3D MAPPING AND PLANNING FOR AUTONOMOUS NAVIGATION OF MICRO AERIAL VEHICLES IN COMPLEX GNSS-DENIED ENVIRONMENTS

Radu Alexandru Rosu on behalf of Sven Behnke

University of Bonn, Germany
Computer Science Institute VI
Autonomous Intelligent Systems
AUTONOMOUS BEHAVIOUR

- Mapping
  - Map of the scene
  - Semantic understanding
AUTONOMOUS BEHAVIOUR

- Mapping
  - Map of the scene
  - Semantic understanding

- Planning
  - Collision avoidance
  - Time-optimal control
- Scene as lightweight mesh
- Semantic and RGB as high-res texture
- Iterative self-improvement through Label Propagation
- Probabilistic fusion
- High resolution texture
- 66 semantic classes
AUTONOMOUS MAV
MAVS FOR FIREFIGHTING

- Fast reconnaissance
- Detect people or latent fires
- Multi drone communication
Image intensities change over time
- Image intensities change over time
- Estimate vignetting, camera response and exposure changes
• Image intensities change over time
• Estimate vignetting, camera response and exposure changes
• Thin plate spline for interpolation of correction factors
Dynamic objects need to be treated separately
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Track the objects
Dynamic objects need to be treated separately

Track the objects

Real-time filtering
PLANNING UNDER CONSTRAINTS

- Sensors have blindspots
- Planning needs to take them into consideration for safety
- Modified A* and CHOMP trajectory optimization
Planned path with visibility constraints
- Fast trajectory generation
- Less than 6ms per trajectory
- Avoid collision with dynamic objects
A collision is detected on the original trajectory, ...
Thank you for your attention!