



Abstract

This project aims to develop the UNR Flying Arena. Located at the High-Bay laboratory, UNR provides large space for testing of unmanned aircrafts. The available infrastructure includes a motion capture system which facilitates ground truth but also enables us to deploy safety mechanisms that can take over the control of our robots in case of emergency. This project aims to develop the relevant ROS-based Framework

1 Description of Work

A Flying Area that provides accurate ground truth, pose feedback when this is needed and implements safety-critical mechanisms, is among the most fundamental tools to boost aerial robotics research. UNR provides such infrastructure with the large facilities of the High-Bay lab and the motion capture system that is available there. However, specific functionalities are missing such as an integrated feedback and command system for our aerial robots or a programmed “safety pilot” that can take over in case of emergency and safely land our vehicles. The goal of this project is to develop such functionalities. All the work will rely on ROS and the goal will be to establish the overall functionality and relevant interfaces for two aerial robotic systems of the multirotor class.



Figure 1: Example camera of a motion capture system as well as a photo of one of the two multirotors to be integrated

As this project is safety critical, we want to focus on well written and bullet-proof software as well as its thorough documentation. The student will also have the chance to work on real aerial robotic platforms and facilitate their automatic control using the motion capture system.



2 Tasks and Milestones

List of Tasks

- **T1:** Learn and Understand ROS
- **T2:** Software Design outline and Agreement on Interfaces
- **T3:** Implementation of the Pose Feedback on ROS
- **T4:** Implementation of the Ground Control Station on ROS
- **T5:** Implementation of the programmed “Safety Pilot”
- **T6:** Documentation

List of Milestones

- **M1:** Pose Feedback ROS package, *M3*
- **M2:** GCS ROS Package, *M5*
- **M3:** “Safety Pilot” ROS Package, *M6*

3 Requirements

1. Very independent, but a good team player
2. Experienced C++ programmer
3. Experience with the Robot Operating System is a plus
4. Pilot skills is a plus
5. Experience with microcontrollers is a plus

4 Supervision

This project is supervised by:

- Kostas Alexis - University of Nevada, Reno (UNR) [kalexis@unr.edu] , (www.kostasalexis.com)
- Luis Rodolfo Garcia Carrillo - - University of Nevada, Reno (UNR) [rodolfo@unr.edu]