**Precision Indoor Personnel Location and Tracking for Emergency Responders**

Technology Workshop, August 2-3, 2010
Worcester Polytechnic Institute,
Odeum, Campus Center,
Worcester, MA

**Workshop Focus**
This Workshop will provide a forum for researchers and developers working in the important area of indoor location and tracking of emergency response personnel to share technical knowledge and to define the state of the art. The focus of this workshop is zero pre-installed infrastructure tracking, that is systems that do not require any previously installed wiring or equipment in the target building, such as is required by RFID-type systems. Further, the focus is on systems which provide complete tracking and position information on all equipped personnel to the incident command post. This year we will have a special session by NIST looking at standards development for location and tracking systems. We will also be holding another ‘live’ test of systems by the Worcester Fire Department.

**Workshop Organization and Results**
Working sessions are organized around the major technical challenges. It is expected that all participants will contribute from their own experience and will share knowledge and best practices. DHS S&T will participate in a user focus group meeting. WPI is sponsoring this workshop with support from a FEMA Fire Prevention and Safety grant.

A Report will be published shortly after the conclusion of the Workshop, including the submitted abstracts from the participants and synopses of the discussions and conclusions of the Workshop itself. This report will be available on the website listed below.

[2010 PPL Workshop](#)
Monday, August 2nd, 2010

7:30  Registration and Continental Breakfast (Odeum, Campus Center)

8:15  Welcome - Dr. Eric Overstrom (WPI Provost)

8:25  Workshop Overview - Dr. R. James Duckworth

8:30  The Real World of the First Responder  
Moderator: William Haskell, Program Director, NIOSH-NPPTL

Fireground Injury and Death: Not EVERYONE Goes Home!!!
Chief Billy Goldfeder, EFO, Deputy Chief, Loveland-Symmes FD, Ohio

First Responder Location - The Real World
Ric Plummer, Fire Engineer, Firefighter, Berlin Fire Department, Berlin MA
Jeff Lenti, STOP Team, Mass. State Police Academy

10:00  Break

10:20  Government and User Perspectives  
Moderator: Casey Grant, Program Director, Fire Protection Research Foundation

LASD/3SI Pilot Project Summary  
Michael Eckert, Deputy Sheriff, Los Angeles County Sheriff's Department

An Overview of GPS-denied Technology Development within the OSD-funded Test and Evaluation / Science and Technology (T&E/S&T) Program
Thomas MacDonald, Systems Engineer, OSD / MacroVision / TRMC

Future Soldier Initiative
Scott Ullery, Engineer, US Army NSRDEC

11:20  Inertial and Integrated Navigation Systems, Part I  
Moderator: Casey Grant, Program Director, Fire Protection Research Foundation

Near-Field Electromagnetic Ranging (NFER®) Technology for Emergency Responder  
Dr. Hans Schantz, Chief Technical Officer, Q-Track Corporation

Personal Dead-reckoning (PDR) System for Firefighters  
Johann Borenstein, Research Professor, Mechanical Engineering Dept. Univ. of Michigan

12:00  Lunch
12:30 **Keynote Speaker:**
1st Responder Location Tracking Technology Development at DHS S & T: Past, Present, and Future
Jalal Mapar, Program Manager, DHS, S&T Directorate

1:30 **Inertial and Integrated Navigation Systems, Part II**
**Moderator:** Nader Moayeri, Senior Technical Advisor, Advanced Technologies Division, NIST

*DTRA for GPS-Denied Navigation and Mapping*
Kenneth Graves, C2 Product Manager, Harris Corporation / RF Communications

*Development of a Hybrid Personnel Location System*
Lin Haas, Senior Program Manager, Argon ST

*TRX Systems Sentrix Navigation System: Developments and Features*
Carole Teolis, CFO, TRX Systems

*Honeywell GLANSER Emergency Responder Locator System*
Steve Huseth, Research Fellow, Honeywell ACS Labs

*Integrated Pedestrian Tracking System*
Todd Faulkner, Staff Scientist, ENSCO, Inc.

*Heuristic Navigation*
Kent Garland, NAVISEER Product Manager, SEER Technology, Inc.

3:30 **Comments**
Congressman James P. McGovern (MA, 3rd)

3:45 **Demonstrations, Exhibits and Posters** (Odeum C, Hagglund and Mid-Century)
**Coordinators:** Mary Centrella and Colleen Sweeney, WPI

**Odeum C**
(Poster Presentations)

1. **Intelligent Radiation Sensor System (IRSS) Advanced Technology Demonstrator (ATD)**
Daniel Cooper, Senior Scientist, Passport Systems, Inc.

2. **Bringing Precision Navigation Indoors**
Major Kenneth A. Fisher, Ph. D., Assistant Professor of EE, AFIT, WPAFB, OH

3. **The Geodetics Personal Navigator (GPN)**
Shahram Moafipoor, Navigation Scientist, Geodetics, Inc.

4. **Standards Relative to Design, Selection, Care and Maintenance of Personal Protective Equipment for the American Fire Service**
Kenneth Willette, Division Manager, NFPA
5. **Design choices, tuning, and calibration of foot-mounted ZUPT aided INS**  
John-Olof Nilsson, PhD Student, Signal Processing Dept./Royal Institute of Technology (KTH)

6. **Development of a 3-D Personal Navigation System for First Responders using Human Gait Characteristics**  
Timofey Spiridonov, Graduate Student, Dept. of Aerospace Engineering/Univ. of Maryland

7. **Emergency Responder Locator (ER-Locator)**  
Robert Kelly, Faculty Researcher, Monmouth University/Rapid Response Institute

8. **Multi-Node Multi-Sensor Indoor Localization Network**  
Eric van Doorn, Chief Scientist, Intelligent Automation, Inc.

David Siu, Engineer, Oceanit

10. **Research on Different Techniques for Indoor Positioning**  
Jouni Rantakokko, Deputy Research Director, Swedish Defence Research Agency, FOI

11. **Overview of Personal Navigation Systems at Northrop Grumman Corporation**  
Han Park, Manager, Advanced Navigation Solutions, Northrop Grumman Corporation

12. **Monitoring the Location of Firefighters Using Available Radio Frequency Identification (RFID) Tag Technology and Newly Developed Software**  
Daniel B. Moran, Deputy Fire Coordinator, Hazardous Materials, Rockland County Fire and Emergency Services, Pomona, New York 10970

13. **Localization Challenges in the Structural Firefighting Environment**  
Francine Amon, Leader, Firefighting Technology Group, NIST

14. **Robust Algorithms For Real-Time Detection Of Motion Artifacts And Accurate Estimation Of Respiratory Rates Using Pulse Oximeter**  
N. Selvaraj, K. H. Chon, Biomedical Engineering Department, WPI

**Hagglund**  
(Demonstrations and Exhibits I)

**WPI Integrated Fireground Environment Sensor, Location and Physiological Monitor**  
David Cyganski, Professor, ECE Department, WPI

**Remote Casualty Location Assessment Device (RCLAD)**  
Randy Bryson, VP Business Development, L3/CyTerra Corporation

**3D Building Visualization and Scene Management for Incident Commanders**  
Stephen McCauley, Product Manager - Visualization Technologies, Kutta Technologies

**Near-Field Electromagnetic Ranging (NFER®) Technology for Emergency Responder**  
Dr. Hans Schantz, Chief Technical Officer, Q-Track Corporation
Zephyr Physiological Status Monitoring System
Jonathan Woodward, CTO, Zephyr Technology/Brian Russell, CEO, Zephyr Technology

Heuristic Navigation for Tracking in GPS Denied Areas
Kent Garland, NAVISEER Product Manager, SEER Technology, Inc.

GLANSER Personnel Location and Tracking System
Lin Haas, Senior Program Manager, Argon ST

Mid-Century
(Demonstrations and Exhibits II)

Personal Dead-reckoning (PDR) System for Firefighters
Johann Borenstein, Research Professor, Mechanical Engineering Dept. Univ. of Michigan

The Responder Knowledge Base
David T. Williams, RKB Analyst, FEMA Responder Knowledge Base
Michael Forgey, Senior CBRNE Specialist, FEMA Responder Knowledge Base

TRX Systems Sentrix Navigation System: Developments and Features
Carole Teolis, CFO, TRX Systems

The Pathfinder System
Dr. Wayne Haase, President, Summit Safety, Inc.

5:30 Adjourn

6:00 Reception and Barbeque (Higgins House)

Reception (cash bar) 6:00 pm
Dinner 7:00 pm
Tuesday August 3rd, 2010

7:30  Continental Breakfast

8:00  **Keynote Speaker:**

*Evaluating Technology in the Field: Importance for Emergency Responders*
Dr. Nancy Merritt, Senior Policy Advisor, National Institute of Justice

8:30  **RF and other Technologies**

**Moderator:** Paul Olson, Chief Engineer, Battle Command Division, CERDEC

Remote Casualty Location Assessment Device (RCLAD)
Randy Bryson, VP Business Development, L3/CyTerra Corporation

Rapid Deployment Antenna and Transactional RF Fusion for the WPI PPL System
David Cyganski, Professor, ECE Department, WPI

*Performance Evaluation of the NavShoe™ Personal Dead-Reckoning System*
Eric Foxlin, CTO, Intersense Inc.

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**Standards**

**Moderator:** Camillo Gentile, Electronics Engineer, NIST Information Technology Lab

*Initial Design and Test of Ground Truth Determination Procedures for Performance Evaluation of Personnel Tracking Technologies*
Francine Amon, Leader/Firefighting Technology Group, NIST

*Developing New NFPA Standards - Initial "Working Group" Phase*
Larry Konsin, Customer Development, MSA / Working Group Chair, NFPA 1801 TIC Standard

*NFPA Electronic Safety Equipment Standards: An Update*
Bruce Varner, Fire Chief / NFPA Technical Committee Chair, Santa Rosa Fire Department

10:30  Break

10:45  **Parallel Working Sessions on the State of the Art**

**PETERSON ROOM:**  *User Community Feedback*

**Moderator:** TBD

**MID-CENTURY ROOM:**  *Standards Development for Location and Tracking Systems*

**Moderator:** Francine Amon, Leader/Firefighting Technology Group, NIST

**HAGGLUND ROOM:**  *Location and Tracking Technology*

**Moderator:** TBD
12:00  Lunch

1:00  Keynote Speaker:

Adaptable Location Systems for Any Environment
Dr. Stefanie Tompkins, Program Manager, Strategic Technology Office, DARPA

1:30  Plenary Working Session
Moderator: Dr. R. James Duckworth, Professor, ECE Department, WPI

- 15 min presentations from each group
- State of the art and primary unsolved problems
- Progress from last year
- Answers to Specific Questions

2:30  System Demonstrations - Worcester Fire Department
Moderator/Organizer: Ric Plummer, Fire Engineer, Firefighter, Berlin, MA Fire Department
John Sullivan, Deputy Fire Chief, Worcester Fire Department

The following systems will be taking part in the systems testing demonstrations:

1. Heuristic Navigation for Tracking in GPS Denied Areas
   Kent Garland, NAVISEER Product Manager, SEER Technology, Inc.

2. Near-Field Electromagnetic Ranging (NFER®) Technology for Emergency Responder
   Dr. Hans Schantz, Chief Technical Officer, Q-Track Corporation

3. Personal Dead-reckoning (PDR) System for Firefighters
   Johann Borenstein, Research Professor, Mech. Engineering Dept. Univ. of Michigan

4:30  Wrap-Up and Plans for the Future
John Orr, Professor, ECE Department, WPI

*Evaluation Sheets filled out and returned

5:00  Adjourn
Internet Access:

*Attendees for the workshop can access the internet using the following log in and password:*

**Log In:** ppl

**Password:** workshop

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**2010 Workshop Steering Committee Members:**

Donna Andrews            Director of Corporate Services, CTC, Inc.
Mary Centrella           Admin. Assist. To Linda Looft
Dr. David Cyganski      Professor, ECE Department, WPI
Dr. R. James Duckworth  Associate Professor, ECE Department, WPI
Thomas J. Kennedy       CEO, CTC, Inc. Public Safety Technology Center
Linda Carre Looft       AVP, Gov & Comm Relations, WPI
Dr. John Orr            Professor, ECE Department, WPI
Ric Plummer             Fire Engineer/Consultant, Volunteer, Berlin, MA Fire Dept.
Colleen Sweeney         Graduate Admin. Assistant, ECE Department, WPI