analytics – Video analytics is the least accurate triggering mechanism but has the benefit of not requiring any devices on the road surface. Plate detection is achieved through software, but the number one problem with video analytics is that you don't know when a plate went uncaptured.
  - Loops - With nearly 100% accuracy and impervious to weather, in-ground loops are the most accurate triggering device available. The downside of loops is they do require a lane closure and minor road construction to properly install them. Resurfacing of roadways may require rework of the loop sensor wire.
- Illumination source: generally speaking, there are two types of illumination sources:
  - Infrared – ideal in situations where covertness is desired over accuracy. Typical IR systems glow a faint red or briefly emit a red light source.
  - Visible/Near Invisible light – Typically chosen when state ID and/or high accuracy is desired. Talk to your provider about ways in which these light sources can be made non-distracting at highway speeds. At lower speed applications the visibility of the light may be a non issue. This light source is also ideal for capturing retro and non-retro-reflective plates.
- Camera – Don't be fooled by mega pixels. Capturing plate accuracy accurately has very little to do with how many mega pixels the cameras has. The most savvy LPR buyers choose to focus on ensuring a minimum pixel count at the point the plate is read. Focusing on the highest pixels/inch removes final layout geometry from the issue.
- OCR: Optical Character Recognition software. This is the "brains" of the system that actually interprets the plate image into individual characters. Ask your suppliers who controls their OCR engine and how often they provide updates. Find out if processing is done at the camera or offline away from the camera? A good OCR engine is continually refined and improved upon, and the LPR provider should have control over this process.

This brief should prove helpful when properly selecing an LPR system and aid you in navigating what can be a tricky process. And remember, you can always call Perceptics to help you weigh through all the options.

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