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3D Optical Tracking Sensor

Researchers want a 3D optical sensor to record the exact flight trajectory of foraging birds such as raptors and vultures as they approach a source of food. Other applications include monitoring for birds within sensitive airspace such as near runways or wind turbines and visual detection of drones. The instrument is passive and consists of at least two matched optical cameras pointed skyward, capturing synchronized still image sets for post-processing.

The project team must identify minimum hardware requirements, identify suitable camera hardware (purchased by the client), develop and implement software to effectively calibrate the optics, capture synchronized image sets and analyze them. The analysis software should produce the coordinates within each image set of at least one potential target and deal in some reasonable way with multiple simultaneous targets.

A historical reference is the Ornithodolite (Pennycuick, 1982) but modern cameras should allow for a totally automated version with no moving parts or operator. Recently developed 3D cameras that record 3D video for human viewing would allow stereo triangulation but do not have adequate baseline separation of the sensors. Recent 'surround' or '360' cameras now have the optics to view in all directions, so by operating a set of suitably separated, calibrated and synchronized cameras, it should be possible to resolve the coordinates of approaching birds.

Deliverables: 1) A hardware requirements document; 2) Calibration and synchronization techniques; 3) Analysis software.

Critical issues: Calibration of the optics, image capture synchronization (or post-hoc correction), image contamination from sun glare and trees, multiple targets in view simultaneously, open source image analysis toolkits.

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