AirCap – Aerial Outdoor Motion Capture

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Indoor MoCap: 4D Scanners

- 22 stereo camera pairs
- 22 full color cameras
- pattern projectors
- 60 meshes per second
- 150k points per mesh
- ~$(1.5m)^2$ scan platform
Can we do human MoCap in outdoor scenarios?

- A team of flying robots.
- Cameras mounted on each robot.
- Robots follow the subject.
- Robot formation covers all important viewpoints.
Goal

Online and On-board person position estimation and multi-robot formation control

Offline pose and shape estimation from multiple aerial videos

MoCap Front-end

MoCap Back-end
Outdoor MoCap using UAVs – Research Challenges

- Real-time performance
- Detect and track people
- Self-localization
- Multi-robot Information fusion
- Inter-robot collision avoidance
- Obstacle detection and avoidance
- Formation control
Autonomous cooperative detection, tracking and following.

Active perception-based formation of MAVs:
- Minimizes uncertainty in the fused person position estimate.
- On-board processing, no markers on the human, no pre-specified formation geometry.

Simulation Experiments in Gazebo

In the next clip we showcase the results of our proposed approach using 8 simulated AscTec Firefly MAVs
- autonomously maintaining an optimal perception-driven formation,
- avoiding multiple static obstacles (trees) and teammates,
- while cooperatively tracking a person walking on an uneven terrain.
AirCap: 3D Markerless Outdoor Human Motion Capture

3D pose and shape overlaid on an external camera view

3D pose and shape overlaid on MAV camera images

walking sequence

exercise sequence

Thank You