

Camera Based Local Positional Vision-Guidance System for Micro Unmanned Ariel Vehicles



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Introduction



- **Unmanned Aerial Vehicles**
 - Remote Control
 - Movements known through sensors
 - ✦ Guides pilot through terrain
 - Recent trend towards smaller UAVs



R.Y. Siegwart, muFly-
Fully Autonomous
Micro-helicopter, ETH-
muFly, 1 December
2009, [Online]
Available: muFly-Fully
Autonomous Micro-
helicopter,
<http://www.muFly.ethz.ch/>



muFly

Introduction (con't)



- **Micro-Unmanned Aerial Vehicles**
 - Small and compact
 - Weight sensitive
 - ✦ Restricts sensors
 - Navigation information vs. Hardware restriction
 - ✦ Creating a balance

Vision Hardware



- **Camera**
 - Overall inexpensive
 - Have sense of movement
 - Display images

Open CV



- **Open Computer Vision (Open CV)**
 - Portable language
 - ✦ Different platforms and languages
 - Create data from images

G. Bradski and A. Kaehler, *Learning Open CV: Computer Vision with the Open CV Library*. Sebastopol: O'Reilly, 2008.

Movement Detection



- **Feature detect (Good Features to Track)**
 - Finds points of interest from old picture
 - Coordinates them to pixel location
- **Lucas-Kanade detection**
 - Create new set of features from current picture
- **Connect the dots**

G. Bradski and A. Kaehler, *Learning Open CV: Computer Vision with the Open CV Library*. Sebastopol: O'Reilly, 2008.

Image Comparison



Inliers vs Outliers



- **Find inliers**
 - Calculate picture translation and rotation
 - Check error of calculated translation from previous to current

Inliers vs Outliers (con't)



- **Pictorial view**
 - Red for outliers
 - Green for inliers
 - Redraw the picture

Results



Future Works



- **Optimizing Code**
 - Iteration accuracy vs speed
- **Correcting errors**
 - Least squared
- **Real-time implementation**

Aknoledgement



- **Dr. C.J. Taylor**
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Thank you



QUESTIONS?