

# A PROJECT ON FLIGHT FORMATION OF DRONES

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Consider a group of drones or robots that moves on a plane. The trajectories of each robot can be described by Newton's Second Law of Motion. We can assume that the plane is frictionless. The robots can communicate with each other. A control protocol is a way of determine the communication network (digraph) among the robots, and robots can make changes in their velocity according to the control protocol, without external influence.

The paper [1] is an example of designing effective and economical control protocols so that a group of robots achieves a certain type of flight formation.

The objective of the project is to learn and experiment different protocols for the following flight formations:

- A group of robots move along a circle of a predetermined center and radius, and maintain distances with their neighbors (no collisions).
- They move along a circle of a predetermined center by can determine the radius by themselves, while maintaining distance with their neighbors.
- Allow both the center and the radius be determined by the robots themselves.

You are expected to set up systems of differential equations for the movements of the movements of the robots, with your control protocols, and simulate the solutions and visualize the movement of the robots.

## Reference

1. John Maidens and Michael Y. Li, Global Lyapunov functions and a hierarchical control scheme for networks of robotic agents, American Control Conference (ACC), 4050-4055, 2013.