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Hybrid Machine Learning and Estimation-Based Flight Trajectory Prediction for Air Traffic Management

This framework combines machine learning and physics-based estimation to produce significantly more accurate trajectory projections, enhancing safety and efficiency for air traffic operations.

Researchers at Purdue University have developed a framework for trajectory projections in terminal airspace by combining a physics-based estimation method as well as a machine learning method. A trajectory prediction model based on machine learning is trained from historical surveillance data to represent the collective behavior of a set of flight trajectories, from which the data-driven prediction can be obtained as the expected future behavior of an incoming flight. A physics-based estimation algorithm called Residual-Mean Interacting Multiple Models then incorporates the machine learning prediction as a pseudo-measurement to account for the current motion of the aircraft. The proposed framework produces a greatly improved prediction accuracy compared to the two existing machine learning-based algorithms.

Technology Validation: This technology has been validated using real air traffic surveillance data and running the technology's prediction model.

Advantages:

-More accurate than the current in use model

-Enhances the air traffic controller's situational awareness.

-Increases safety and efficiency of air traffic operations.

Applications:

-Integration into the Federal Aviation Administration's air traffic management software

TRL: 4

Technology ID

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Category

Artificial Intelligence & Machine Learning/Reinforcement & Federated Learning

Aerospace & Defense/Defense Electronics & Surveillance Technologies

Aerospace & Defense/Autonomous Systems (UAVs & AVs)

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