**Image Fusion for Situational Awareness**

***Executive Summary***

* Availability of battlefield and situational imagery is adding more data points to the Situational Awareness (SA) picture
* Exploitation of imagery today requires multiple views of disparate imagery to build the big picture
* Develop a set of algorithms to fuse multiple images into a single image

***Background***

Traditionally, fusion of information deals with the data types received from multiple sensors. With the increasing available and ease to captures images from satellites, UAVs, drones, and even mobile devices, image fusion is required to combine relevant information into a single image to increase situational awareness. In the past, while imagery has been available, there has been no way to unify and fuse the data into a single SA picture.

***Tasking***

Building on the work performed during the Spring semester 2016 classroom activity, further develop algorithms and available applications to determine if a solution to this problem space currently exists. The initial effort used images from the same camera taken at different times. The team was able to fuse the images and determine the areas of changes.



To extend that project, the team should look for ways to use the detected areas of change to determine the type of object (i.e. person, vehicle, building, etc.).

The team should also look at the possibilities of using different sensors (i.e. camera, infrared, LIDAR, etc.) and fusing the images to provide a single, cohesive view. The emphasis for this activity could be on identification of product features and their applicability to near-real-time systems.

The team should explore the creation of new algorithms – or the enhancement of existing ones – to allow image data from multiple sensors to be fused into a single image. For example:

* A digital radar cross section fused with a passive 3D IR radar image to create a composite image showing both sensor feeds.
* Drone or satellite imagery of the battlefield combined with a topographic or base map image in an ortho-/geo-rectified manner.
* Multiple image products from different perspectives fused into a single 3D image.
* Multiple images with internal features edge-matched to determine probable overlap.

The AFMS team will provide basic imagery for the fusion project. Image data will be provided in different formats, resolutions, and perspectives (view, angle, elevation, etc.).