

Ideas on the Edge



GPS Gets a Little Downtown Attitude

ABOELMAGD NOURELDIN AT ROYAL MILITARY COLLEGE WANTS TO HELP GPS GET DOWN IN THE DOWNTOWN.

Millions of motorists world wide are getting hooked on GPS. After all, what could be cooler than getting your location to within a few metres from a set of satellites 27,000 kilometres away?

But global positioning system technology has an uncool side: it's just not hip to the downtown scene.

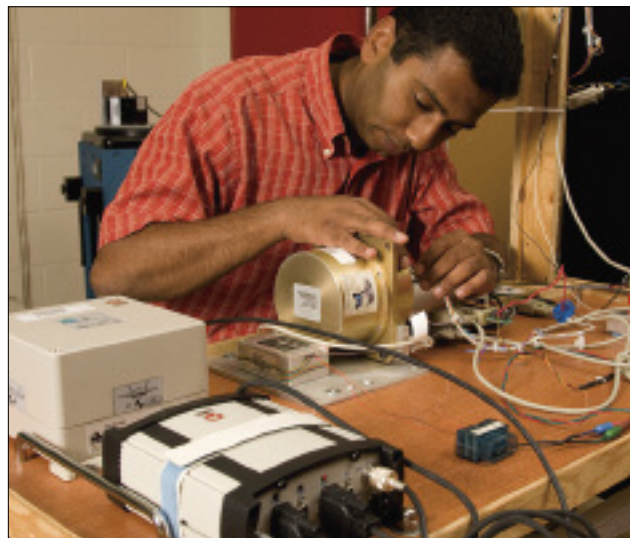
A GPS unit depends on receiving signals from at least four satellites at a time in order to plot its position. That's great in the open countryside, or in the suburbs. But in an urban environment, obstacles like

bridges, tunnels and tall buildings can scramble those signals—or block them out altogether. It's not unusual to lose GPS contact for up to 10 minutes at a time—an outage that can put you a very uncool distance from where you want to be. And if you're a commercial or emergency vehicle navigating downtown, the result can be costly—or tragic.

Dr. Aboelmagd Nouredin wants to change that. He and his team at Kingston's Royal Military College, are

looking for ways to make tomorrow's GPS hipper to the city.

Their solution is to combine GPS satellite data with information from an "inertial navigation system"—a package of tiny instruments that can sense every change in a vehicle's direction and speed. The instruments are similar to the devices that track





ABOELMAGD NOURELDIN

movement in some console game systems and high-end cell phones. Created using MEMS technology—micro-electric-mechanical systems—these sensors

are barely the size of a pinhead, and are optically engraved onto computer chips.

Such inertial navigation systems (INS) have their own problems, however. While the

sensors are very accurate, errors do eventually build up, in somewhat the same way that your sense of direction and distance

eventually drifts if you keep your eyes closed in a moving car.

The RMC approach is to combine the strengths of both

technologies. When a car is receiving GPS data, Dr.

RESEARCH THAT MATTERS
REAL-WORLD BENEFITS FOR ONTARIANS:

- more accurate electronic navigation in the city
- leadership in the rapidly developing field of artificial intelligence



PRECISION TOOLS LIKE THIS ROTATING TEST PLATFORM LET THE RMC TEAM CALIBRATE THEIR TEST SYSTEMS.

Noureldin’s hybrid system uses artificial intelligence routines to compare satellite information with what the inertial devices are saying. By continually noting any discrepancies and how they occur, the system “learns” how to correct for any drift in the position the inertial sensors are plotting. Whenever obstacles block or distort the GPS signals, the system applies that knowledge to tweak and correct the inertial navigation reading until the overhead signal is restored.

Just how practical is it?

“We should have a finished prototype in a year,” says Dr. Noureldin. And a major car maker is already calling. Cool.

Project: Autonomous Vehicular Navigation Laboratory
Institution: Royal Military College
Research Sector: Engineering
Principal Investigator: Aboelmagd Noureldin
Trust Investment: \$107,560
CFI Investment: \$107,560
Total research investment from all sources: \$302,194



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