



FAKULTÄT FÜR  
INFORMATIK

## Kickoff Software-/Team-Project SwarmLab

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Chair of Intelligent Systems

# Organization

- Time and location:
  - Start: 13.04.2016
  - End: 15.07.2016
  - Place: G29-035
- Contact:
  - Christoph Steup: [steup@ovgu.de](mailto:steup@ovgu.de)
  - Sebastian Mai: [sebastian.mai@st.ovgu.de](mailto:sebastian.mai@st.ovgu.de)
- Meetings:
  - Individual meetings organized periodically by Team Leader

# Teams

- 4 Teams of max. 4 Students
- Bachelor / Master mixed
- One leader (chosen by team) :
  - Organize project (sub-tasks, milestones, documentation)
  - Communication to staff
- Presentation by all members
- Prerequisites:
  - Courses: PKES, TI2, Swarm Intelligence, Control Theory
  - Programming: C++/C, Ocaml, Lua, Latex ...
  - Enthusiasm and Teamwork

# Registration

- In case more than 16 Students want to take part:
  - Write an E-Mail to [steup@ovgu](mailto:steup@ovgu) containing:
    - Your Name
    - Your Field of Studies (IF-B, CV-M, DKE ...)
    - Your experience with robotics in years
      - Either Robotic Simulation ( VREP, Gazebo, MRDS ...)
      - Or real Robotic Systems
    - Your Expertise with the following programming languages in years:
      - C/C++
      - Lua
      - Ocaml
      - Java
    - If you visited the following courses (marks are optional)
      - Technical Computer Science
      - Principles of Embedded Systems
      - Swarm Intelligence
      - Control Theory
    - Your favorite Topics in descending order

# Evaluation

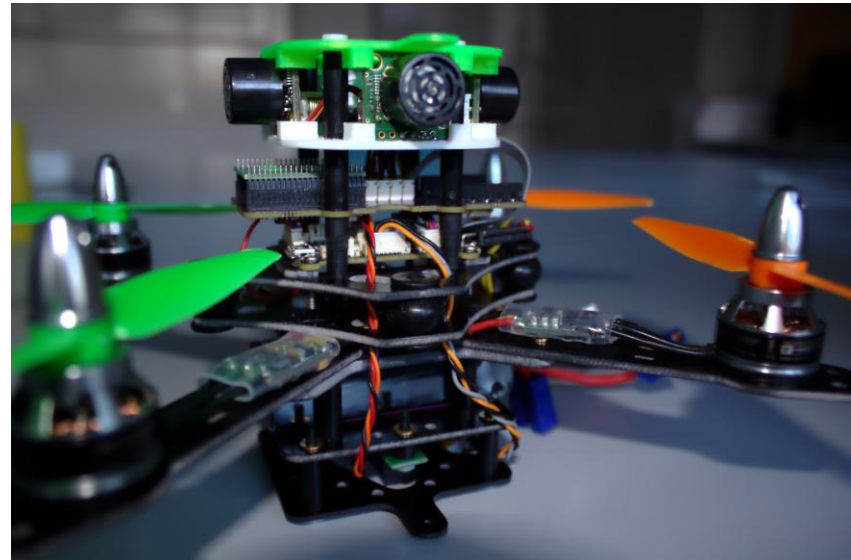
- You deliver:
  - Working Prototype
  - Code
  - Documentation
  - Project Management
  - A talk including video or demonstration
- We deliver:
  - Guidance
  - Introductory meetings to show you your way around the used systems
  - Either a grade or a ungraded “Schein” for Bachelors

# Topics

- Automatic calibration
- Synchronization of external and internal video copter log files
- Unified software modules for real and simulated copters
- Swarm-based distributed exploration (Simulation)

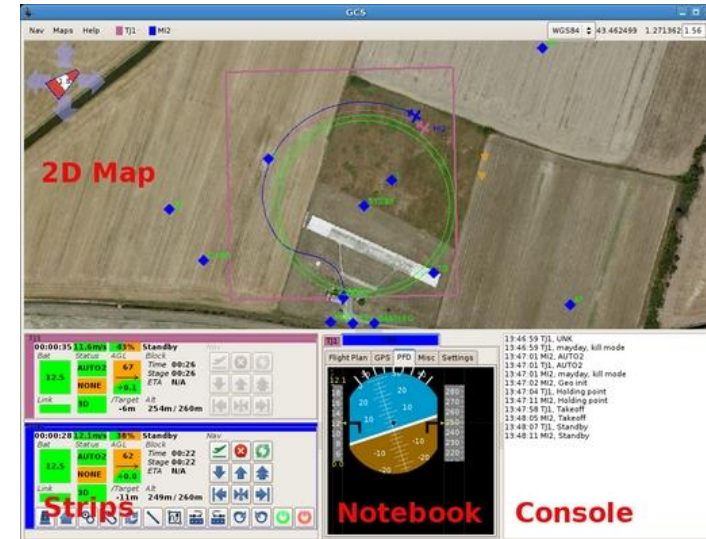
# Automatic calibration

- Copters need calibration to compensate production errors
- Manual calibration tedious
- Existing camera system on ceiling to track single copter
- Existing non-linear model of copter behaviour
- Idea:
  - Observe movement of copters
  - Compare movement to expected movement based on control input
  - Change calibration based on difference
  - Repeat until calibrated



# Synchronization of external and internal video copter log files

- Scientific experiments need extensive logging
- Three heterogeneous log sources:
  - 802.15.4 wireless telemetry
  - Sd-card on copter
  - Camera tracking
- All Logs in own time domain
- Need to synchronize start time and clock rate
- Either on-line or post-mortem





# Unified software modules for real and simulated copters

- Different software architectures for real and virtual copters
- Partially similar API
- Goal: Transfer of software modules of real copter to virtual ones
- Idea:
  - Define one API of real and virtual copter
  - Cut software modules from Paparazzi
  - Embed software modules in Plugin to VREP simulation
  - Configure the data flowing between simulation and paparazzi module

# Swarm-based distributed exploration (Simulation)

- Global optimization task of swarm of copters
- Copters need to search for distributed phenomenon in simulated environment
- Simulation already existing including sensors and actuators
- Phenomenon: Distance-to-Obstacle and Color-of-Ground
- Goals:
  - Define distribution scenarios of phenomenon
  - Develop/Adapt algorithm to tackle search
  - Evaluate different scenarios using different parameters
  - Summarize performance

