Foot-mounted inertial navigation made easy

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Made easy in the sense ...

- We have built a module that modularizes the foot-mounted inertial navigation technology
Why is it important?

- Key engineering principle for large/complex systems
- Greatly reduces communication requirements/enables higher sampling rates
• Open source
• Good performance
• Low cost
Outline

• The modules
  - Modularize how ...
  - The implementation
  - Tracking results
• Supporting/supported research
• Final remarks
The modularization problem

- Typical implementation
  - Measurements from foot-mounted IMU to application platform
  - Processing on application platform

- Required for fusion but exposes system complexity and requires high rate communication
Stepwise dead reckoning
The modularization

- Step-wise aided inertial navigation
- Dead reckoning
- Low rate dead reckoning updates
Supporting hardware and software

- **Key features**
  - Multiple single-chip IMUs
  - Floating point uC
  - Wireless link (Bluetooth)
  - Low form-factor
  - Open

- **Software**
  - C (no OS)
  - Framework + algorithms
Performance results
Supporting/supported research
Calibration (supporting)

Tactical locator – TOR (supported)

Implement Setup


Some field experiments

- Search operation in smokefilled built-up environment
- 15min
- Fully equipped smokedivers
- Walking first part
- Crawling second part

Screen capture (5x)
Final remarks

- All resources at [www.openshoe.org](http://www.openshoe.org) (calibration and massive-MIMU platform as well)

- Possible to buy modules ([www.gt-silicon.com](http://www.gt-silicon.com))

- Demo tomorrow