

NASA SBIR/STTR Technologies

A3.03-7631 - DAAS: Data Analytics for Assurance of Safety



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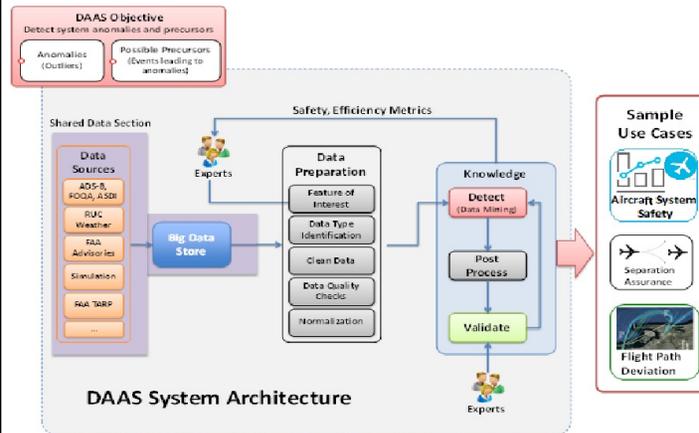
Identification and Significance of Innovation

Assuring safe operations in the National Airspace (NAS) encompasses monitoring a variety of systems simultaneously and in real time. It is helpful to imagine NAS as a system of systems where each system loosely interacts with the other. Under this paradigm, an aircraft is a system, so is an airline and as is an airport. Automating safety assurance for each of these systems would involve monitoring an array of sensors each with a different time cycle and reporting characteristics and processing enormous amounts of data. Given the complexity of NAS, it is unlikely that any one tool could provide a solution. Instead, a number of tools each monitoring a smaller, more manageable part of the NAS, all the while sharing information with each other, seem more promising. The distributed network of tools offer a more robust solution and would be well placed to take advantage of equally distributed nature of Big Data storage and cloud computing. In the future, these tools would ensure airborne separation assurance, track Air Traffic Control guidance conformance and ensure safe ground operations.

Estimated TRL at beginning and end of contract: (Begin: 2 End: 3)

Technical Objectives and Work Plan

- Objective 1: Development of Big Data processing capability for data mining requirements.
 - Objective 2: Development of data mining techniques that can use large volume of historical data learn from.
 - Objective 3: Development of DAAS architecture that scales with problem scope and shares information with other tools.
- Outline of Phase I Tasks
- Task 1 Hold kickoff meeting and establish program requirements
 - Task 2 Review literature and identify promising data mining techniques suitable for safety assurance using Big Data
 - Task 3 Identify multiple use cases to demonstrate the data mining algorithms and obtain operations data for training and validation
 - Task 4 Extract, transform, load, and operations data into the Big Data store. Prepare the data based on requirements for candidate data mining algorithms identified in task 2.
 - Task 5 Develop data mining capability for NAS specific data
 - Task 6 Develop validation capability to document and visualize anomalies reported by the DAAS based tool.
 - Task 7 Demonstrate DAAS based safety tool prototype.
 - Task 8- Develop concepts for Phase II and transition



NASA Applications

Researchers at NASA will find the tool useful for exploration of new concepts in system safety. DAAS will allow them to experiment with different concepts of operations for interval management, fuel management, route planning, conflict avoidance and mitigation planning, and separation standards and evaluate their impacts on safety. NASA could couple the tool with advanced NAS-wide simulations platforms like SMART NAS to evaluate other technologies in presence of automated safety.

Non-NASA Applications

We envision DAAS tools to be implemented in shadow mode as a controller decision support tool. The controllers would be able to use the DAAS to ensure safe operations at peak congested times. Airlines can mine their operations data to uncover any safety incidents or close calls to improve processes.

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NON-PROPRIETARY DATA