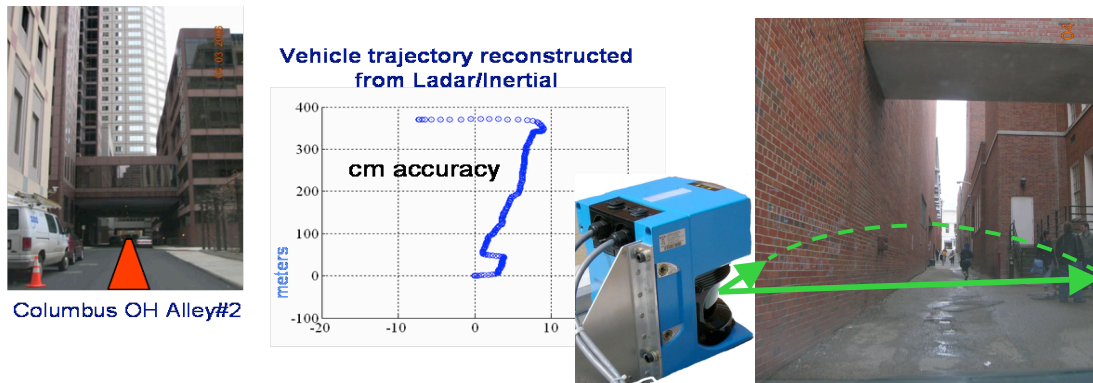


Urban Navigation Using Tightly-Integrated Ladar/Inertial

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Sponsors: Air Force Research Laboratories (AFRL), Dayton Area Graduate Student Institute (DAGSI)



Performance of a Tightly-Integrated Ladar/Inertial System. Left: Alley in Columbus, OH, where GPS navigation is not available; the plot shows centimeter-level positioning performance using a tightly-integrated Ladar with a tactical grade inertial measurement unit (IMU). Right: Artist impression of a SICK Ladar scanning an alley in Athens, OH.

There is a need to provide a much-needed capability for operations in urban environments where GPS is not available due to shielding, excessive errors due to multipath, and the proliferation of new GPS jamming techniques. Accurate (meter-level) and reliable positioning is one of the key enablers for urban operations.

This research effort integrates a Systron Donner DQI tactical grade inertial measurement unit (IMU) with a commercial SICK scanning Ladar. Tight integration enables high performance feature extraction and association, not possible with prior Ladar systems. Furthermore, the system can function with partial map and no map information. In addition to sub-meter positioning, the system also outputs precise attitude and heading determination and provides both high-density Ladar surveillance and obstacle avoidance capabilities.

Further reading: A. Soloviev, D. Bates and F. van Graas, "Tight Coupling of Laser Scanner and Inertial Measurements for a Fully Autonomous Relative Navigation Solution," *Proceedings of the Institute of Navigation National Technical Meeting*, San Diego, CA, January 2007.