uNavChip: **Ultimate Navigation Chip**

**Chip-Scale Personal Navigation System Integrating Deterministic Localization and Probabilistic Signals of Opportunity**

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**INTRODUCTION**

Localization, together with communication, are key capabilities to achieve effective situation awareness, coordination, and support. Agents are preferably localizing themselves w/o any infrastructure.

The enabling technologies include foot-mounted miniaturized inertial sensors, ranging devices, and a communication (com.) and processing (proc.) devices.

**APPROACH**

Inertial navigation, with foot-mounted sensors and motion models providing zero-velocity updates, constitute a unique, robust and high accuracy dead reckoning capability.

Signals of Opportunity (i.e., cellular signals) can be turned into our own “dedicated pseudolites” for position fixing and augmentation.

Cooperative Localization for a team of mobile agents, with comm. and comp. capabilities; jointly processing a relative measurement between any two agents increases localization accuracy.

**IMPLEMENTATION**

![Ultimate Navigation Chip (uNavChip)](image)

- Core
  - Inertial Measurement Unit, Clock, Altimeter, Proximity
- Guard
  - Authenticate external signals of opportunity
- Cloud
  - Detect external signals of opportunity

*Provide maximum autonomy, security, precision*

**ENABLING TECHNOLOGY**

- **Micro-Electro-Mechanical Systems**
  - 15 mm²

**REFERENCES**

