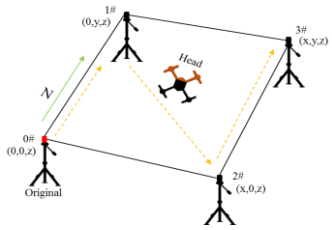
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Advanced Interactive Technologies
Prof. Dr. Otmar Hilliges
http://www.ait.ethz.ch/

MA “Wide scale Outdoor Drone UWB flight with GPS fusion”

Supervisor: Prof. Otmar Hilliges, Tobias Naegeli (naegelit@inf.ethz.ch)
Place: ETH Institute for Pervasive Computing

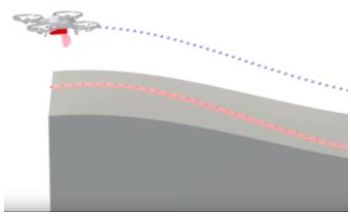


Introduction

Smooth shots have been a crucial demand in the media and entertainment industry ever since its first days.
Creating spectacular images for sporting events or action movies, however, still requires heavy camera equipment such as dollies or cranes.
These methods are very expensive and inconvenient: Due to their size and weight, transportation is cost-intensive and the setup often requires two or more people and a lot of time. Additionally, there are limitations: For sports productions, available options offer hardly longer tracks than 20m and there are speed limits of about 40km/h.

Drones are famously known for their aerial videography capabilities. However, state-of-the-art drones face two major issues, preventing them from being used as a compelling replacement for dolly movements:

1. Filming often requires more than one take of the same shot. Therefore, drones need to be able to refly the exact same path several times. This is hardly possible with a manually controlled drone, and if so, it requires hours and hours of training.
2. Computer-controlled drones may solve this problem. However, their current positioning systems are not reliable enough yet, due to the lack of precision technology.



Thesis Description

The focus of the thesis is to implement, evaluate and test a novel indoor positioning system for drone media productions. The technology is based ultra wideband (UWB) beacons in combination with a differential GPS solution.

Requirements

The ideal candidate will have an INFK, MAVT or ITET background with a focus on Estimation and Control or general Robotics. Solid programming skills (Matlab and C/C++) and an interest in hands-on development and experimentation is also a requirement.
Programming languages: Matlab, C/C++.

Expected Project Work Packages:

1. **WP** Literature study, setting up the working environment and getting familiar with Matlab code base and UWB.
2. **WP** implementation of UWB based positioning in the LAB space and basic calibration.
3. **WP** Develop the needed estimators for drone based flight.
4. **WP** Fly UWB based indoors and report accuracy.
5. **WP** Test System outdoor on a scale of 100mx180m.
6. **WP** Integrate GPS/Differential GPS Sensor.
7. **WP** Write thesis.

Thesis grading scheme

Grade	Description
6.0	Outstanding quality; significantly exceeds expectations; original contribution by the student
5.5	Problem solved in a very good way; student has expanded the original question
5.0	Problem has been solved; expectations are met but not surpassed
4.5	Problem solved with minor deficits; expectations fulfilled with deficits in some details
4.0	Problem just solved (marginal solution); expectations only partially met; major deficits