Twirre

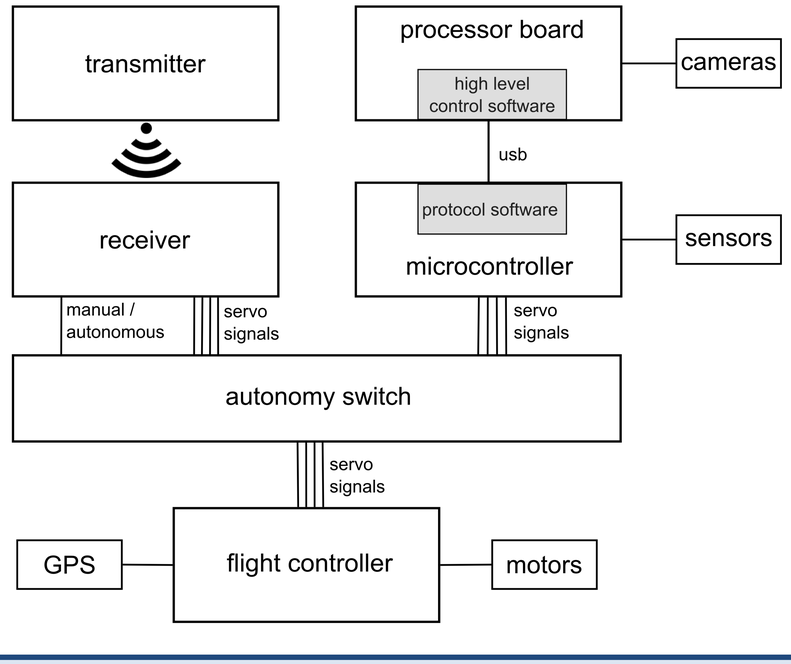
Architecture for autonomous mini-UAVs using interchangeable commodity components

J. van de Loosdrecht, K. Dijkstra, J.H. Postma, W. Keuning and D. Bruin
NHL University of Applied Sciences, Centre of Expertise Computer Vision (www.nhlcomputervision.nl)

Objectives

- All sensors and processing on-board
- Low-cost components
- Upgradable and extendable
- Useful in multiple applications
- Instantly and reliably switch between manual and autonomous control

Architecture



Cascade control system

- High level: simulation of human stick inputs
- Low level : exchangeable flight controller

Autonomy switch

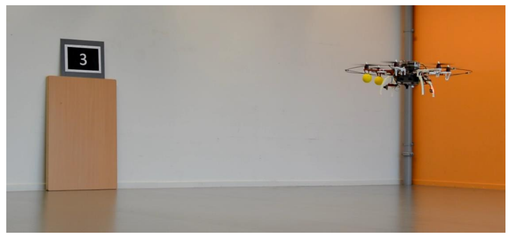
- In hardware only, no software involved

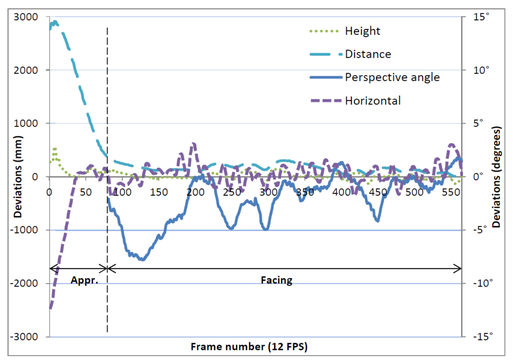
Software

- Mission and high level control system
- Portable C(++)

Example implementation

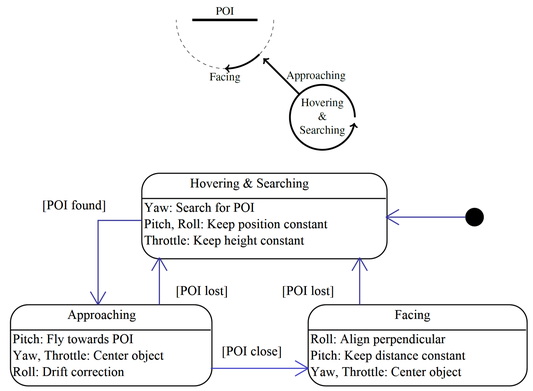
Result of experiments





State machine

- Hovering & Searching
- Approaching Point of Interest
- Facing Point of Interest



Conclusions

- Twirre architecture has been derived from objectives
- Low-cost multi-copters are implemented
- Successfully tested in GPS-deprived environment
- Autonomy switch is safe and reliable

Future work

- Extract reusable software components
- Add extra sensors for increased robustness
- Extend state machine
- Release system software to public domain

International Micro Air Vehicle Conference and Competition (IMAV 2014)