



Finding, Tracking and Attitude Estimation for Intercept Guidance

How

- Vision-based algorithms development will be based on the previous experience dealing with image processing technology to recover dynamics of different aerial systems
- Algorithms developed to contribute to the first technology gap will first be implemented and thoroughly tested on a small-scale swarm quadrotor formation at Camp Roberts, CA. Then, they will be adopted to and tried on the NPS swarm UAS using simple scenarios and logic to choose a counterpart to engage
- The algorithm development to address the second objective will be based on electro-optical/infrared data collected by various aerial assets available at NPS including the TASE-200 sensor flying on a manned aircraft and capable of providing integrated and synchronized EO/IR video and INS/GPS stream

What

- This proposal aims at developing real-time algorithms capable of including vision-data stream in onboard real-time computations to contribute to two key technology deficiency areas
 1. Provide a detect-and-track capability for the NPS Swarm UAS fleet to support a current work on efficient target intercept in a many-on-many engagement, and
 2. Integrate the optical flow with inertial data to obtain a navigation solution in the GPS degraded or denied environment

Why

- Being able to have full situational awareness during a multi-UAS operations is a key ability and a key gap preventing UAS from enabling higher-autonomy-level capabilities
- There is also a need to develop novel positioning, navigation and timing solutions in GPS-challenged environments by combining precision instrumentation, advanced hardware technology, and comprehensive algorithm and software development
- Emerging technologies include vision-based navigation. To this end, being able to process the optical flow in real time contributes to the both needs - aiding navigation and detecting / characterizing incoming threats in a multi-UAS environment to enable autonomous reactive guidance