

# Below the line

Bob Lees, co-founder of Diamond Consulting Services, on why the loop detector just refuses to go away



The versatility of modern loop-based detection solutions is epitomised in the reversible express lanes and cashless multi-lane open road tolling application for the Tampa Hillsborough Expressway Authority (above and above right)

The more strident proponents of newer and emergent detection technologies are quick to highlight what they see as the disadvantages, and hence the imminent passing, of the humble inductive loop. The more prosaic will acknowledge that loops continue to have a part to play in traffic management, falling back on the assertion that it is all a question of application. And yet year after year the loop, despite its 'inherent' disadvantages being trumpeted to the heavens, continues stubbornly on.

In fact, its percentage share of the overall detection market continues to be a lot higher than most people think, according to Bob Lees, co-founder of Diamond Consulting Services (DCS), the company which developed and markets the Idris loop-based automatic vehicle detection and classification technology.

"Broadly, the loop market breaks down into three sectors: intelligent transportation systems (ITS); traffic and signal monitoring; and parking," says Lees. "Parking in particular is a volume market, where loop detectors sell in the tens of thousands at a commodity price."

## A solution for all seasons

"Loops are ubiquitous and for one very good reason: their performance is unaffected by weather. That's not such a consideration in controlled environments but it's a different story in open conditions. Loops are also less prone to vandalism or theft - an issue in countries

and locations where high crime is an issue.

"But perhaps the biggest point-scorer is loops' versatility, something we've proven with Idris. We've been able to do things that were inconceivable even a few years ago, such as working in congestion. Traditionally, a loop was 'on' or 'off'. Even the proximity of vehicles was enough to give a reading of continuous occupancy with the consequence that, for example, data recorders based on simple loops don't work under these conditions."

"However, using digital signal processing techniques you can do some very clever things with the vehicle profile, allowing vehicles to be properly separated and classified in congestion. By their very nature loops are very accurate point source detectors which have well-defined behaviour characteristics, for example when vehicles are shifting between lanes. This behaviour allows us to determine with extreme accuracy the difference between two vehicles side-by-side and a vehicle straddling the lanes. This increase in accuracy is one of the reasons why loops using these techniques are so well-suited to high-speed tolling and shadow tolling applications."

## Invasive versus non-invasive

The 'traditional' disadvantage of loops is the need to bury them in the road surface. Lees: "Magnetometers are somewhat easier to install in the road surface but they're only able to detect ferrous metals. With more and more vehicles using non-

ferrous materials in order to reduce weight and improve economy, that's a limitation. By contrast, loops measure changes in inductance, so aluminium, for example, isn't an issue.

"The choice between invasive and non-invasive detection solutions drives the question of whether the loop will survive as a technology in the long term.

"Granted, network operators might not look too kindly on the idea of someone cutting into the surfaces of their shiny new high-speed roads' porous surfaces and if you go to Scandinavia, for example, where many roads' wearing courses are re-dressed each spring to a depth of about 40-60mm because of the damage inflicted by studded winter tyres, loops don't look to be especially viable. But there is an alternative.

"We announced at Intertraffic this year our ability to offer a complete data-recording axle-based array using loops that are positioned in the sub-base of a road under the wearing course. It's a concept that's been around for some time but detection companies have shied away from axle-based applications because of the inability to achieve the required sensitivity. In our experience, there are two loop detector manufacturers offering products that will give the necessary performance when allied to Idris - Nortech and Quixote. We haven't yet qualified the solution for tolling applications but we're currently looking to see if it's practicable.



"In truth, it's a question of measuring loop life against road life. Mounting in the sub-base effectively means that a loop's operational life can be as long as a road's - provided it's been installed correctly. Most serviceability problems come about because a loop's joint's gone or the sealant has broken up.

"Another criticism of loops is in many ways an advantage: once a loop goes, it goes. There's no gradual degradation as with other, mechanical solutions. Typically, with Idris, you put it in and leave it alone."

### Applications

Lees agrees with the manufacturers of competing technologies that technology choice is a question of application.

"Look at the use of Idris in incident management: it can pinpoint a stopped vehicle to within around 100m [330 feet]. Then, you need a camera to see what's going on. It's a case of '1+1=3', and when you get engagement on that basis the advantages of a holistic approach become apparent very quickly.

"I can see loops continuing to have a significant part to play over the next 10-20 years so long as vehicles continue to be made of metal. If you were to go back 10 years and say, 'Idris will be the Gold Standard for axle-based ORT,' people would have ridiculed you. Well, that's where we are. So look forward. Of course loops have a part to play. Whether other technologies overcome their current

inadequacies or new ones emerge... to answer that, I come back to positional accuracy.

"You want something new? Video, 10 years ago, was the knight in shining armour. It's still struggling in some aspects - vehicle obscuration, bad weather and sun angle to name but three. At intersections in particular there are huge safety issues and we're actually seeing roads jurisdictions coming back to loops because they're consistent and accurate.

"But don't assume that loops will stand still. There's constant innovation. DCS filed patents 12 years ago on an axle-count system for high-speed tolling. We still have no real competition. In many ways I'd welcome it because it would validate what we do.

"An alternative to axle-based ORT is volumetric measurement. You can do this from above ground but not, I would argue, to the same accuracy. In truth, I don't think people always look to loops as the first-choice technology for detection but the fact is that they give the accuracy that people need.

"It's all dependent on the required level of accuracy, of course. In Germany, Toll Collect is axle-based but the classifier is the vehicle's onboard unit. In North America, AVC is the primary classifier, to ensure that they can take account of things like raised axles, trailers and abuse."

### Looking forward

Future applications are, according to Lees, a product of imagination: "We're already at 99+ per cent accuracy. We'll keep raising the bar. And broadening the product range; we started in 1996 as a multi-lane engine on the M25 around London and we have a very accurate core engine. The issue is presentation to the market, not technical. It's important to address the market need and adapt to meet new applications - development should always be market-driven.

"Idris started as an incident detection product. Then that got un-sexy. Now there's a move to protect assets and towards applications such as hard shoulder running. In many respects we're going back to where we started but with a much more accurate engine. A particular advantage of Idris is that it can use existing infrastructure. In the UK, for example, it can be used in conjunction with MIDAS loops, which are sited every 500m [1,650 feet] along the motorways.

"In congested conditions, you're looking for queues and shockwaves. The worst you might expect is a few fender-benders. In high-speed conditions, a stopped vehicle is a much more serious proposition because there's a real risk of serious death or injury. Idris processes across the whole spectrum. With camera

walls there's a risk of operator blindness. Loop-based detection using Idris can provide alerts in both open road conditions and confined spaces such as tunnels.

"Turn that around: a camera can be used to identify a high-value vehicle or potential risk, such as a HAZMAT carrier. Those assets can then be tracked very accurately across a road system using Idris - we can identify and track individual vehicles.

"On inter-urban routes, there's the ability to detect the 3am run-off vehicle and target the response of emergency assets. And from 2014 when the new European Directive on tunnel safety comes into force, which lays down rules on queuing and headways, there is the opportunity to proactively manage access; tunnels in particular are a prime example of where cooperation between different detection technologies is a sum greater than the parts.

"In the enforcement field, red light running applications are progressing to speed on green. There are solutions out there at the moment, more so in Europe, but the US is following. We can detect cyclists, although pedestrians are a problem - though it is possible to discern from patterns of movement that something is amiss."

In the final analysis, he concludes, the loop will continue on for some time yet by virtue of the traffic market's very nature:

"This is a very slow-moving and conservative sector - it has to be, given the safety issues involved. But what that means is that for every new innovation that comes along - and there are authorities and jurisdictions out there which are prepared to run with innovation and experiment - there is a vast bulk of transport engineers and professionals who look for validation. The loop continues to provide that and will do for some time yet." ■

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