

# **Intelligent Fractional Order Controller for Cooperative Formation Control of UAV's.**

The UAV is defined as an aircraft that operates without an onboard pilot. A UAV is a flying robot that can autonomously fly through software-controlled flight plans in their embedded systems. It works in conjunction with several onboard sensors, inertial measurement unit and Global Positioning System. Compared with single UAV, the UAV formation has higher reliability and security and is more likely to accomplish complex missions under extreme conditions. The problem of UAV formation control with collision and obstacle avoidance has attracted extensive attention. Formation control of UAV's are useful in applications such as forest fire surveillance, border patrol, natural resources exploration and search and rescue operations. UAV's carry sensors, communication equipment's, cameras and other payloads.

PI Control, Linear Quadratic Control, Feedback Linearization, Back stepping and Sliding mode control strategies have been investigated so far for formation control of UAV's using Leader follower approach.

Fractional Calculus corresponds to the generalization of the classical operation of derivation and integration to orders other than integers. Fractional order controllers based on fractional calculus are less sensitive to parameter changes in the controller and the controlled system. Fractional order systems are more accurate in modelling and controlling than integer order systems. Fractional order systems are also used to study chaotic systems. Compared with the traditional integer order controllers, fractional order control techniques have achieved more impressive results in term of improving the robustness during wind gusts, pay load variations, friction and modelling uncertainties. Research about formation control based on leader follower approach so called distributed fractional order finite time control (DFOFTC) for a group of UAVs is investigated by Z Yu et al (2018).

Intelligent Fractional order nonlinear controllers have not been investigated so far in formation control of UAVs. It has been proposed that the UAV's change their formation in response to the environment by incorporating intelligent fractional order controllers. Intelligent techniques such as Neural networks, Fuzzy logic and Genetic Algorithm can be used to tune Fractional order Controllers that incorporate nonlinear control Algorithms.