

Mapping out the future of GPS technology

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Ditching satellites and complex, powerful computers and opting for camera technology inspired by small mammals may be the future of navigation systems.

Dr Michael Milford from Queensland University of Technology's (QUT) Science and Engineering Faculty said his research into making more reliable Global Positioning Systems (GPS) using [camera technology](#) and mathematical algorithms would make navigating a far cheaper and simpler task.

"At the moment you need three satellites in order to get a decent [GPS signal](#) and even then it can take a minute or more to get a lock on your location," he said.

"There are some places geographically, where you just can't get [satellite signals](#) and even in big cities we have issues with signals being scrambled because of tall buildings or losing them altogether in tunnels."

The world-first approach to visual navigation algorithms, which has been dubbed SeqSLAM (Sequence Simultaneous Localisation and Mapping), uses local best match and sequence recognition components to lock in locations.

"SeqSLAM uses the assumption that you are already in a specific location and tests that assumption over and over again.

"For example if I am in a kitchen in an office block, the algorithm

makes the assumption I'm in the office block, looks around and identifies signs that match a kitchen. Then if I stepped out into the corridor it would test to see if the corridor matches the corridor in the existing data of the office block lay out.

"If you keep moving around and repeat the sequence for long enough you are able to uniquely identify where in the world you are using those images and simple [mathematical algorithms](#)."

Dr Milford said the "revolution" of visual-based navigation came about when [Google](#) took photos of almost every street in the world for their [street view](#) project.

However, the challenge was making those streets recognisable in a variety of different conditions and to differentiate between streets that were visually similar.

The research, which utilises low resolution cameras, was inspired by Dr Milford's background in the navigational patterns of small mammals such as rats.

"My core background is based on how small mammals manage incredible feats of navigation despite their eyesight being quite poor," he said.

"As we develop more and more sophisticated navigation systems they depend on more and more maths and more [powerful computers](#)."

"But no one's actually stepped back and thought 'do we actually need all this stuff or can we use a very simple set of algorithms which don't require expensive cameras or satellites or big computers to achieve the same outcome?'"

Dr Milford will present his paper SeqSLAM: Visual Route-Based Navigation for Sunny Summer Days and Stormy Winter Nights at the International Conference on Robotics and Automation in America later this year.

Provided by Queensland University of Technology

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