Detecting, Locating, and Discriminating Impulsive Airburst as HE/CB Event Using Unattended Acoustic Sensors

US Army RDECOM-ARDEC

By: Mr. Sachi Desai, Dr. Myron Hohil, Mr. Amir Morcos, and Mr. Brian Peltzer
Relevance to Homeland Security

• Providing a low cost solution for defense and enhanced situational awareness against Chem/Bio attacks via airburst disseminations.
• Protecting vital interest against aerosol attacks via airburst explosions.
• Utilizing acoustic sensors to cue more expensive sensing systems.
Key Objective of Technology

• Determining if an explosive event contains only High Explosive material or plausible Chemical/Biological agent on the battlefield.

• Providing emergency workers greater response time using a stand alone acoustic sensor.

• Giving greater situational awareness to first responders.
Topic Content

• Current Readiness
• Key Challenges to Implementation
• Benefits of the Technology
• Conclusion
• Future Work
Maturity and Readiness Level

- Portable Area Warning Surveillance System (PAWSS).
  - 1yr Limited Objective Experiment (LOE).
  - Focused on the utility of cascading detection methodologies.

- LOE Outcomes.
  - Demonstration of capabilities within simulated battlefield environments of layered wide area cascading detection.

- Cueing System.
  - Develop a cueing mechanism for expensive sensing technologies like JSLSCAD.

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Merging the acoustic algorithms with more complex but distance/energy limited sensing technologies to provide notification and cueing.
Benefits to Homeland

The utilization of acoustics for cueing and notifying more expensive sensing chem/bio sensing technologies will increase situational awareness for first responders reducing exposure and expedite rescues.

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Conclusions/Recommendations

• Features extracted facilitate robust classification.
  – Reliable discrimination of CB rounds, 98.3% or greater of single volley events.
• The features this algorithm is based on utilize only acoustic properties.
  – Degradation due to signal attenuation and distortion is nullified and exceeds 3km in range propagation.
• The acoustic signature propagated from the event provide approximate location to the event and if event was CB dissemination event.
  – Isolating the details of higher oscillatory components.
• Real time verification at PAWSS LOE of CBRN Discrimination Program Implemented in C++.
  – Airburst discrimination in real time for all variants was 100%.
• Implementing the algorithms with an array provide added situational awareness for first responders in advent of potential CB attacks.
  – Utilizing TDOA algorithms and acoustic propagation properties to provide cueing capabilities to more expensive limited sensing technologies.
• Future Considerations.
  – C4 initiated releases and providing cueing information to a JSLSCAD in September 2007.