IIT Indore Develops a Novel Algorithm for Collision Avoidance in Massive UAV Swarm

In today's world, ensuring that Unmanned Aerial Vehicles (UAVs) do not collide is critical. While there is a standard method for detecting collisions, no single standard exists for avoiding them. Current avoidance methods have their own challenges. **IIT Indore** has developed a New Algorithm for Safe Flight of Large UAV Swarms. This breakthrough was achieved through a joint effort. From IIT Indore, **Prof. Kapil Ahuja** and **Mr. Amit Raj** of the Math of Data Science and Simulation (MODSS) Lab, Department of Computer Science and Engineering, led the research. From Institut Mines-Télécom (IMT), **Prof. Yann Busnel** from the Research Department contributed to the work.

One common approach is to change the flight paths of UAVs. However, this method works well only for a small number of UAVs. When applied to large UAV swarms, it can create complex and impractical routes, sometimes even causing endless loops.

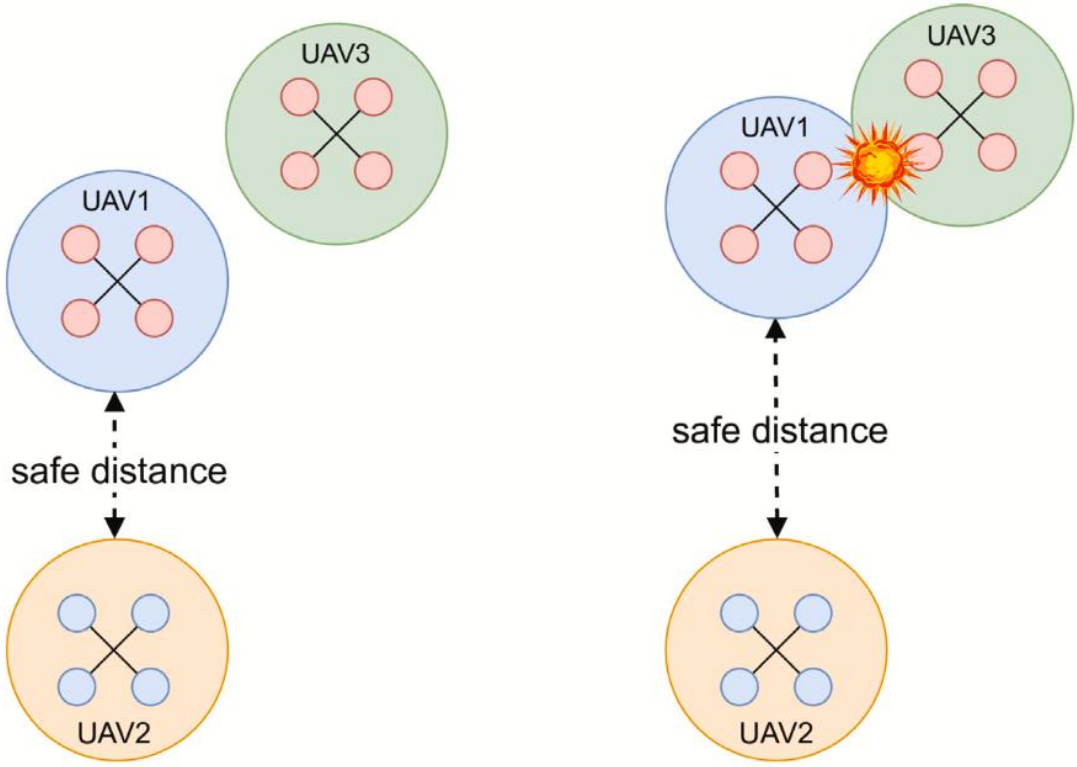
Another popular method is to change the UAVs' start times. This is done by creating groups, or batches, of UAVs with non-colliding paths. While effective, this process is slow, as forming too many batches delays the overall launch of the swarm.

To address these issues, researchers at the IIT Indore and IMT in France have developed a new collision avoidance algorithm. It combines the strengths of both existing methods while eliminating their drawbacks.

Using a UAV simulator that records UAV positions at specific intervals (such as every second or every 0.1 seconds), the team designed a trajectory adjustment method. When two UAVs are predicted to collide, the position of one UAV is slightly shifted. This shift is gradually increased before the collision point, reaches its peak at the point of collision, and then gradually decreases afterward.

The researchers then integrated this trajectory adjustment technique with the batching method. As a result, the new algorithm produces smooth, simple and finite route changes while reducing the number of required batches by half.

Prof. Kapil Ahuja said, "This innovation promises safer and more efficient flights for massive UAV swarms, paving the way for better performance in various applications."


UAV3
UAV1
safe distance
UAV2
UAV3
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UAV2