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Multi-Robot Aerial Survey Route Planner

Researchers at Stanford have developed a new path planning algorithm that enables autonomous multi-drone aerial surveys over large-scale environments. Their system solves the problem of finding routes over large areas in order to complete aerial survey tasks in reduced time. The data gathered from these flights can be used for wildlife monitoring, farm and ranch land management, and potentially rapid search and rescue. In contrast to existing back-and-forth 'sweeping' methods, the new system supports the use of multiple robots and requires significantly less backtracking. It interfaces with drone ground control software by providing a set of routes that cover a desired area in common formats. These routes can be flown simultaneously by a team of drones. Using their system, the researchers have surveyed several sites including one of the largest Adélie penguin colonies in the world (containing over 300,000 nesting pairs) in about 3 hours. Previous human-piloted single-drone surveys required over 2 days to complete.
Read a Stanford News story about the project

Stage of Development
The team has now deployed this system over Mono Lake, CA (to survey a California gull colony) as well as a 2,000 acre ranch in Marin, CA. This work has been supporting additional surveys in all locations for 3 years running, and enables re-planning during survey operations. Optimization efforts are ongoing.

Applications

- Field ecology and surveying
- High resolution wildlife imaging
- Land management for farmers and ranchers

Advantages

- Shorter paths that cover the same area when compared against similar sweep-style methods

Publications

- K. Shah, G. Ballard, A. Schmidt, and M. Schwager, "Multidrone aerial surveys of penguin colonies in Antarctica," *Science Robotics*, vol. 5, no. 47, p. eabc3000, Oct. 2020
- K. Shah, G. Ballard, A. Schmidt, and M. Schwager, "Large Scale Aerial Multi-Robot Coverage Path Planning," *Field Robotics*, 2022. Under Review.

Innovators

- Kunal Shah
- Grant Ballard
- Annie Schmidt

Licensing Contact

David Mallin

Licensing Manager, Physical Sciences

Email