



U.S. ARMY
RDECOM

Applied Anomaly Detection

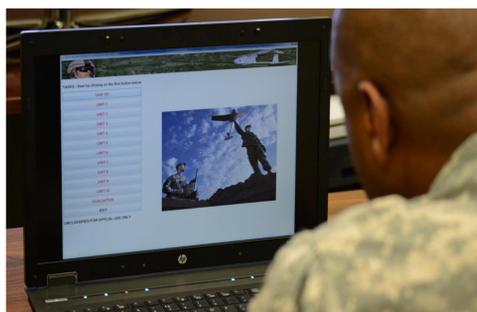
ARL
OPEN
campus

S&T Campaign: Information Sciences System Intelligence and Intelligent Systems

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Research Objective

- Develop tools to assist Soldiers with various detection and decision tasks
- Develop algorithms to aid in the detection and identification of potential targets



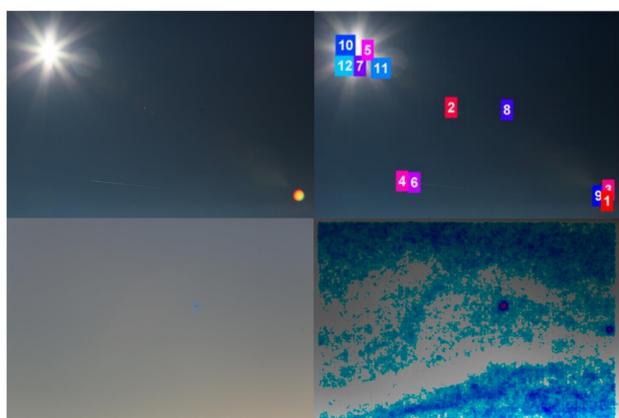
Algorithms and Tools to aid detection for the Warfighter, Applied Anomaly Detection Tool (AADT) software

Challenges

- Capturing acoustic and image data sufficient to provide example material and presentation of information
- Modeling the bottom-up and top-down processes and the interaction of these within the algorithm

Initial Results

- The visual saliency model when applied to static images identifies salient regions in a manner consistent with human visual gaze (Harrison & Etienne-Cummings '12)



Upper Left Corner: Original Image

Upper Right Corner: Salient Areas Highlighted from Image

Lower Left Corner: Original Image

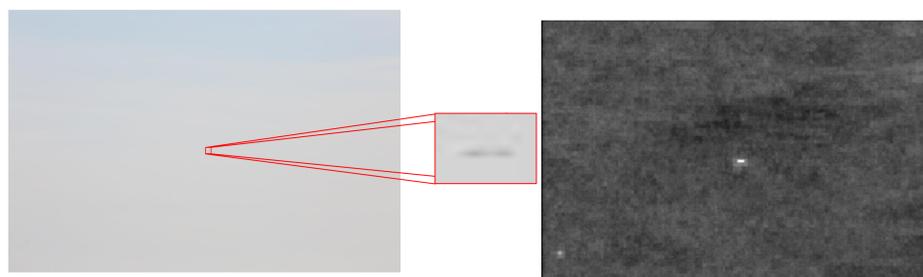
Lower Right Corner: Saliency Map of Image

ARL Facilities and Capabilities Available to Support Collaborative Research

- AADT can be used as a unique applied approach to potentially aid in cognitive-vision tasks and experiments
- AADT is modular and reconfigurable for various tasks with various data types (i.e. visible, thermal, acoustic,...)
- Biologically consistent target detection algorithm
- Computational model that can be used to expand the understanding of visual pathways for novel solutions to target detection
- AADT and computational models can be used for robust computational target detection under various atmospheric conditions potentially improving the design of devices for training, detection, navigation, and decision support
- Multi-modal dataset of different objects

Initial Results

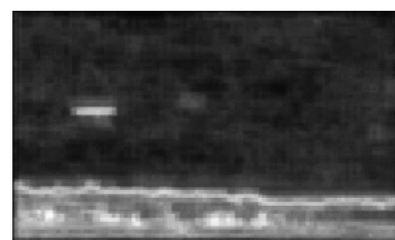
- In simple scenes the model successfully marks a moving UAS as salient.



Sample image (left) and associated saliency map (right)



Sample image



Saliency map



Motion map

Complementary Expertise/ Facilities/ Capabilities Sought in Collaboration

- Collaboration with researchers in neuromorphic research
- Collaboration with researchers in computational mathematics
- Access to virtual or immersive environments laboratories
- Future efforts in real time processing