

# Pervasive Personal Navigation

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MITRE Sponsored Research



# Problem

- **Knowing the position of dismounted personnel is essential to a wide variety of missions**
  - **Combat and peacekeeping**
  - **Intelligence and covert action**
  - **Emergency response**
- **But GPS reception is not reliable in many places where dismount missions are conducted**

# Background

GPS has proven transformational, yet may perform poorly in environments important to dismounts.

## Indoors

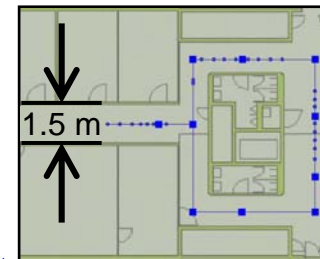


Urban Canyons



Under Foliage

*Close Quarters  
Need Accuracy  
Exceeding GPS*



# Objective

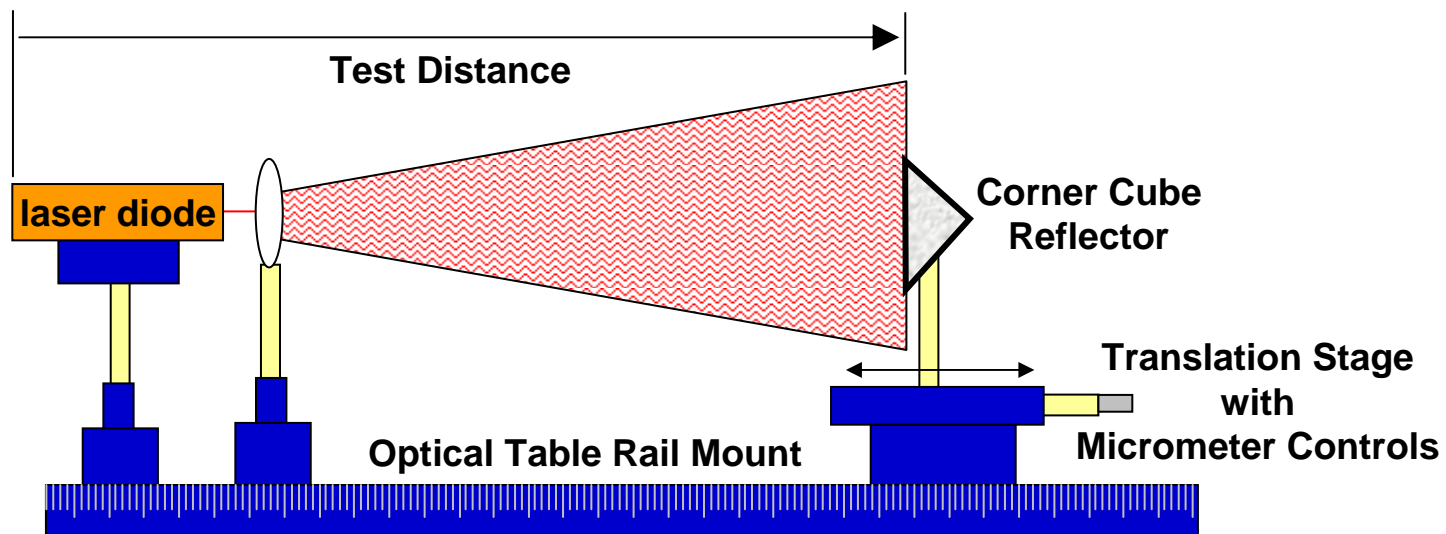
- **Develop solution for autonomous position determination of dismounted personnel in GPS-challenged environments**
  - **Absolute position via high-sensitivity GPS when available**
  - **Relative position via dead reckoning that exploits human ambulation constraints**
- **First year: explore sensor alternatives and system sensitivities**

# Activities

- Investigating novel intra-body distance sensors for precisely tracking foot motion
- Performing system engineering with human motion data
- Evaluating high-sensitivity GPS devices
- Evaluating commercial INS-based technologies

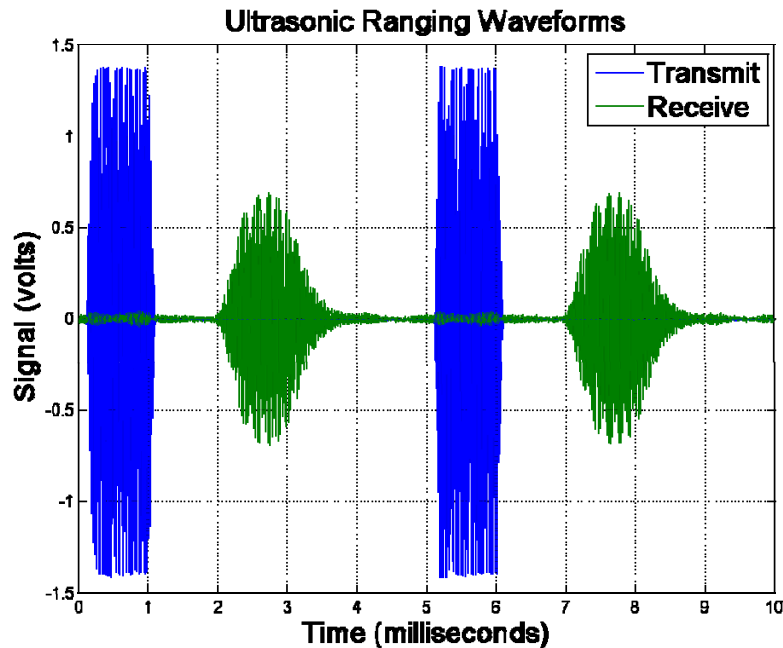
# Highlight

**We have determined that compact optical approaches can sense intra-body distances with millimeter accuracy.**



# Demonstration

We are also testing ultrasonic methods for intra-body distance sensing.



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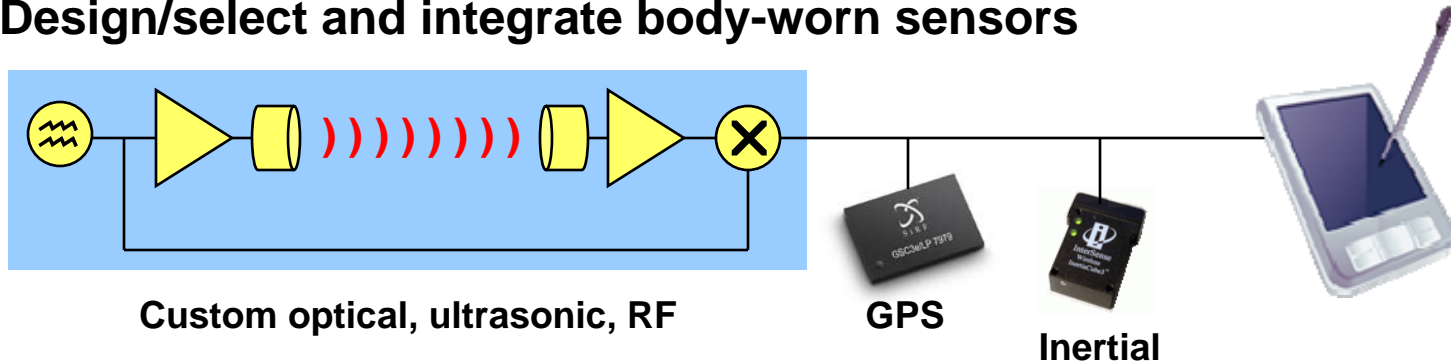
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# Impacts

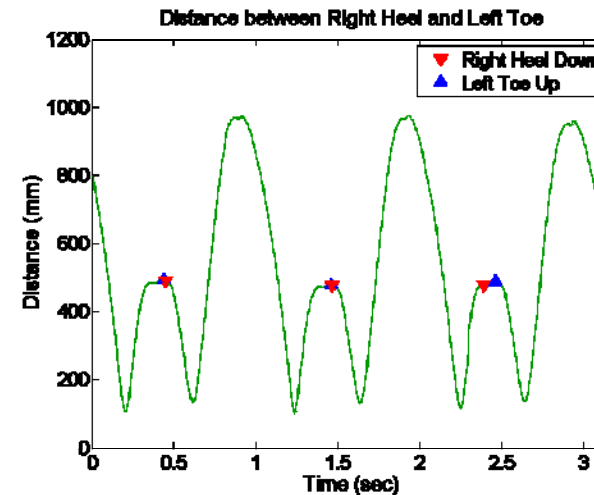
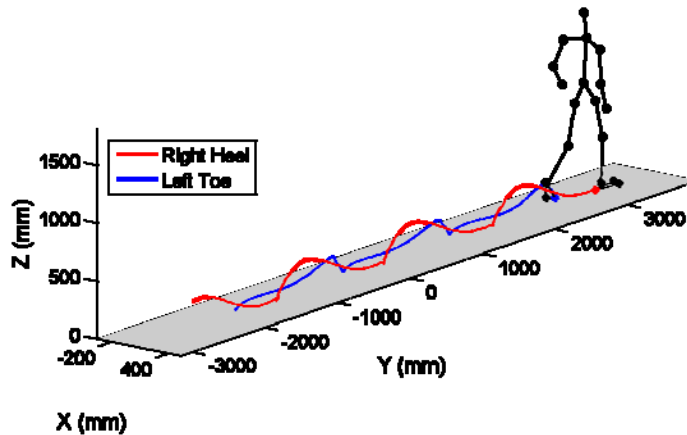
- **High-reliability, high-accuracy positioning will improve dismount situational awareness**
- **Potential users and sample applications**
  - **Armed forces: personal blue force tracking**
  - **Intelligence: mapping, path guidance**
  - **Homeland security and first responders: map reading without signs, egress navigation**
- **Pursuing collaborations from 2006 HLS/WPI Indoor Personnel Location workshop**

# Future Plans

Design/select and integrate body-worn sensors



Develop positioning algorithms from human motion data



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