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Mechanism for Physical Coupling of Quadrotors in Mid-Flight

Unmanned aerial vehicles (UAV) have received increased attention in the last decade due to their versatility, as well as the availability of inexpensive sensors for their navigation and control. Multirotor vehicles, specifically quadrotors, have formed a fast-growing field in robotics, with the range of applications spanning from surveillance and reconnaissance to agriculture and large area mapping.

The increasing availability and affordability of UAVs introduce opportunities of drone cooperation for executing more elaborate tasks. However, current technologies have not explored the potential of physically coupled drones in mid-flight. Coupled drones are able to combat a larger load capacity and perform in-flight docking functions. Therefore, there is a need to explore potential technology advancements and innovate drone capabilities.

Researchers at Arizona State University have developed a mechanism that allows a quadrotor drone to intercept another drone, and control it. This mechanism physically couples two quadrotors mid-flight, therefore increasing cooperative payload or enable target pursuit and capture.

The drone determines its trajectory through cascade proportional-integral-derivative (PID) controllers and seizes its target through an attached magnetic structure. Once coupled, the system can either disengage the target or initiate cooperative behavior. Coupling allows multiple UAVs to perform functions only capable on the ground, such as remote charging and docking, mid-flight.

Potential Applications

- In-flight coupling of drones
- Payload increase for commercial applications
- Target pursuit and capture

Benefits and Advantages

- Autonomous – The mechanism contains a series cascaded PID controller systems for maneuvering any 3-dimensional space and targeting other drones.
- Cooperation – Coupling capable between multiple quadrotors, independent of size, and form structures for collaborative tasks, such as remote charging and

docking, and increased payload for commercial applications.

For more information about the inventor(s) and their research, please see

Dr. Panagiotis Artemiadis' Directory Page