Universität Stuttgart
Institut für Flugmechanik und Flugregelung

Active target following with a multi-camera system

HiWi - Stelle

Tracking moving subjects is of interest in many fields like cinematography, sport, wildlife capturing, TV, and data collection. Doing that with multiple, coordinated, cameras would also allow the extraction of coherent 3D information helping in various tasks like pose estimation, 3D environment reconstruction, and target tracking.

Problem definition: The core of the project is be to design, build and implement a system of (ground) cameras, mounted on different tripods/anchors, that can be controlled in yaw, pitch, and roll. The system must be able, as a first step, to synchronize the video system and keep track of the relative orientation of the cameras. The system should also be robust and work without any (or minimal) prior extrinsic calibration so that can be applied in a variety of scenarios. The control algorithm should ensure that optimal visibility of the target and 3D reconstruction are always satisfied. The target could be for example a human, a ball, or an animal. The control algorithm could either react or predict the subject's movements. Finally, a multiple objective strategy could also be implemented to track, for example, a blimp and a human. Application to aerial vehicles will be the final step of the work.

Task:

- Research camera tracking and control algorithms (e.g. video surveillance field, sports events…)
- Design the hardware to have fine control and (local) state estimation.
- Develop control algorithm and synchronization-strategy.
- Test the approach and results both in simulation and real hardware

Requirements:

- Interest in control, camera systems
- Hardware experience
- Possibly some DL knowledge
- Experience with ROS / Gazebo / OpenCV required
- Good problem-solving capabilities
- Experience with C++ / Python desired
- Good academic performance

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