Autonomous Drone Landing with Fiducial Markers and a Gimbal-Mounted Camera for Active Tracking

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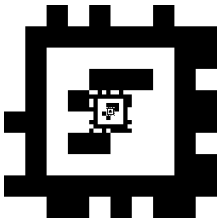
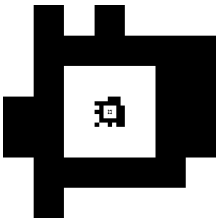
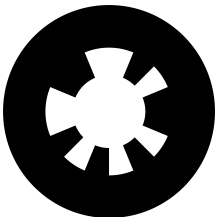
Fiducial Markers



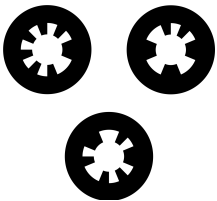
(a) April Tag 48h12



(b) April Tag 24h10



(c) WhyCode (Orig)



(d) WhyCode Multi

The Downward-facing Camera Axiom

Orientation Ambiguity

Testing Platform: DJI Spark

DJI Mobile SDK

Testing Platform Limitations/Workarounds

Example Tracking Performance

Example Landing Trajectory

Example Control Outputs

Erroneous Control Outputs

Erroneous Landing Trajectory

Landing Radii

Future Work

Main Messages

- *Actuated*, gimbal-mounted camera

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- *Actuated*, gimbal-mounted camera → easier to search for the landing pad.
- Orientation ambiguity, discontinuities → pose estimation is harder.
- Autonomous precision landing still possible but can be improved.