Expandable Variable-Autonomy Architecture Viable Maneuver Displays

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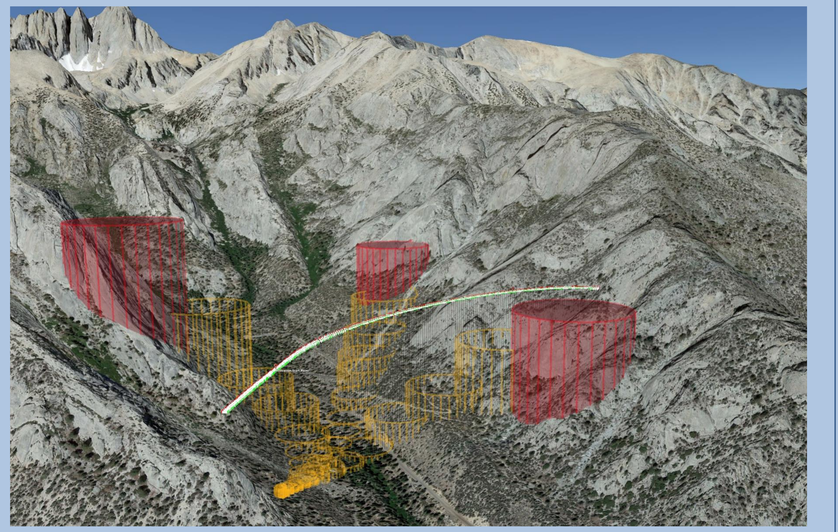
Introduction & Motivation:

The Traveler – Resilient Autonomy team (RA) at NASA Armstrong Flight Research Center (AFRC) is developing a hierarchical autonomous system framework called EVAA – Expandable Variable-Autonomy Architecture which is a reference implementation of a Run-Time Assurance (RTA) architecture, that is seen as a likely path to the certification of autonomous Unmanned Aerial Systems (UAS).

The objective of this study is to develop flight test displays that will help the research team evaluate the iGCAS (improved Ground Collision Avoidance System) & iACAS (improved Air Collision Avoidance System) algorithms in real-time during flight tests.

Method & Approach:

The cross-platform game engine *Unity®* (*Unity Technologies*, San Francisco, California) is being utilized as the main tool for developing the graphical displays.



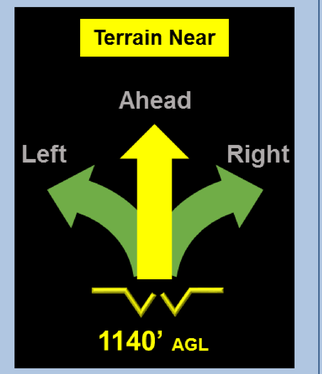
A Finite State Machine is being implemented to display and communicate flight data and simulate actions to create a visual aid for the test conductor and discipline engineers to monitor the progress of the test was the main approach which was agreed upon.

User Centered Design (UCD) methods are adopted to focus on early and continuous user involvement in product design and human factors consideration.

Task & Outcome:

The task objective is to develop RTA graphical interfaces for real-time evaluation of onboard sensors and algorithms, further develop and clarify the specific display requirements, as well as research best practices for human factors related to graphical data displays.

The completion of the task will enable the Flight Test Crew to successfully conduct and monitor the mission during Unmanned Aircraft Systems (UAS) flight tests.



If the mission course and execution would lead to a catastrophic event, the guidance VMD of the safety monitor (iGCAS or iACAS) with the highest consequence would appear in a two-dimensional screen indicating viable maneuver options available and diminishing at every frame, until the system takes over and steers the aircraft to safety.

The two-dimensional display is an initial demonstration of how telemetry data is acquired, handled, and integrated into the real-time display, paving the way for an enhanced display in a three-dimensional environment to follow in later stages.

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