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A CORNERSTONE OF THE RISING "FRICTIONLESS PARKING" TREND

The Promise and Challenges of LPR

• By Jon Martens

License plates have been a constant presence on U.S. vehicles for nearly a century. Since 1918, each state has issued plates to identify vehicles and keep track of their owners. Today, however, the license plate is much more versatile than ever, because of license plate recognition (LPR) technology. Now plates can be read automatically (at least in those states that don't limit license data collection by law), and the information can be converted into data for tracking and processing by law enforcement agencies.

LPR technology also has made a splash in the parking industry with advances to camera and computing technology. In fact, it has become a cornerstone of the rising "frictionless parking" trend.

With frictionless parking, drivers are able to enter and exit parking facilities without stopping to present a credential (such as a proximity card), and displaying a permit has become a thing of the past. Queuing when exiting can be greatly reduced as the plate is recognized as being paid before the paid ticket can be inserted to activate the gate.

Frictionless systems read the driver's license plate information and associate it as a valid credential, and the same system operates entry and exit gates. In essence, the license plate becomes the permit for those who reserve parking and the payment ticket for transient parkers.

LPR can not only manage revenue control, but also handle access control, limiting access to those parkers authorized to use a particular garage or lot.

Additionally, combining mobile LPR with pay-by-plate meters and pay-by-cell offers significant efficiencies. And, of course, LPR systems make enforcement much easier, because each vehicle in the parking facility is accounted for.

As useful as LPR is when combined with, say, meters, it does pose challenges. For instance, what happens when a user enters the wrong plate number or transposes a number? To manage this, some systems can consider "fuzzy logic"; otherwise, a ticket will likely be issued and the situation will have to be addressed through an appeal process.

Accuracy also can be a concern with LPR. What if the plate is blocked from view? Will temporary plates made of paper be readable? What about similar characters, such as an "O" and an "0"? These issues can undermine a system's capture and accuracy rates, as can sun glare, non-reflective plates, stacked character plates, dirty plates, and custom plates.

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LPR Camera Array

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These main factors – capture rate and accuracy rate – should be considered in the overall application and performance of an LPR system.

Capture rate considers the total number of vehicles observed to the number of plate images captured and read. It can be impacted by several factors that are typically not a direct function of the LPR system. For instance, a plate that is not visible or damaged cannot be captured by the system.

Common reasons for non-visible plates include: It is missing or positioned in the vehicle's window; damaged or dirty; blocked by a trailer hitch, bike rack or similar item; a temporary paper plate; non-reflective; or surrounded by "clutter," which can confuse the LPR system.

What if the plate is blocked from view? Will temporary plates made of paper be readable? What about similar characters, such as an "O" and an "0"?

Plates not automatically captured are considered exceptions and require human review to locate, visually interpret, and enter the plate digits manually. Because these plates are not readily visible, the LPR system can't be expected to read them, and thus they are typically not counted against the accuracy level of the system.

Accuracy rate is calculated using the valid plate reads and the number of characters that match for each of the captured plates. Captured plate data are compared with the actual plate image and given a confidence score based on the number ("N") of characters that match. An "N-0" score indicates a perfect match with all characters matching on the plate.

Obviously, the stronger the score, the better the system is at accurately reading plate digits. Assuming good capture on entry and exit, the system with higher and consistently accurate plate reads is more likely to provide a good match and reduce the need for manual review.

So how many vehicle plates *won't be* readable? And of those that *are* readable, how many will be inaccurate? To determine this, we at Walker Parking Consultants researched captured plate images from both stationary and mobile LPR platforms.

Based on the data, the average valid capture rate for stationary LPR was found to be about 92%, meaning that, on average, just less than 1 of 10 vehicles has a plate that is either blocked in some way, missing or damaged.

In all fairness, the sample ranged from a low of 78% to a high of 97%. While you can't keep folks from carrying bicycles that block the plate, you can ensure the camera is positioned and triggered to obtain the best possible shot of the plate.

From a performance expectation, gated systems should have near perfect capture rates of the vehicle to allow human verification of the plate number if needed.

Capture rates of mobile LPR was based on reads of plates and "non-plates." The reviewed samples contained several non-plates recorded as reads, including signs, drains and even some plant leaves. Accuracy of the valid plate images was determined by evaluating the data characters and actual plate images where the plate was fully visible. The data indicated that 92% of the plates were perfect matches, or N-0.

When the parameters were extended to include N-1 matches, that accuracy level increased to roughly 97%. At N-2, accuracy increased to about 99%. Often, these accuracy levels are the ones discussed, as they represent the accuracy reads of plates that can be seen and analyzed.

Mobile LPR image accuracy levels were slightly lower, although as the number of required matched digits increased, the levels were about the same.

The bad news is that plates that are "unreadable" due to no fault of the LPR system still must be dealt with and evaluated. In our samples of multiple lanes, when these unreadable plates are combined with plates less than N-0, the average was 84%. When the required match was reduced to N-2, the average increased to just over 90%.

Integrating LPR into your parking requires a plan for dealing with plates that can't be read or matched. No matter your application, you should plan to periodically review "exception" plates that can't be read during the capture process or that don't meet your required N read rate.

In stationary LPR configurations, this requires a computer review station that automatically displays the plate image or images requiring review for manual verification and correction. In mobile LPR applications, this typically requires a visual verification (after the enforcement vehicle stops) that the plate data match the actual plate, so that it can be compared to a database of valid plates.

Ultimately, an LPR-based frictionless parking system can provide significant benefits to both you and your parkers, but you need to have back-up systems in place for those occasions when a plate can't be read accurately.

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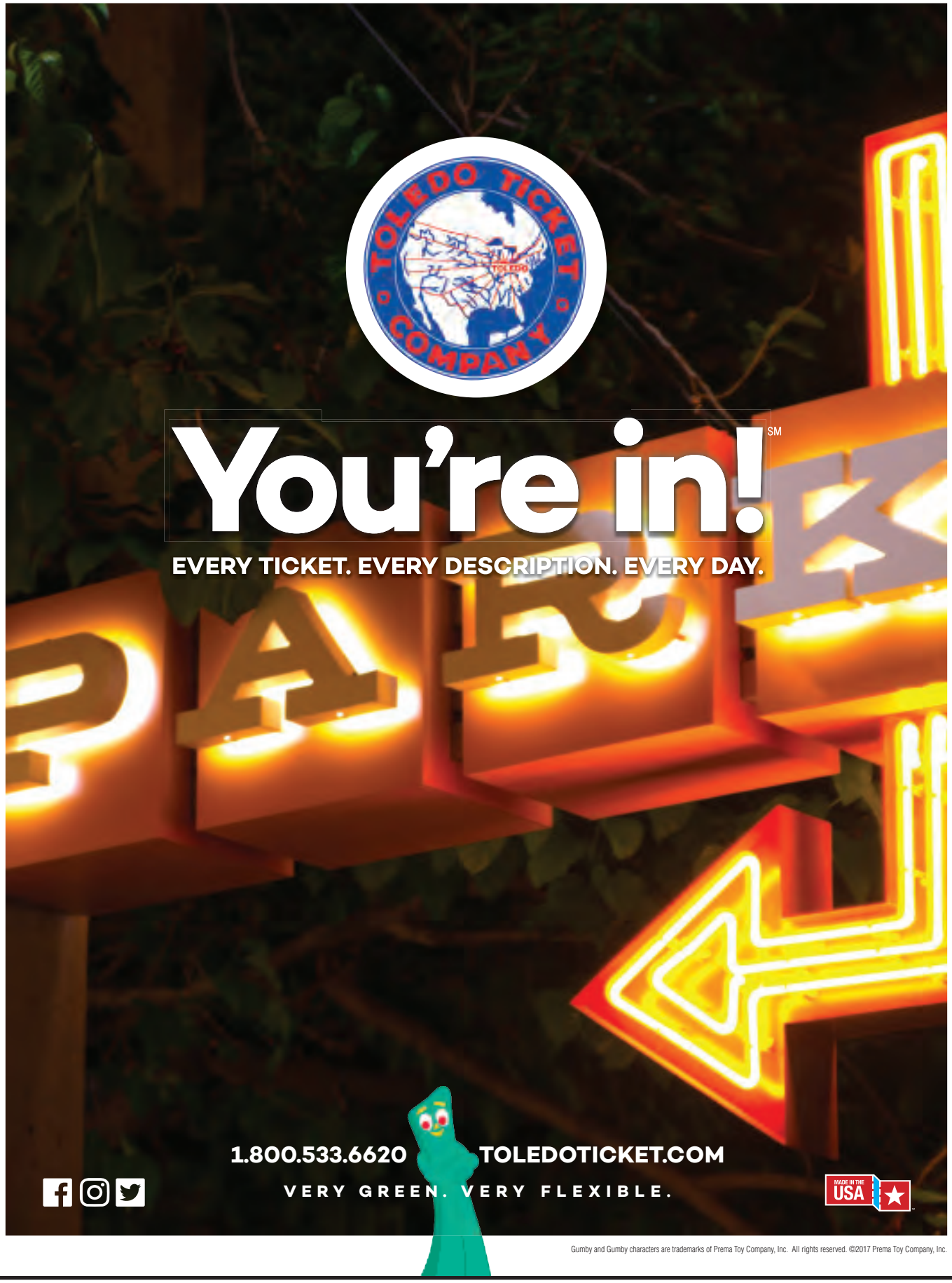

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