INF FAKULTÄT FÜR INFORMATIK

Presentation of Projects: Computational Intelligence and robOTTO

Prof. Mostaghim, Dr.-Ing. Christoph Steup
Chair of Intelligent Systems

Organization

- Time and location:
  - Start: 17.10.2018 or 23.10.2018
  - End: 15.02.2019++
  - Time: 13:00 (1:00 pm) (KickOff Meeting)
  - Place: G29-035
- Contact:
  - Dr.-Ing. Christoph Steup: steup@ovgu.de
  - M.Sc. Sebastian Mai: sebastian.mai@st.ovgu.de
  - Michael Faber: michael.faber@st.ovgu.de
- Application Form: Either direct or via E-Mail
- Future Meetings agreed on by Doodle
- Web:
  - Flying Swarm
  - Rolling Swarm
  - robOTTO

Teams

- Teams of max. 4 Students
- Bachelor / Master mixed
- DE-Project/Team Project/FIN-SMK mixed
- One leader (chosen by team) :
  - Organize project (sub-tasks, milestones, documentation)
  - Communication to staff
- Presentation by all members
- Prerequisites:
  - Courses: PKES, Operating Systms, Swarm Intelligence, Control Theory
  - Programming: C++/C, Python, Latex …
  - Enthusiasm and Teamwork

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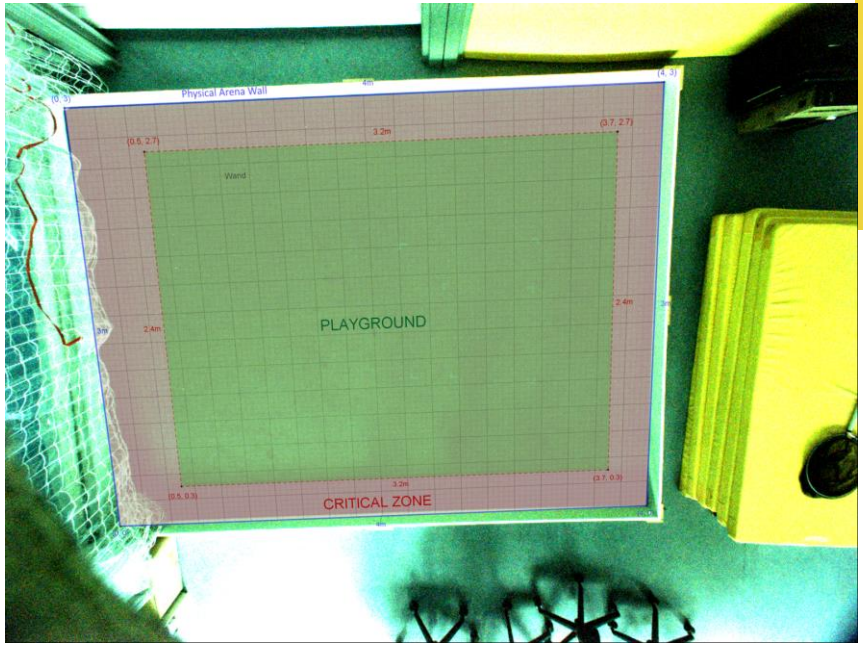
Evaluation

- You deliver:
  - Working Prototype
  - Code
  - Documentation
  - Project Management
  - A talk including video or demonstration

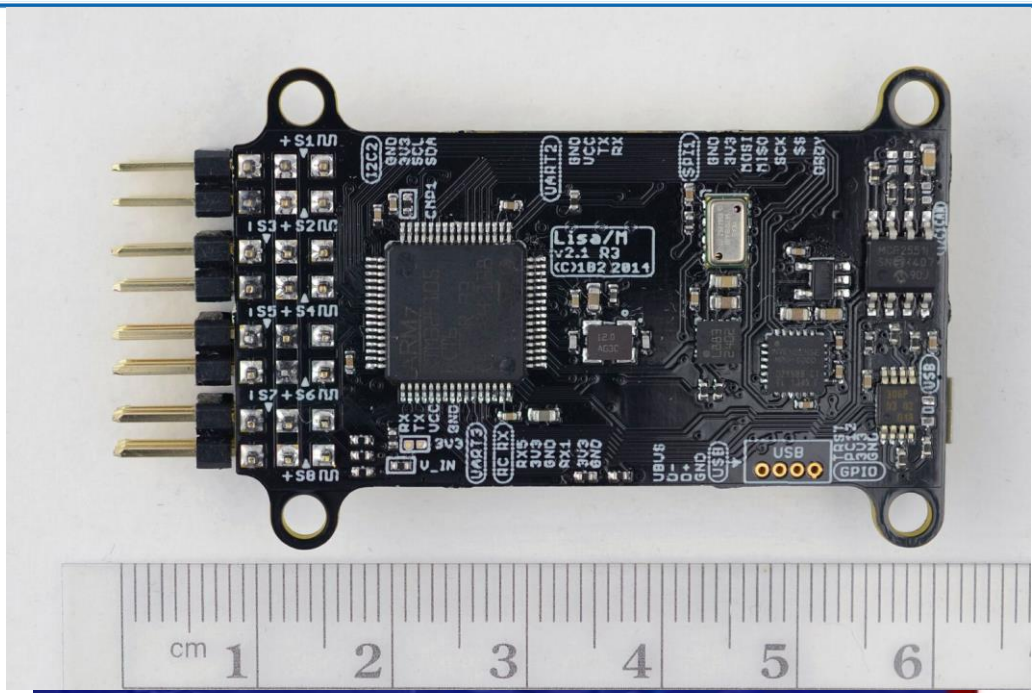
- We deliver:
  - Guidance
  - Introductory meetings to show you your way around the used systems
  - Either a grade or a ungraded “Schein” for Bachelors

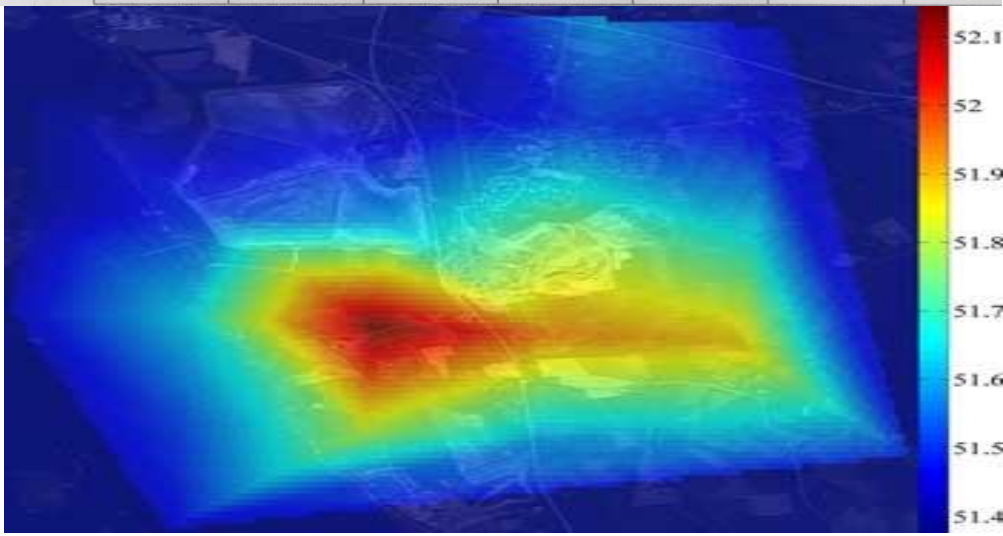
Flying Swarm



3D Magnetic Mapping

- Copters contain included 3-Axis Magnetometer
- Use Magnetometer to create 3D Map for Indoor Environments
- Enable Positioning
- Enable Compensation of Magnetomet Data
- Goal:
  - Evaluate Precision of Magnetometer
  - Create SW to aquire Map
  - Check Location Capability
  - Check Correction Capability

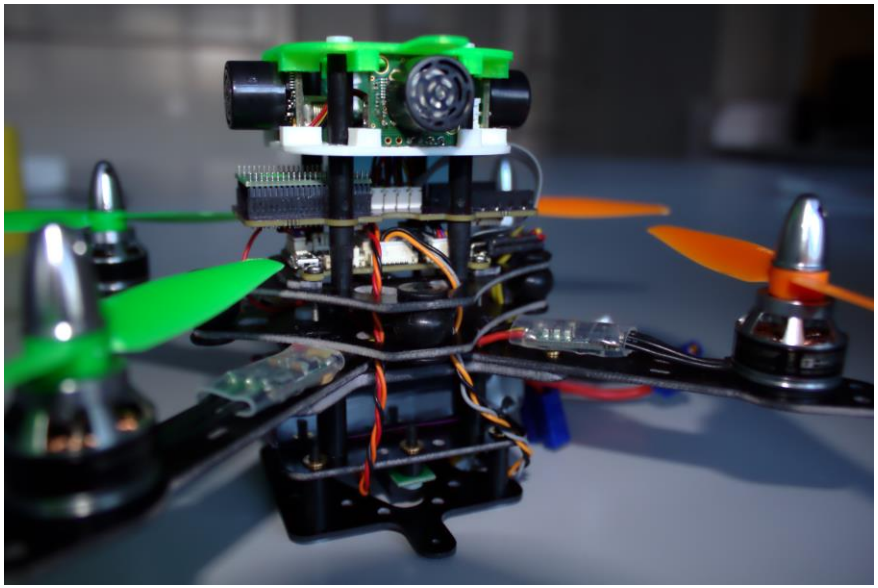




Source:
http://www.oulu.fi/infotech/annual_report/2011/isg

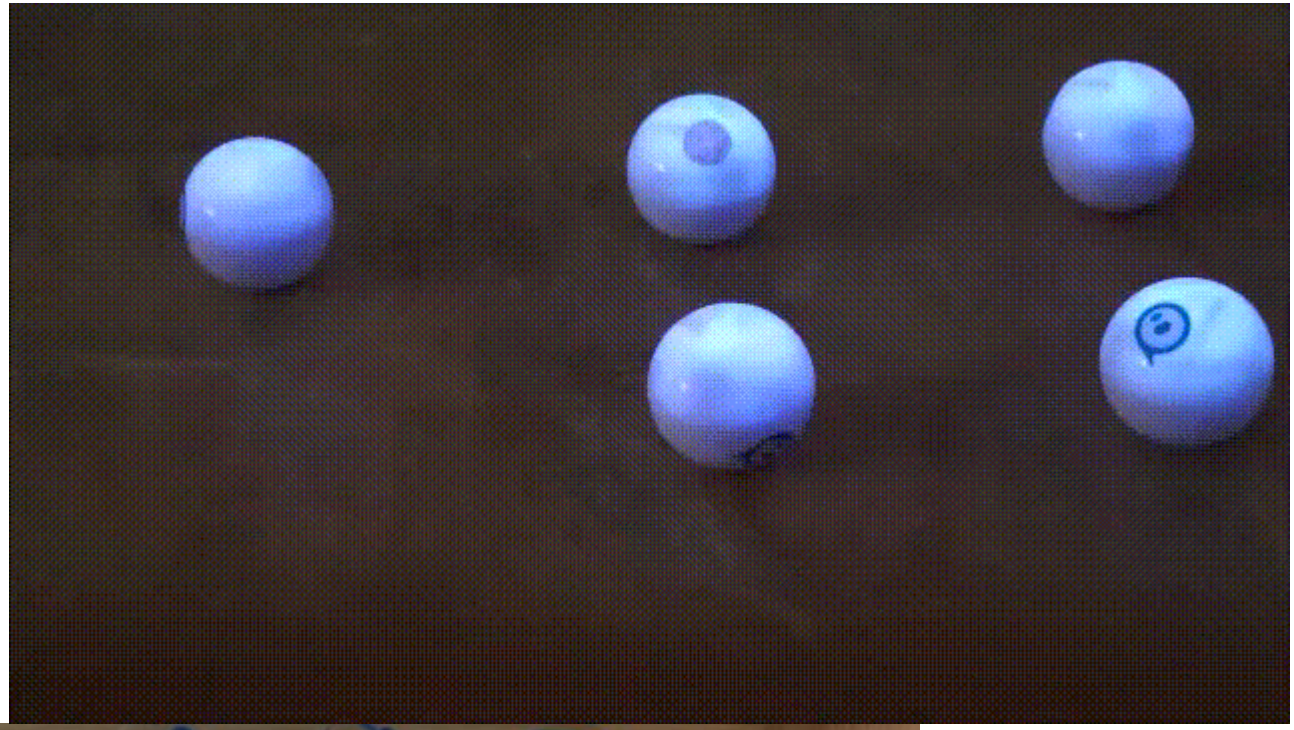
Prototype Port of FINken to ArduPilot

- Currently using Paparazzi UAV
- ArduPilot has strong Community
- ArduPilot better suited for experimental changes
- Paparazzi better suited for long term stable missions
- Goals:
  - Analyze Differences of Systems
  - Enable ArduPilot on Finken Hardware
  - Tune Parameters



Docs.px4.io/en/flight_controller/pixhawk4.html

Rolling Swarm



Analysis of B-Human Software

- B-Human very successful Team in SPL-League
- Demo Application including NAO and Spheros wanted
- Different Environments creates Problems in usage of B-Human Software
- Goals:
  - Analyze B-Human Software Structure
  - Analyze B-Human Environment Model
  - Adapt B-Human Environment Model to SwarmLab

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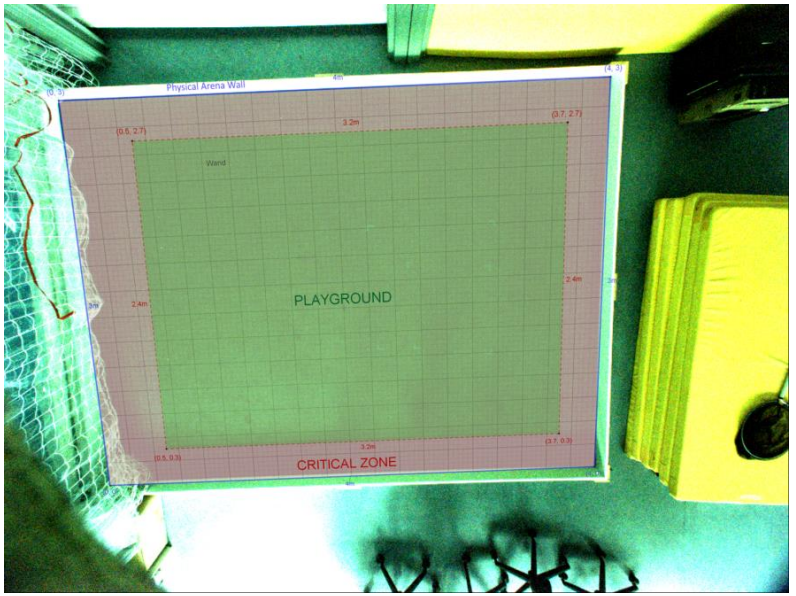
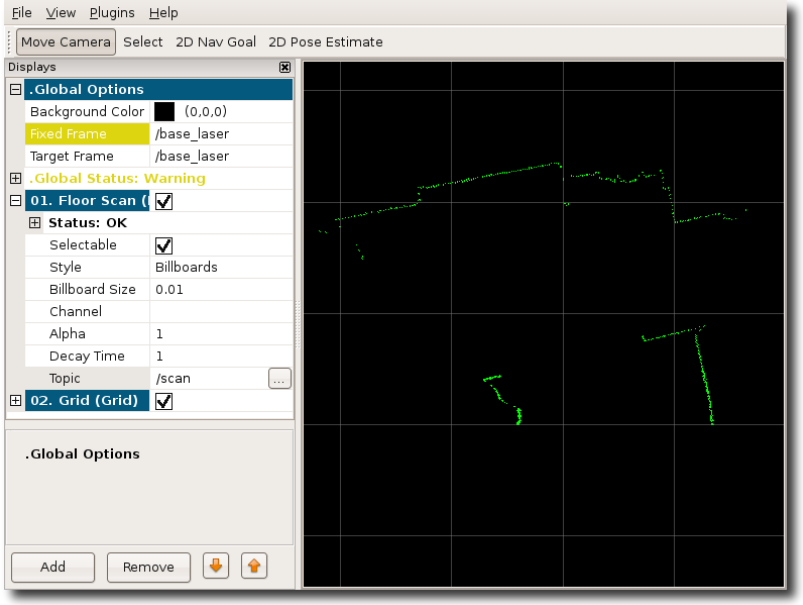
Virtual Sensors for Spheros

- No external sensors mountable on Spheros
- Position Information enables inference of environment state
- Realistic error model
- Possible Virtual Sensors:
  - Virtual Laser Scanner
  - Virtual Ranging
  - Virtual Magnetometer
  - Virtual GPS





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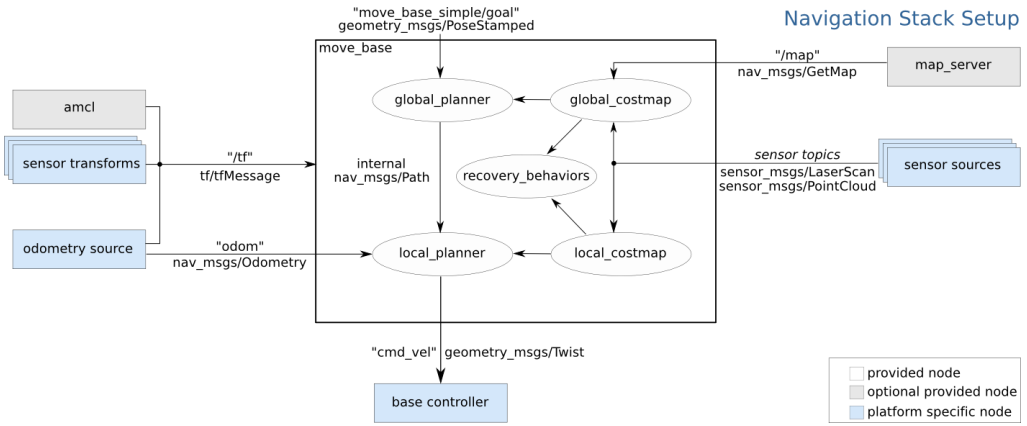
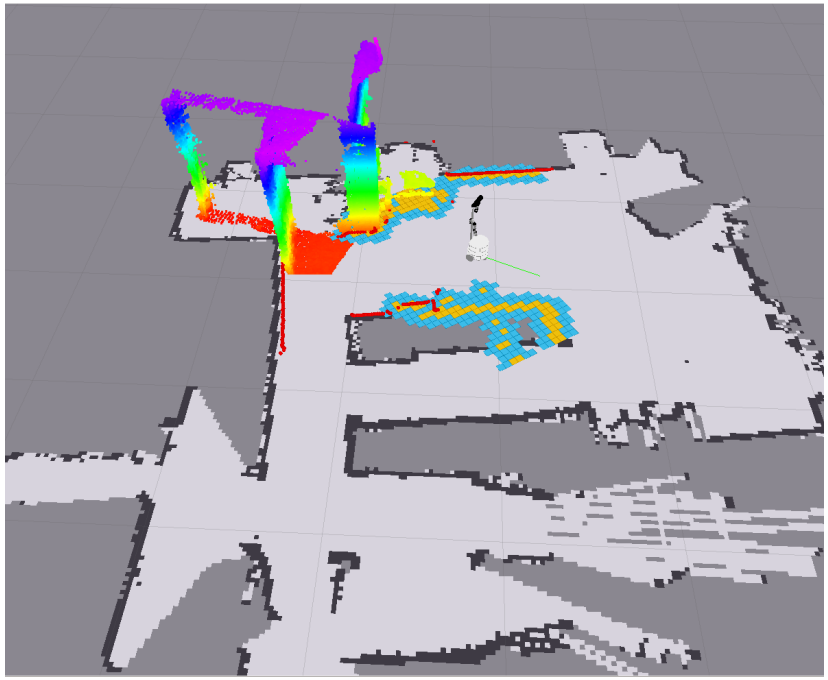
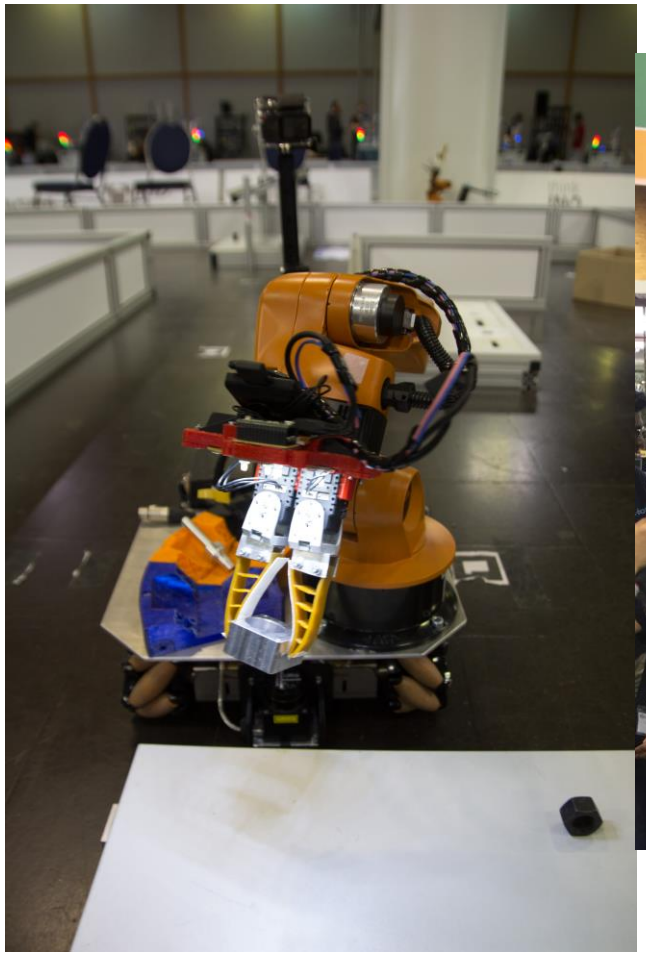
Swarm-Behaviour API for Spheros

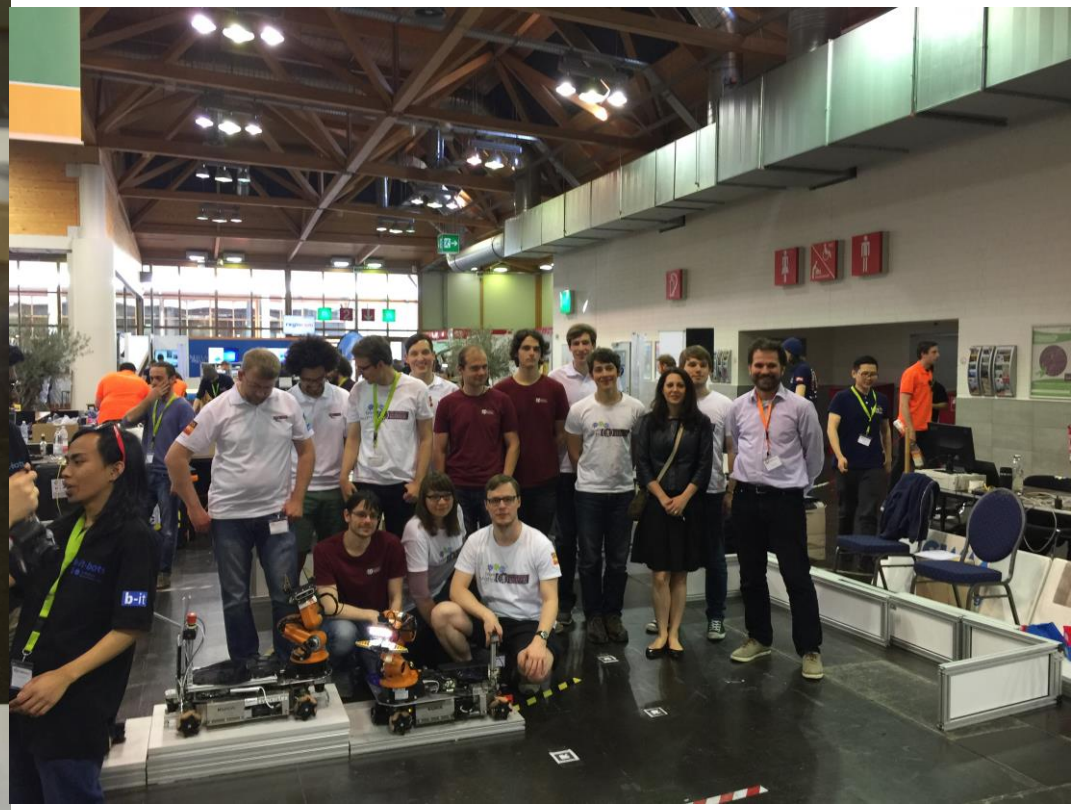
- ROS-based Interface
- Abstraction of Capabilities
- Integration of Position Information
- Swarm State Visualization
- Demo Application:
  - Mobile Swarm Display
  - Adaptive Formation Driving





robOTTO





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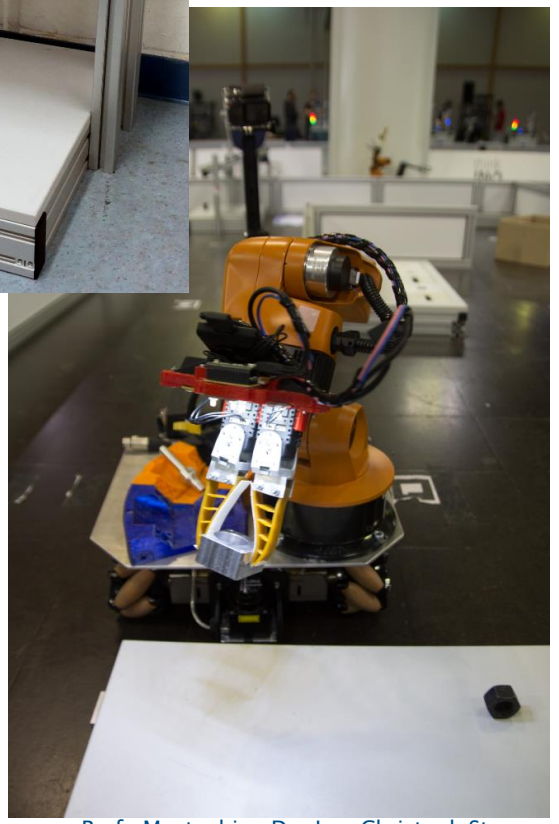
Arena Description-based Manipulator Planning

- RoboCup Team used MoveIt for Motion Planning
- Currently only Inverse Kinematics
- Arena, Robot, Object Description is existing
- Complex Arm Movement planned on Run-Time not doable -> Static Planning
- Goal:
  - Include Descriptions in MoveIt Planning Scene
  - Enable Run-Time Planning of complex Trajectories



Design of a new Referee Box for RoboCup @Work

- RoboCup @Work League uses Referee Box to distribute Tasks to Robots
- Enhanced Visualization for Viewers at the Cup
- Enhanced API for Evaluation Metrics
- Comm. Interface is very difficult for new Teams
- Goals:
  - Design new UI and Task Configuration System
  - Evaluation and Analysis API
  - Communication based on ROS