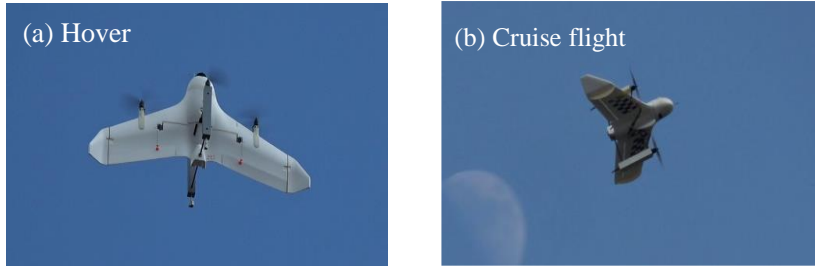


Flight Mechanics and Control



VTOL tail-sitter UAV prototype in different modes.

Study I: Transition Optimization for a VTOL Tail-sitter UAV

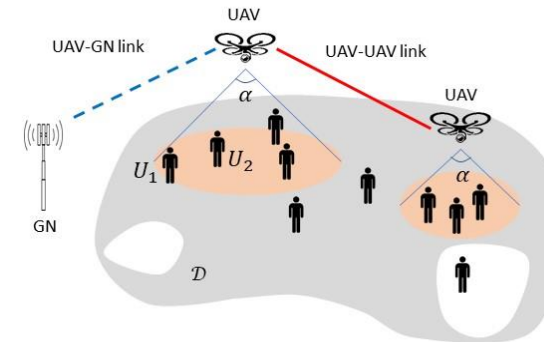
Summary:

- Carry out simulations and outdoor experiments with the optimized forward (hover-cruise) and backward (cruise-hover) transition solutions
- The results show that the optimized transition strategy enables the vehicle to finish transition with less time and change of altitude compared with that by using traditional linear transition methods

Study II: Optimal Deployment of UAVs for Target Surveillance

Summary:

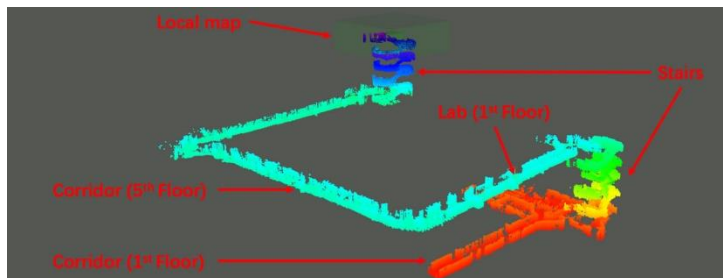
- Propose a novel coverage model and a reactive collision free 3D deployment algorithm
- The algorithm consists of two navigation laws for the horizontal movement and the vertical movement (implementable in real time).
- At least locally optimal performance can be achieved, a valid connectivity between any UAVs and ground nodes (GNs) is guaranteed.



Structure of the UAV-based surveillance system

Applications:

- Infrastructure inspection
- Surveillance
- Search and rescue
- Parcel delivery



Large-scale mapping inside a building.

Study III: UAV Simultaneous Localization and Mapping (SLAM) System

Summary:

- Develop the FLVIS (Feedforward-feedback Loopbased Visual Inertial System) which achieves high accuracy and robustness UAV pose estimation.
- MLMapping, a multilayer mapping framework for autonomous UAV navigation applications is developed. The map is divided into three layers: awareness, local, and global. The framework supports different kinds of map outputs for the global or local path planners.