

UAS Swarm: Identifying Chemical Plume Attacks Using an Autonomous System

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Abstract: USMA SWARM is a team tasked with producing an unmanned aircraft system (UAS) swarm capable of detecting a chemical threat utilizing several drones and chemical detection modules (CDM). The swarm of drones operates autonomously, through a behavior developed and refined by the team. This behavior has each individual drone follow a Lissajous pattern to sweep the designated area. The Lissajous pattern was chosen for its surveying efficiency in respect to minimizing time for distance traveled. If any of the drones within the swarm interact with the chemical plume, whether physical or simulated (by the emulator), the behavior will shift from the sweeping pattern to a mapping behavior where each drone performs circles around the chemical plume to form a general shape of the plume. Utilizing simulations and emulators, the team has tested the behavior to validate its functionality and efficiency. The team has also incorporated visualization with a real time common operating picture for the ground force commander to view the drones' findings throughout the test. Future work includes integrating wind sensors attached to the drones for more realistic flight data.

Keywords: Unmanned Aircraft System, Chemical Detection, Lissajous Pattern, Emulator