

NRI: FND: Flying Swarm for Safe Human Interaction in Unstructured Environments

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Objective: We will design and create a swarm of 200 flying robots that are safe to operate around people. They will use only on-board sensing to interact with each other and humans, which can “sculpt” the shape of the conglomerate form.

Technical approach:

Based on a single motor, underactuated flyer, where the spinning body can be used to scan sensors and transmitters for both localization and communication. Power will be maintained by a rapid charging base station. Flyers will continuously rotate in and out of the swarm as they charge and discharge while flying.

Key deliverables:

- Create small autonomous flyer which only uses onboard robot-to-robot sensing and communication
- We will demonstrate 200 robots in a swarm forming shapes controlled by a human closely interacting with the swarm

Progress:

- Autonomous position and trajectory control
- Designs for autonomous charging station
- Prototype for IR based robot-to-robot sensing and communication
- Making strides towards wake design
- Updated of robot design to aid in fast take-off



Figure: (Left) isometric view of prototype robot design. (Right) Rendering of human swarm interaction for shape sculpting.

Outreach and Broader Impacts

- Robot design and control will be open source.
- Improve on safe interaction between humans and flying robots
- Research and Education are integrated by incorporating flyers

into classroom activity, public presentations to K 12 and science

fairs.