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Formation Flight of Unmanned Aerial Vehicles Using Track Guidance

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Abstract

Precise flight path tracking capability is generally required for high performance unmanned aerial vehicles (UAVs) to conduct complex missions. Accurate waypoint navigation is a key feature that these UAVs usually possess. This study presents a track guidance algorithm for path-following guidance and modifies it based on the leader-follower scheme for formation flight. The suggested guidance algorithm is a spatial version of the first order dynamic characteristics for a time-dependent system. Hence, invariant tracking performance is guaranteed in the spatial domain such that a constant flight trajectory pattern can be obtained without considering the speed of the vehicle or the disturbance. In this algorithm, the heading or yaw rate of the vehicle is guided to direct the flight path a certain distance ahead of the UAV to minimize the track error between the pre-assigned flight path and the position of a single vehicle. The modified track-guidance algorithm is designed using the separated forward and lateral guidance law. A crucial design parameter is the spatial constant that controls the shape of the convergence to an assigned flight path. Reference flight trajectories are designed on a two-dimensional surface, and the proposed algorithms are

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