

Autocalibration in Ubiquitous Tracking Environments

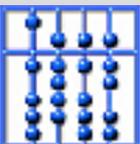
Thesis Proposal

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20.01.2004

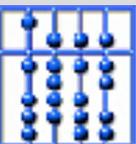
Motivation

- Calibration = Alignment of coordinate systems of different trackers
 - For autocalibration, a certain overlapping between the tracking areas is necessary.
- Why calibrate
 - Smooth transition between trackers
 - Sensor fusion: Eliminate systematic error
- Most AR setups do require a separate calibration step
 - Time consuming
 - System only calibrates itself when explicitly told to do so

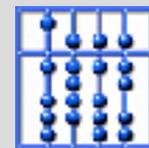
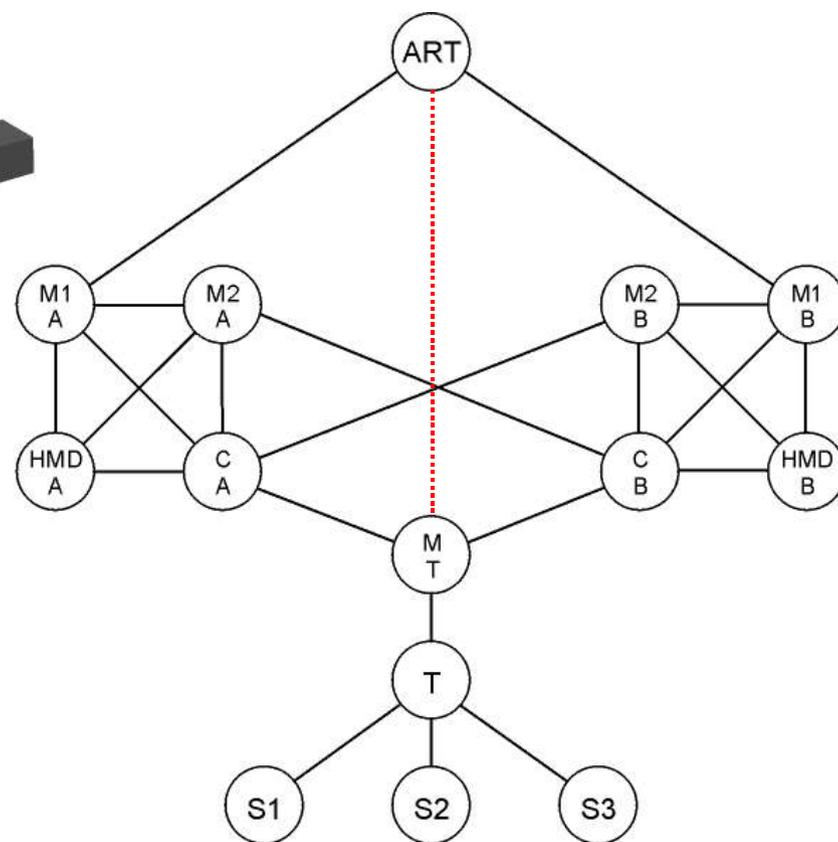
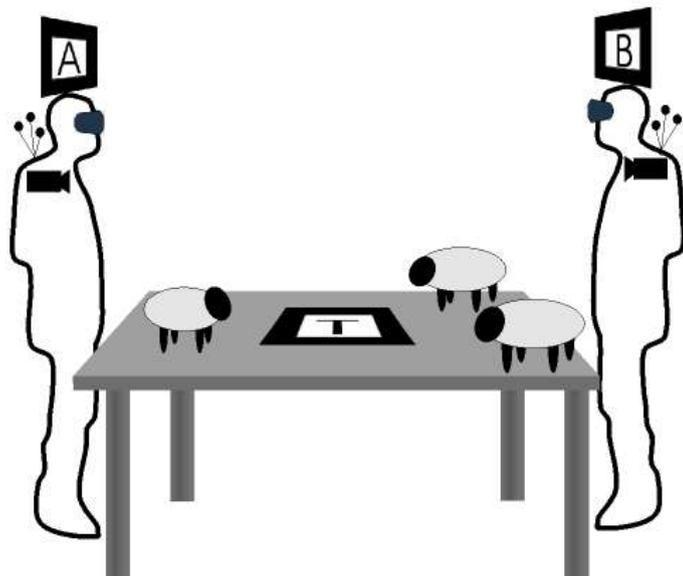


Approach

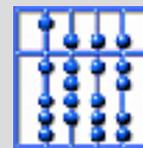
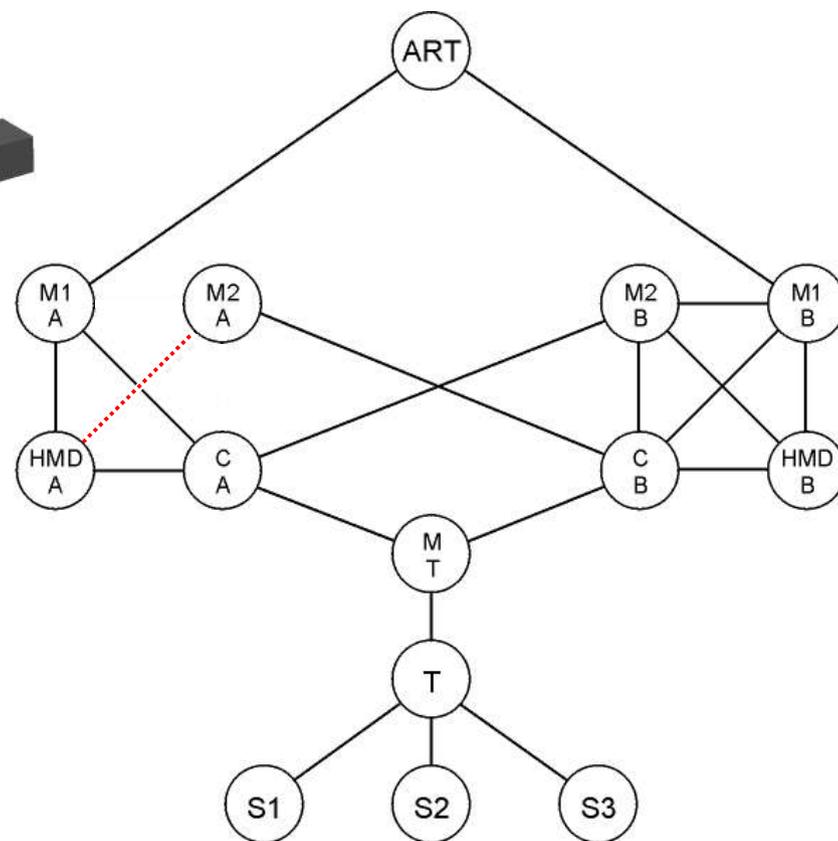
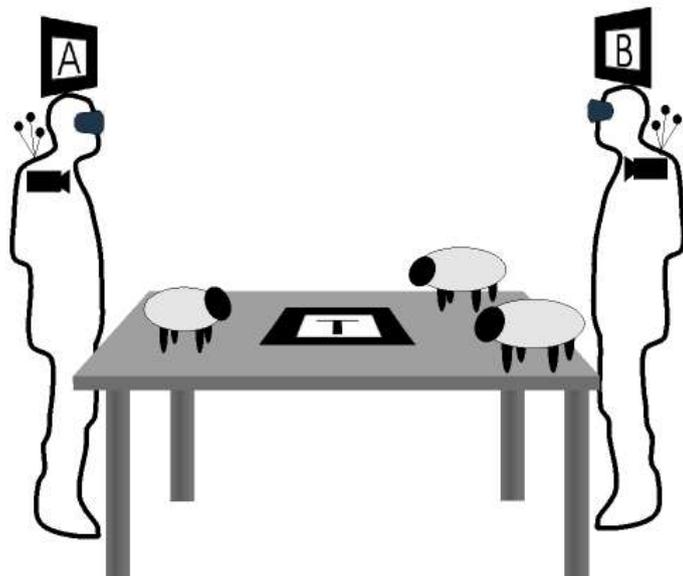
- Calibrations are added as static measurements to the spatial relationship graph
- UbiTrack framework finds reference measurements when they are available
- Reference measurements are weighted by precision and averaged over time
- System calibrates during use
- Quality of calibration improves as further measurements are integrated
- Other sensor can be used as „ground truth“ or the overall system error can be minimized



Scenario

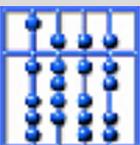


Scenario



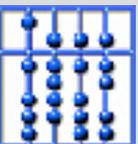
Challenges

- Dealing with uncertainty
 - Averaging over measurements with different precision
 - Simple least squares estimation is no option
 - Estimation of calibration quality
 - Where does the measurement precision covariance matrix come from?
 - Most sensors do not provide precision information
 - Manual measurement of each sensor
 - Can average sensor error be estimated in parallel to calibration?
- Estimation of other sensor parameters
 - Camera calibration
 - Drift in velocity or acceleration sensors



Next steps

- Improve my knowledge of statistics and state estimation
- Search literature for (auto-)calibration problems and solutions (especially robotics literature)
- Think about integration in UbiTrack and DWARF
- Later
 - Implementation
 - Testing
 - Evaluation



Questions?

