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Complex Dimensions of Real-World Multisensory Perception

S&T Campaign: Human Sciences
Integration of Humans and Systems

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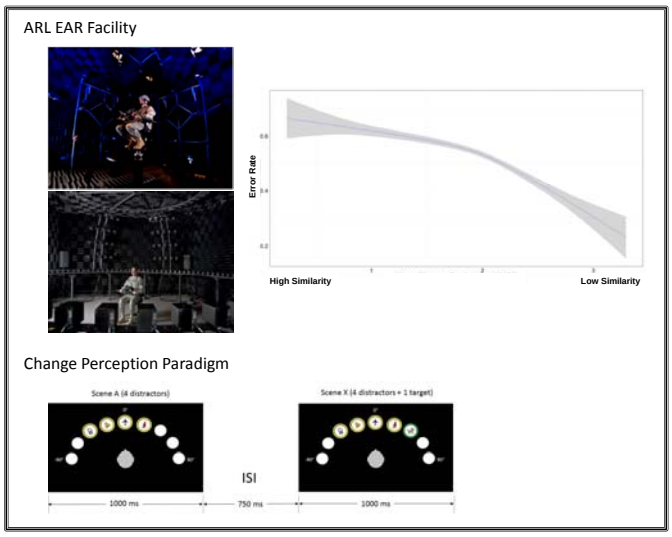
Research Objective

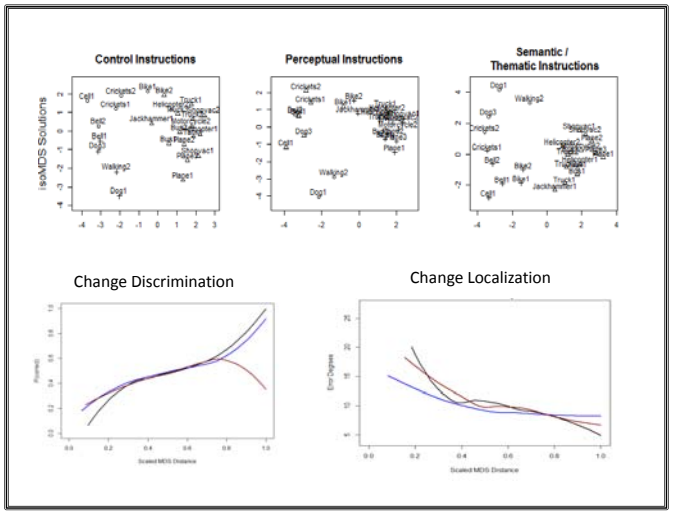
- **Quantifying complex dimensions underlying perception of real-world multisensory events, leading to objective metrics for improving multimodal system designs**



Subjective perception of similarity among stimuli, not simply stimulus features, drives human performance in complex auditory scene perception

Challenges

- **Mapping multidimensional parameters of real-world unisensory and multisensory stimuli**
- **Modeling techniques for characterizing stimulus events along multiple dimensions**



Characterizing the complex interactions between top-down and bottom-up influences that shape perceptual decisions will require novel quantitative and computational models.

ARL Facilities and Capabilities Available to Support Collaborative Research

- **Environment for Auditory Research (EAR) at APG, MD**
  - Multiple, reconfigurable spaces
  - Unique stimulus arrays, suitable for visual and auditory, as well as tactile displays
- **Multi-aspect real-world measurement capabilities**
  - Wearable, un-tethered operation
  - Flexible, fully customizable user interface
  - Multiple modalities: EEG, EKG, EDA, respiration, blood pressure, motion, posture, and others
- **Multisensory augmented reality testbed platform**
  - Wearable, head-mounted
  - Highly immersive
  - Flexible, reconfigurable sensor arrays
  - High-resolution, wide field, stereoscopic visual displays
  - Embedded eye tracking capabilities
  - Depth sensing, including hand and finger tracking
- **Unique ARL expertise includes:**
  - Sensory & perceptual processes
  - Adaptive mechanisms in multisensory integration & perception
  - Real-world experimental design and analysis

Complementary Expertise/ Facilities/ Capabilities Sought in Collaboration

- **Additional expertise and collaboration needed for:**
  - Modeling human unisensory and multisensory perceptual performance
    - Statistics
    - Applied Mathematics/Physics
    - Systems and Adaptive Control Engineering
- **Innovative new research approaches sought in:**
  - Measurement and experimental design to characterize and understand human perception in complex, real-world environments
  - Understanding the dynamic nature of perception that underlies human interaction in the real world

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