Intelligent UAS Sense-and-Avoid Utilizing Global Constraints

Investigator(s): Dr. David E. Smith, PI, Intelligent Systems Division (Code TI), NASA ARC; Eric Mueller, Aviation Systems Division (Code AFT), NASA ARC; Javier Barreiro, Stinger Ghaffarian Technologies (SGT) Inc.; Dr. Minh Do, Stinger Ghaffarian Technologies (SGT) Inc.

Purpose

Design and build a novel sense-and-avoid reasoning framework that can handle both global constraints and local sensor/camera feedback to significantly improve over the performance of existing sense-and-avoid mechanisms. By reasoning about global constraints such as expected trajectories of nearby aircraft, airspace information, and real-time weather information, both on-board control software and ground-based UAS operators can make more informed, intelligent decisions to effectively avoid conflicts and maintain separation.

Background

Sense-and-avoid is an important research topic in Unmanned Aircraft System (UAS) control to prevent conflicts and maintain safe aircraft separation. This will become even more critical with the congressional mandate to allow UASs to fly in the National Air Space (NAS) starting in 2015.

Relying only on the UAS's local on-board sensor/camera feedback, recent work has focused on improving algorithms for computing collision free nonlinear trajectories. Being able to reason with both local sensor information and global information, the improved sense-and-avoid technology can better identify and avoid both medium and longer-term conflicts. This allows more UASs and manned aircraft to share the ever more crowded airspace. There are two end-point applications where our framework can have measurable impacts: (1) real-time advisory software for UAS human operators and (2) UAS on-board control systems.