Pervasive, Accurate and Reliable Location Based Services For First Responders

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Challenges for Location Based Services in Emergency Situations

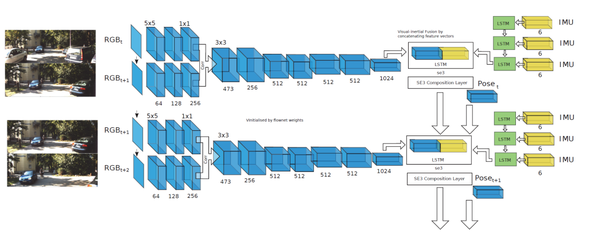
- Cannot rely on existing infrastructure or satellite tracking
- Poor penetration prevents use of high-frequency RF
- Need for high accuracy, availability and reliability

Approaches

- Combine multiple *pervasive* technologies with different failure modes to provide *reliable* sources of positioning information
- Fuse noisy trajectories into maps to provide *accurate* locations of all personnel in real-time

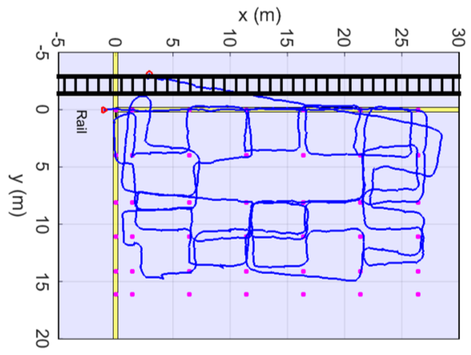
Visual Odometry

Exploit deep learning approach for combining visual frames with inertial data for highly accurate data-driven odometry:



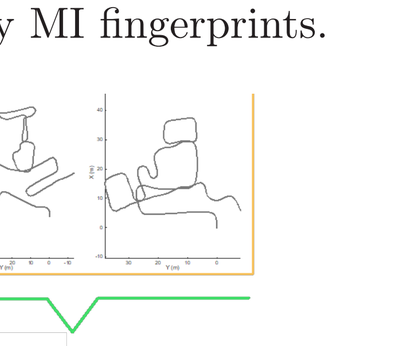
Inertial Tracking

Use robust dead reckoning methods for obtaining accurate trajectories:



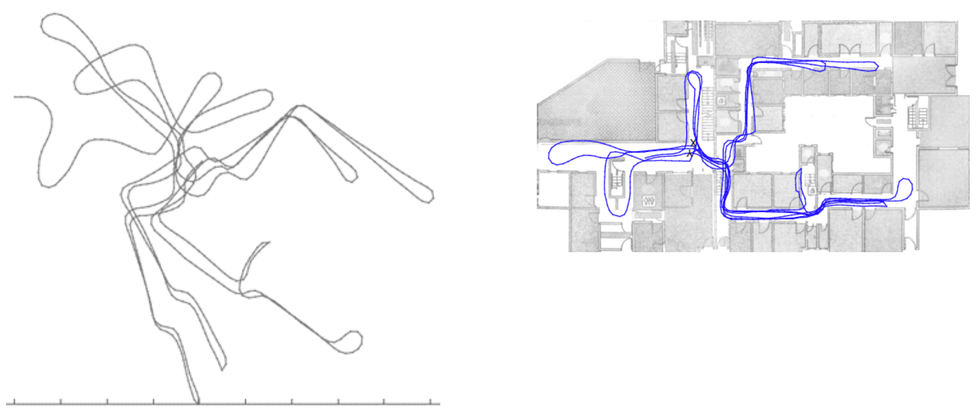
Magneto-Inductive

Magneto-inductive positioning and communication uses LF to penetrate dense materials:



Map Matching

When possible, exploit existing maps to "snap" noisy trajectories onto a 2.5D floorplan. Maps are augmented with additional features.



Trajectories with drift

Map-matched

Map Building

When maps are not available or accurate, multiple trajectories are stitched together to form an accurate map, bound by MI fingerprints.