Air Superiority via Decentralized Swarming Tactics and Autonomous Pursuit

- Hardware-wise, the fleet of existing sUAS will be refurbished with the ranging sensors, mesh-network enabling RF radios, and global shutter imaging sensors.
- Vision-based detect-and-track algorithms and ranging-sensor data fusion algorithms will be developed and integrated onto onboard companion computer to provide the real-time inputs to UAS autopilot.
- A variety of (decentralized) swarm behaviors will be studied and a repertoire of behavior primitives (outer-loop controller settings) created using genetic optimization algorithms. Verified in simulations optimized swarm controllers together with individual or group pursuit algorithms will be integrated with sUAS swarm (autopilots) to demonstrate a high-level of autonomy missions disrupting an evading UAS swarm attack.

The recent advances in low-cost small UAS with ultra-high definition video capability, moderate payload capacity, and beyond line of sight command and control have enabled tremendous opportunities in a variety of missions. Unfortunately, that also includes using these systems by hostile personnel in both foreign and domestic locations.

Deliverables will include passive sensor / companion-computer / autopilot / mesh network integration solution, vision- and range-sensor-based navigation and guidance algorithms, computer simulations, and novel capability demonstration using a small-scale swarm of UAS.

Several Masters and PhD students are expected to take part in this research effort with the test trials to be conducted at Camp Roberts, CA.

The objective of this research is to build upon the previous research efforts by four universities in developing the network- and passive-sensor-guidance-capable fleet of small multirotor unmanned aerial systems (sUAS) to design, build and test the extended-range system assuring air superiority against multiple incoming threats assuming minimal human interface.

FY19 Call for Proposals

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