

Sensor Fusion Track 1

- Who is end user?
 - Port security admin. (PSA)
 - Operational commanders
 - Emergency responders
 - Law enforcement
 - Unmanned Systems LCS PMS 420 (Littoral Combat Ship)
 - NECC MESF
- What is greatest need/challenge?
 - Logic algorithms need help
 - Common 'language' across domains
 - Testing environment, real not simulation
 - Politics
 - Robust testing environment

Sensor Fusion Track 1

- Research Needed-Underway
 - Sensor Fusion protocol
 - Standardization needed
 - Lower cost sensors
 - Cooperation/collaboration behavior for autonomous vehicles

Sensor Fusion Track 1

- Technology that could be 're-adapted'
 - NASA Space exploration robotics-sensors
 - Social networking
 - Twitter
 - Facebook
 - Panda
 - Smart phones
 - iPhone apps

Sensor Fusion Track 1

- Regional Partnerships to solve the challenge?
 - Cross-pollenization of
 - NASA, DoD, DHS, TSA, FAA, USCG, etc.....
 - High Schools - FIRST Robotics, Lego League, EO labs @ Ft Belvoir
 - First Responders
 - Need legal network to handle tech transfer between gov't agencies & business
 - Work w/Medical Sensor labs

Sensor Fusion Track 1

- How does this relate to other tracks?
 - “Fused” data input to all systems
 - C2 MDA for other tracks
 - Human Systems integration for decision support
 - Turn information into actionable knowledge for all other categories
 - Diverse commercialization and data base requirements (e.g. storage, correlation, search)

Sensor Fusion Track 2

- Who is end user?
 - Operator
 - Communities of Interest
 - Harbor security - ship combat centers
 - Different agencies/interest levels of data fusion
 - The system itself (specific platform - if system is fully automated)
- What is greatest need/challenge?
 - Data visualization
 - Communication across networks
 - Understanding - extracting data
 - Data formatting
 - Common ontology / Metadata
 - Consistent interpretation
 - IP protection & apparatusity to safely share
 - Bring in new 'identifiable data' and systems to capture new data inputs
 - Flexible
 - Expandable
 - adaptable

Sensor Fusion Track 2

- Research Needed-Underway
 - Understanding & perception
 - Common metadata format / output that is easily & unambiguously interpretable and understood

Sensor Fusion Track 2

- Technology that could be 're-adapted'
 - Google maps
 - Univ. of Indiana - Douglas Halsteadfer "Copy Cat" Artificial Intelligence (AI) Perception
 - Unmanned Robotics AI or other
 - Filtering Algorithms

Sensor Fusion Track 2

- Regional Partnerships to solve the challenge?
 - HRRP/HRTC sensor cluster forums
 - Federal, state, academia, labs, industry, finding agencies

Sensor Fusion Track 2

- How does this relate to other tracks?
 - Sensor fusion will enable comprehensive approach to port security
 - All tracks need & rely on multi-level data access and fused data
 - Unmanned systems operations are related to sensor fusion, especially for see & avoid capabilities

Sensor Fusion Track 3

- Who is end user?
 - War fighter
 - The Robot itself
 - Police force / emergency responders / security
 - Decision makers
 - Those needing to have information from data
- What is greatest need/challenge?
 - Sensor mix
 - Different sensor characteristics
 - Time correlation
 - Autonomous data analysis
 - Different sensor type
 - ID discriminators to differentiate environments (need correct sensor mix)
 - Remove and/or identify sensor uncertainty
 - Know what we are missing

Sensor Fusion Track 3

- Research Needed-Underway
 - Remove uncertainty
 - Human system interface
 - Display technology
 - 3D visualization
 - Virtual reality

Sensor Fusion Track 3

- Technology that could be 're-adapted'
 - iPhone type architecture
 - Subscribe to fused product operational standards for data
 - Open source hand held devices (e.g. Android) where s/w can be tweaked and updated by multiple users

Sensor Fusion Track 3

- Regional Partnerships to solve the challenge?
 - Fed , State, Local, NASA, Jefferson Labs, FAA, Industry
 - VMASC, NASA - Modeling & Sim Center for data fusion

Sensor Fusion Track 3

- How does this relate to other tracks?
 - Emergency Management more responsive if problem is better identified
 - Port & Harbor Emergency Response - a solid fusion would enhance their response/prevention to events