

**CHENNAI – PONDICHERRY**

**SLIDE: A Straight Line Conflict detection and Alerting Algorithm for Multiple Unmanned Aerial Vehicles**

**Abstract:**

Conflict detection is an important research issue in Unmanned Aerial Vehicles to ensure safety and collision free flights. In this paper, we first propose a comprehensive analytical framework for a three dimensional conflict detection. Then, we propose SLIDE a new Straight LIne conflict DEtection and alerting algorithm for a set of UAVs to safely share a common airspace. SLIDE is fully distributed and requires a limited state information exchange between UAVs. The assumptions of precise state information and packet-loss free communications are relaxed so as to guarantee the applicability and efficiency of the algorithm in real world situations. A thorough discussion is also presented to deal with appropriate tuning of the different parameters of the collision detection framework. Extensive simulations based on OMNeT++ are used to validate SLIDE and evaluate its performance. Simulation results indicate that SLIDE guarantees a reduced number of false and missed alarms even in high density traffic scenarios and communication perturbed environment, yet it leaves adequate time to accomplish the required maneuver actions.

**Existing System:**

The existing conflict detection approaches are limited by two major drawbacks. First, they usually assume the availability of all the airplanes predetermined flight plans. Such an assumption may not be satisfied especially in freeflight operations and highly dynamic environments (e.g., battlefields, disaster zones) where trajectories are continuously adapted to the corresponding existing environment. Second, and more importantly, most of the proposed work assume perfect sensing capabilities and communication links enabling the UAVs to collect precise information about their surrounding environment. Nevertheless, UAVs mostly operate in uncertain, complex and harsh environments. Neglecting the environment uncertainties usually results in a major underestimation of the collision risks, and hence in violations of the safety requirements. These issues motivated us to propose the straight line conflict detection and alerting algorithm SLIDE. SLIDE views the immediate future trajectory as a straight line and does not require the prior knowledge of the UAVs trajectory plans. On the contrary, UAVs are permitted to have dynamically adapted flight trajectories as required by the environment and the flight situations.

**Proposed System:**

A distributed approach that requires little communication between the UAVs. The only information periodically exchanged between the UAVs is their 3D position and velocity vectors. UAVs intent information is not required.

A comprehensive mathematical framework for 3D conflict detection where conflict conditions are stated in terms of simple inequalities and conflict parameters are expressed as a function of the current state information.

A relaxation of the assumptions of perfect sensing and packet-loss free environment in order to improve the practicality of the proposed mathematical framework and the proposed alerting algorithm and their application to real world situations.

An alerting algorithm based on our proposed analytical model.