



Foot Force-Torque Sensor

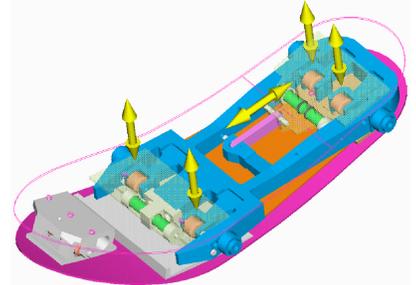
Novel Sensor for Measuring Forces and Torques at the Foot

Technology Need

Real-time, "in-situ" (not restricted to a force plate), high accuracy, highly sensitive *measurements of the forces acting on a human foot*. Transparent to the user without compromising motion. Operates in any terrain and environment. Modular and easily integrates with other systems.

ORNL Prototype Sensor

- Provides 4-axis measurements
- Test results matches published force plate data
- Characteristics:
 - Max force: 1200 lb
 - Sensitivity: <0.2 lb
- Mass: 2.5 lb
- Thickness: 1.75 in
- Status: Fabricated and successfully tested (see figures).
- Developed through the DARPA Exoskeleton Program



4-axis foot force-torque sensor.

Enhanced Prototype

- Additional sensing and a more compact design:
 - 7-axis sensor
 - Vertical forces (toe, ball of foot, and heel)
 - Lateral forces
 - Toe force
 - Moments
 - Flexible (permit normal foot flexing)
 - Thin profile (target: < 1 in)
 - Low mass (target: < 1.5 lb)
 - Attach to slightly modified boot
 - Environmentally sealed
- Status: Being developed based on results of initial prototype
- Being developed through the DARPA Exoskeleton Program



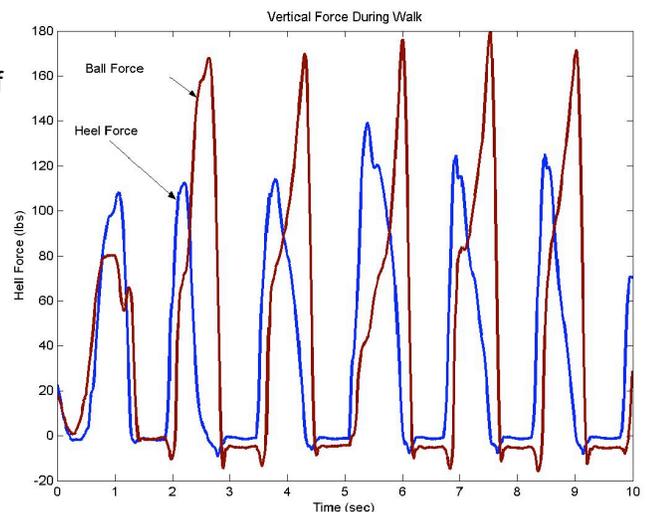
Testing of prototype.

Potential Applications

- Exoskeleton
- Orthotics
- Biomechanics research
- Prosthetics

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Test Data: walking forces.