Acoustic Sensors & Processing

S&T Campaign: Information Sciences
Sensing and Effecting

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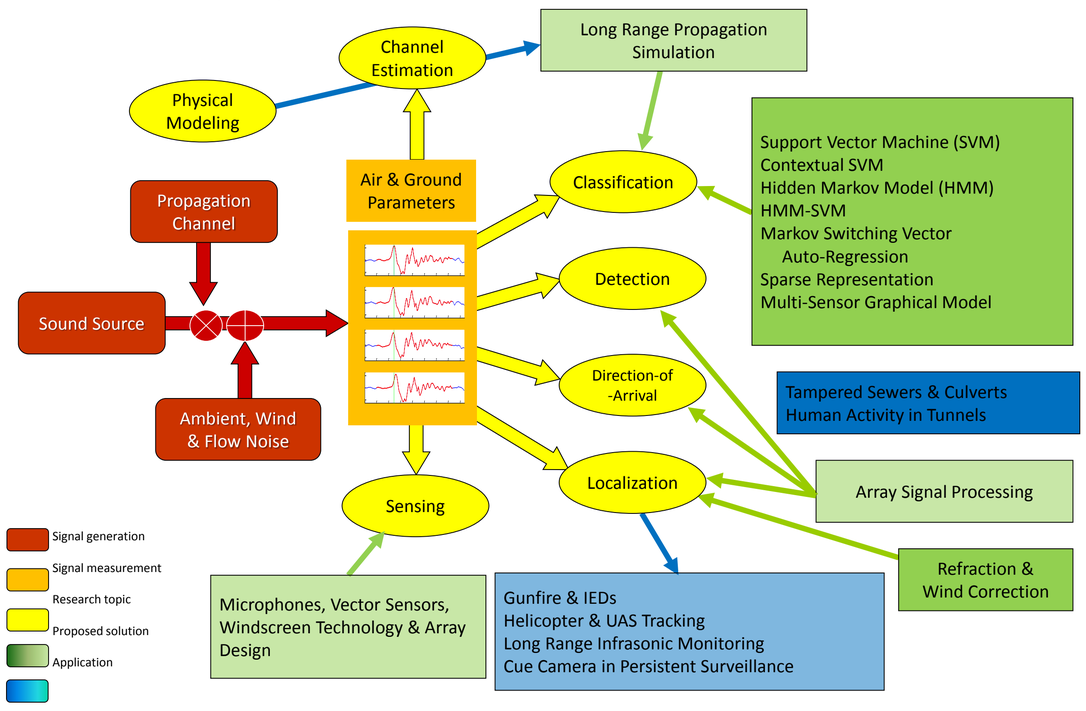
Research Objective

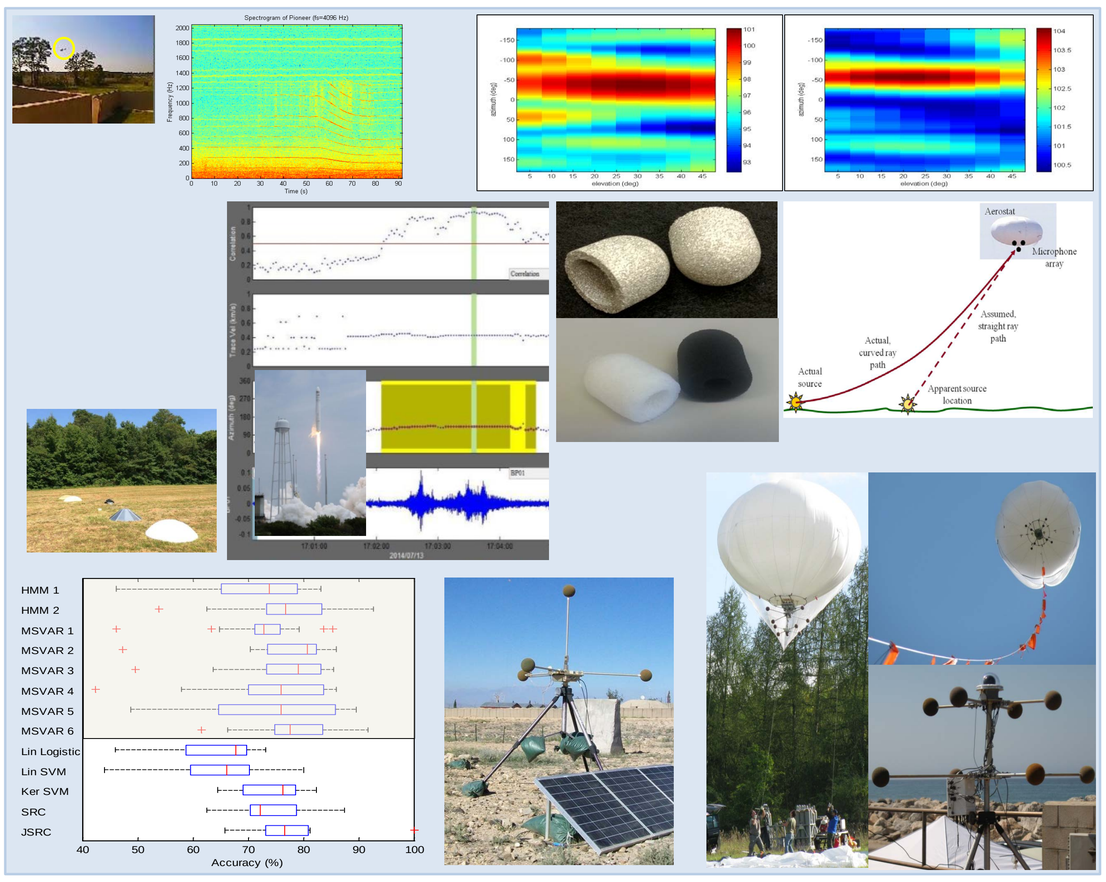
Apply knowledge of physics, sensors & processing to exploit acoustic signals for military purposes via passive, low-cost techniques



Ongoing research focuses on providing continuous long range, passive sensing of impulsive events, early warning for low-altitude UAS, and persistent, actionable situational awareness.

Challenges

- **Highly complex environment – urban, mountain, jungle, low-SNR, dynamic platform, noise interference**
- **Generally one measurement with unknown originating signal & channel**
- **Standard computer simulation of propagating signal is computationally expensive**



The atmosphere's meteorological conditions, terrain, vegetation and ground impedance affect signal shape and propagation path. ARL is developing improved signal processing techniques, researching alternative windscreens and sensors, and training classifiers to generalize the propagation channel.

ARL Facilities and Capabilities Available to Support Collaborative Research

- **Multi-target detection, tracking & classification algorithms**
- **Novel array processing techniques achieve better detection and higher angular resolution than standard algorithms**
- **Extensive knowledge in embedded signal processing**
- **Extensive experience with acoustic sensors & DAQ systems**
- **Experimental aerostat allowing unique investigation of acoustic measurements above ground turbulence**
- **Large database of cataloged acoustic signatures**
- **Expertise in electronic product development to include design, simulation, fabrication and assembly of electronic circuitry using designer software applications**

- **HPC open to sponsored researchers from academia**
- **Access to multiple test ranges & targets**
- **Personnel trained in proper data collection techniques**
- **On-site acoustic anechoic chamber, DAQ, sensors, speakers, pan/tilt, waveform generators**
- **Loud infrasound and transient source generators**

Ongoing Collaborations:

- **U of Kansas, U of Mississippi**
- **INSCOM, NGIC, Los Alamos NL, ARDEC**
- **NATO SET-189 & SET-218 TGs**

Complementary Expertise / Facilities/ Capabilities Sought in Collaboration

- **Advanced, multi-target tracking in noise**
- **Practical sound propagation models**
- **State of the art classification algorithms**
- **Acoustic particle velocity/vector intensity probes**
- **Calibration facilities**
- **Expertise in hardware, software & wind noise reduction techniques**

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