WRIVA PROPOSERS DAY LIGHTNING TALK

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Overview

EXCELLENCE

- An integrated innovation engine that provides exceptional value

- A multi-disciplinary, world-class workforce that solves problems in original ways

- Ethical, professional, client and problem focused

CORE COMPETENCIES

- Detecting weak signals in heavy clutter with low false alarms.

- Low-SWaP sensors with real-time fusion for multiple domains

- Merging AI with Physics-based domain understanding

- Extracting maximum performance from systems
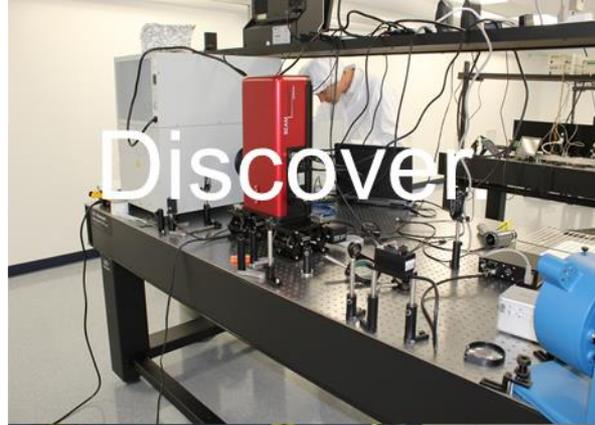
DESCRIPTION

- Employee-Owned w/ Small Business status

- 350 employees, 70% w/ advanced degrees

- Eight Locations: AL, AZ, CA, CO, FL, VA: six SCI or TS capable

- 250K sq.ft. lab/office/production capacity; QMS is AS9100/ISO-9001 Certified.

- > 40 years of government experience

APPROACH

- Rapid, creative, end-to-end development

- Discover: A science and technology engine advancing state-of-the-art sensing: over 40 patents in force; 30+ Active SBIRs

- Develop: A responsive collaborator rapidly maturing prototype system solutions for new and existing sensors

- Deliver: Reliable producer of high-performance systems; typically low-SWaP

Organization

Corporate Officers

Technology/Business Areas

Maritime Systems
- Airborne Programs
- Sea/Undersea Programs
- Environmental Intelligence

Lasers & Lidars
- Degraded Visual Environment
- AIRTRAC Laser

Force Protection
- CUAS
- Chem-Bio Detection
- Auto-medicine

Intelligence Community

Undersea Dominance

Signal & Info Processing

**Huntsville**
- Missile Defense
- Space
- Radar

Scientific and Technical Staff Matrix

Areté's highly networked, matrixed approach and flat structure enable rapid, integrated innovation

Locations

Northridge, CA (HQs)

San Diego, CA

Longmont, CO

Tucson, AZ

Valparaiso, FL

Huntsville, AL

Chantilly, VA

Arlington, VA

Electro-Optics*
Production

Intelligence & National Security

Sensor Applications & National Security
Prototyping, Low-rate Production

Signal & Info Processing

Maritime Sensing

Army, Space & MDA

Maritime Sensing*
Production

Maritime Sensing*
Production
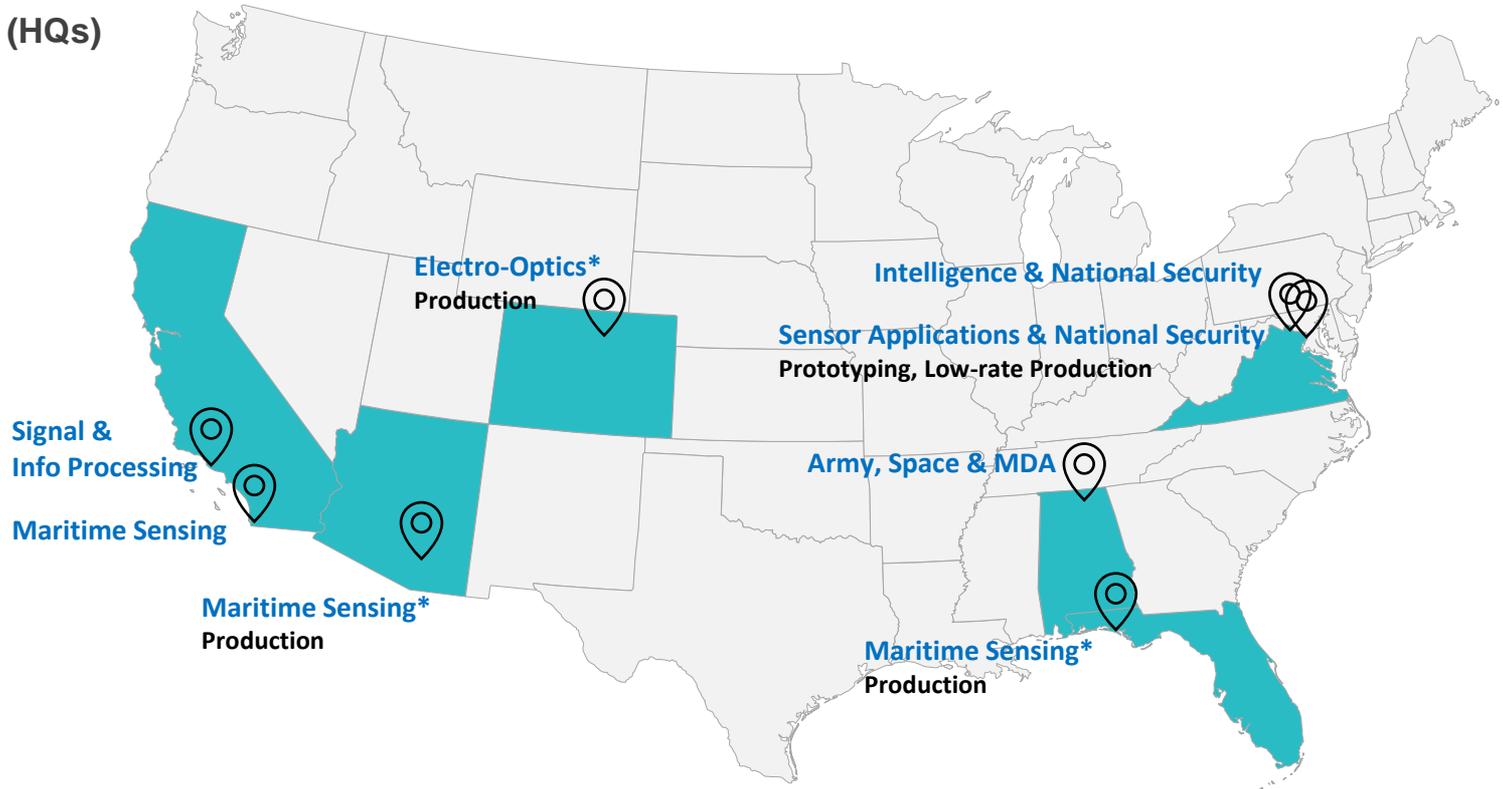
* AZ, FL, CO Locations: Quality Management System (QMS) is AS9100D & ISO-9001 Certified

Areté Background

- Areté has developed techniques for fusing several combinations of sensors:
  - Multi-Spectral EO
  - LIDAR/SONAR
  - SAR/IR
  - SAR/EO/IR
  - LIDAR/RADAR/IR

ASTEROIDS

- Software for creating high-resolution Digital Surface Models (DSMs) from commercial satellite imagery
  - A DSM represents the Earth's surface and all objects on it
  - Useful for visualization, disaster management, vegetation management, etc.

- Designed for single pass collections from one sensor
  - Works with images collected in different passes, different sensors, different modalities
- Developed over the course of 10 years

– Create damage maps of an area hit by a disaster, with the goal of providing actionable information to first responders being deployed to the area for rescue operations


Before

2020 Beirut Explosion

After

Areté / Copyright 2022
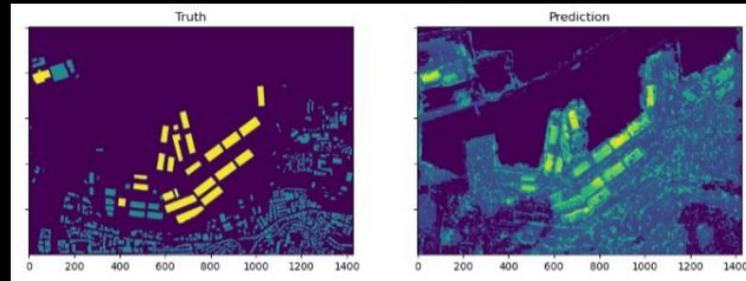
DEM Generation

- VOI is divided into subregions
- Each subregion is calculated separately
- The result from each subregion is blended together and cropped to form a DSM of the VOI

- CPU implementation already multi-threaded

Subregion VOI

Registration

Frames

Cost Volume Generation

Cost Volume Conditioning

Initialize Level-Set

TVSV Iterations

Threshold to DSM

DSM Post Processing

Combine Subregions

Sub – region
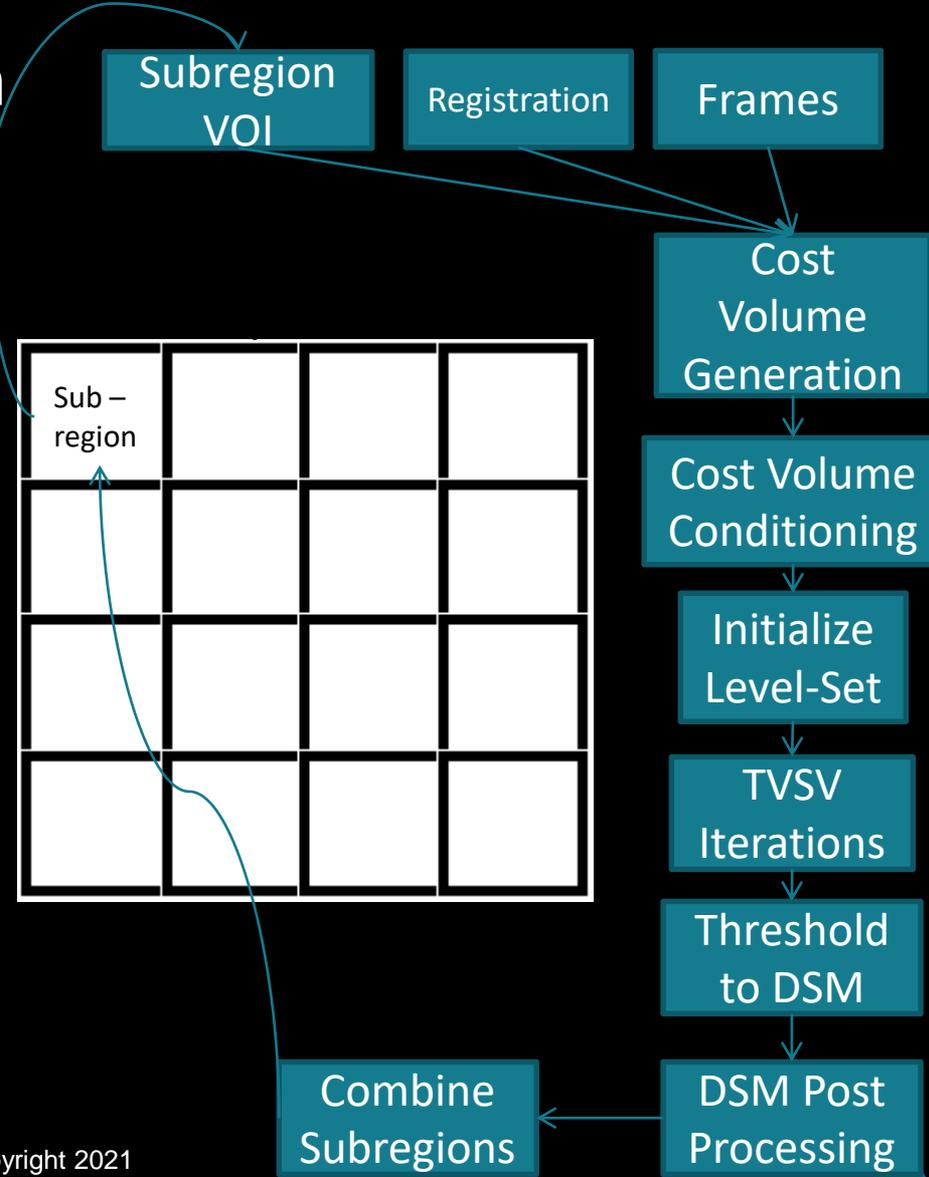
LIDAR/FLIR Fusion Example

Raytheon FLIR image (Feb07, clip_10)

Fused FLIR and LIDAR

Areté LIDAR (Feb07, data0143)
Intensity view
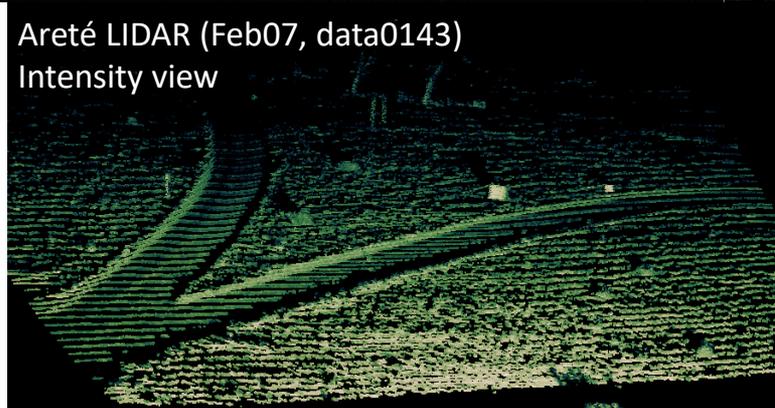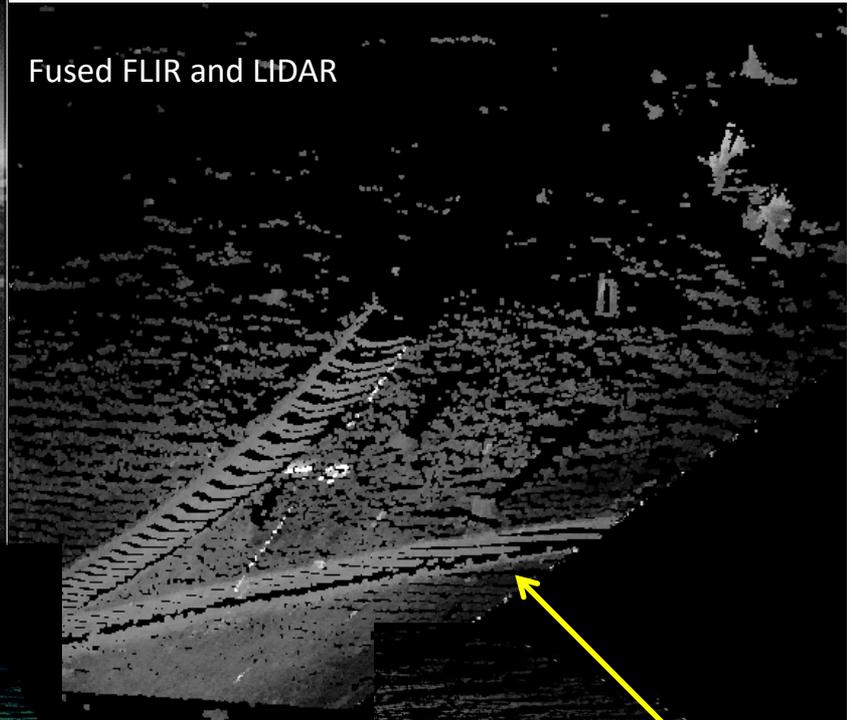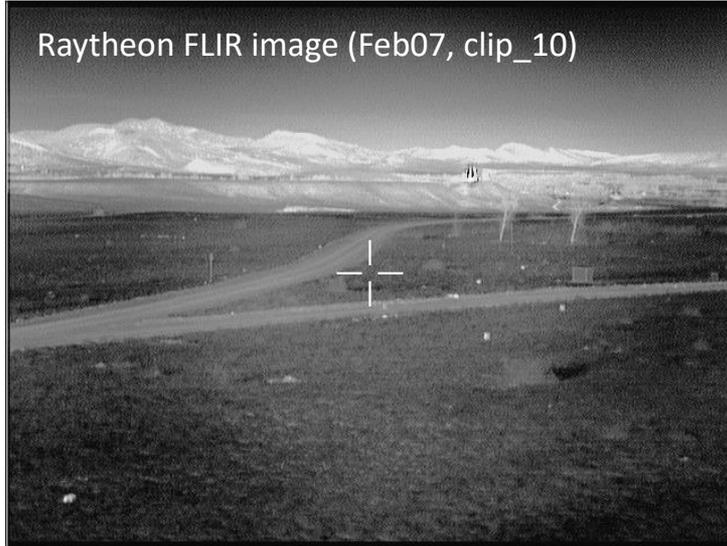
Creating the surface

- Identify ground surface from registered LIDAR and RADAR point clouds

- Reduce ground points to a surface mesh

- Large area now defined with only a small fraction of original data
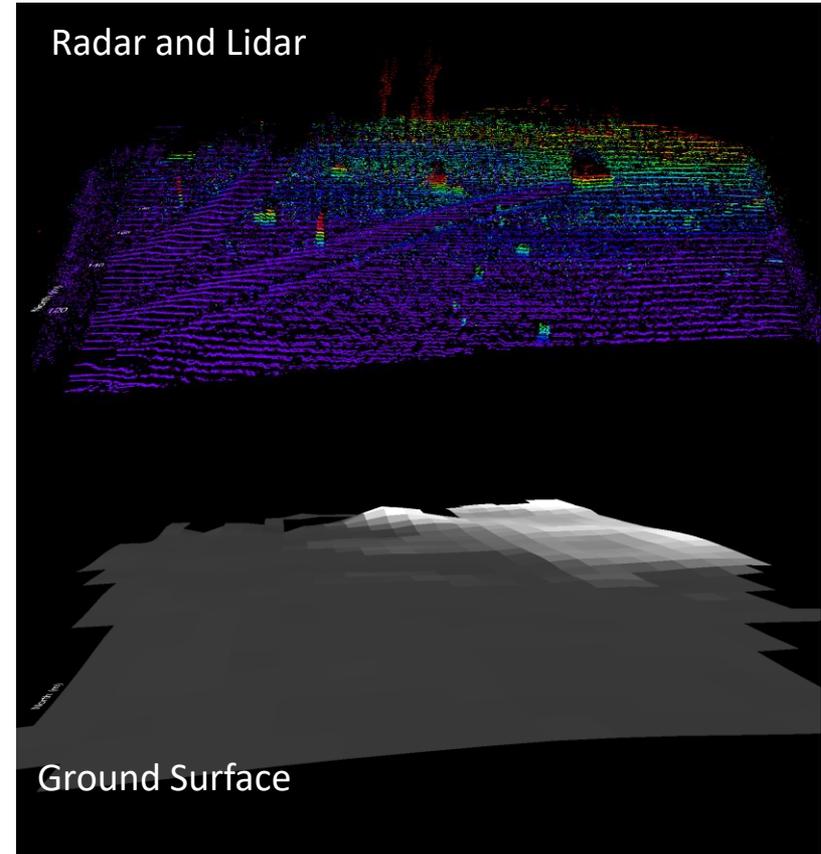
Radar and Lidar

Ground Surface
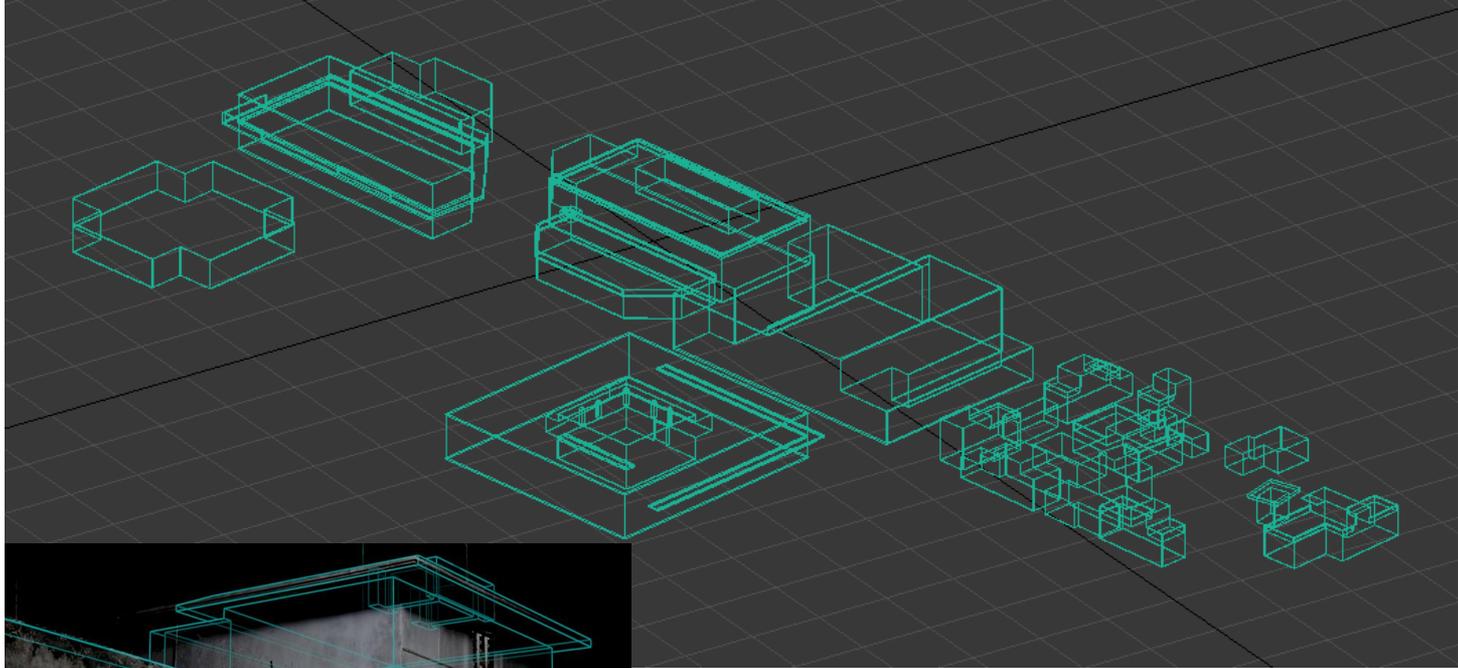
Areté's Re-identification Across Domain Network

- Arete's RADON is a **DNN-based query network for matching objects across imaging domains**

- The network is capable of learning transformations of pose, viewpoint, lighting, and sensor characteristics through training on simulated data, and performs well against real imagery:

Traffic cam view

Profile view

RGB

IR

- RADON key innovations:
  - Transfer learning to accelerate training and reduce training data requirements
  - Curriculum learning strategy to facilitate learning subtle class distinctions
  - Training from simulation with successful application to real imagery