

Fully Onboard Low-Power Localization with Semantic Sensor Fusion on a Nano-UAV using Floor Plans

Nicky Zimmerman*, Hanna Müller*, Michele Magno, Luca Benini



Università della Svizzera italiana



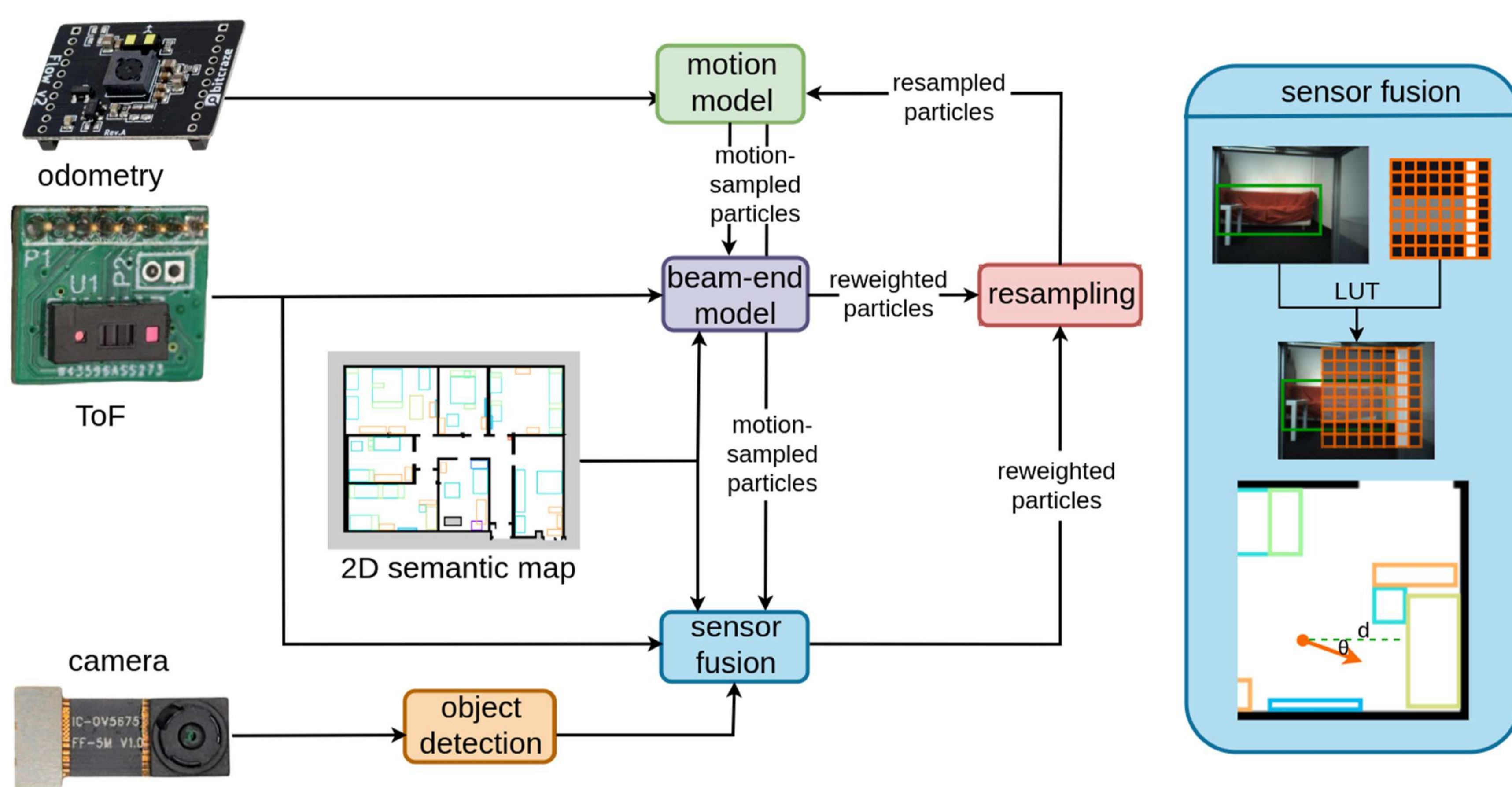
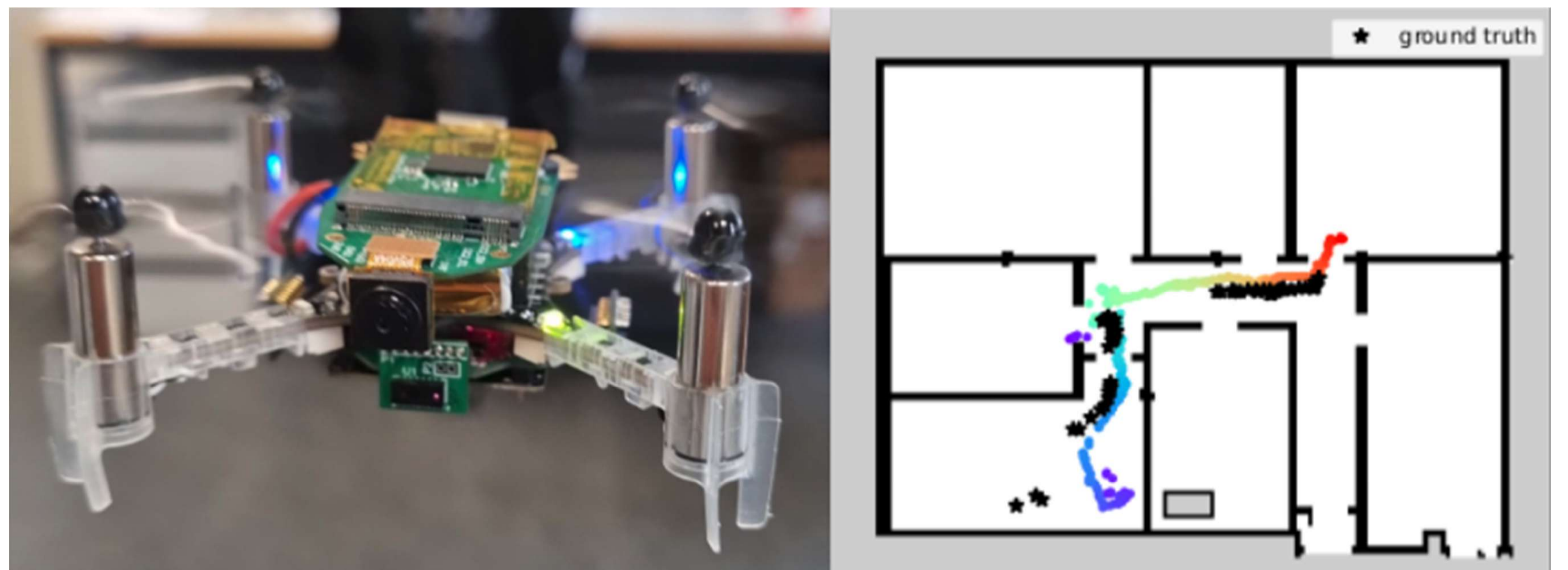
ETH zürich



*:equal contribution

Abstract

- Ultra-low power object detection
- Compact semantic map representation
- Sensor fusion for low-res camera and miniaturized ToF
- Semantic global localization onboard a nano-drone

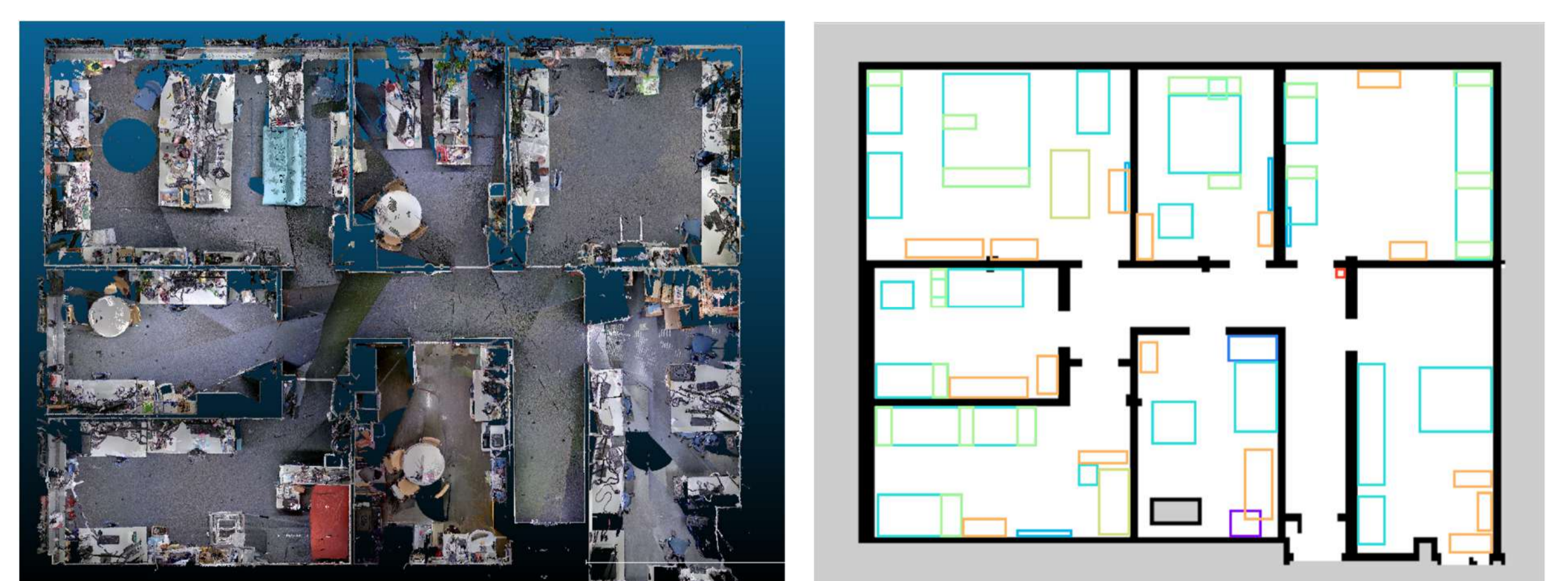
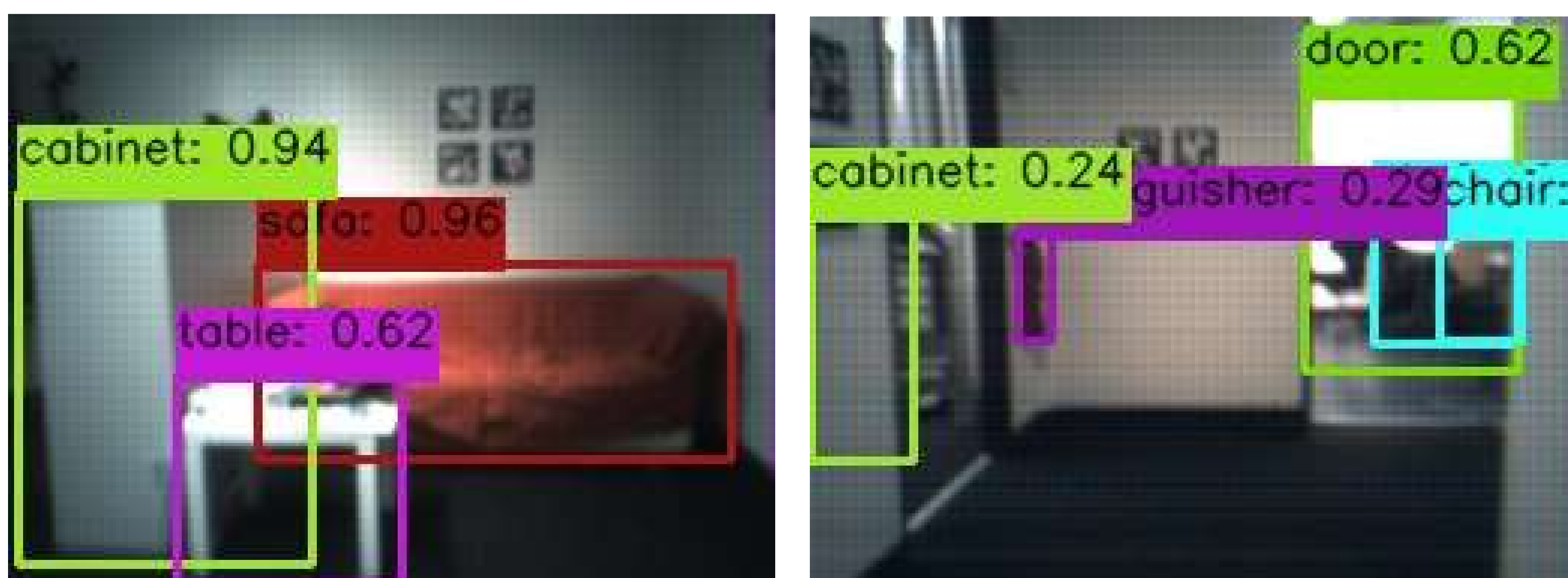
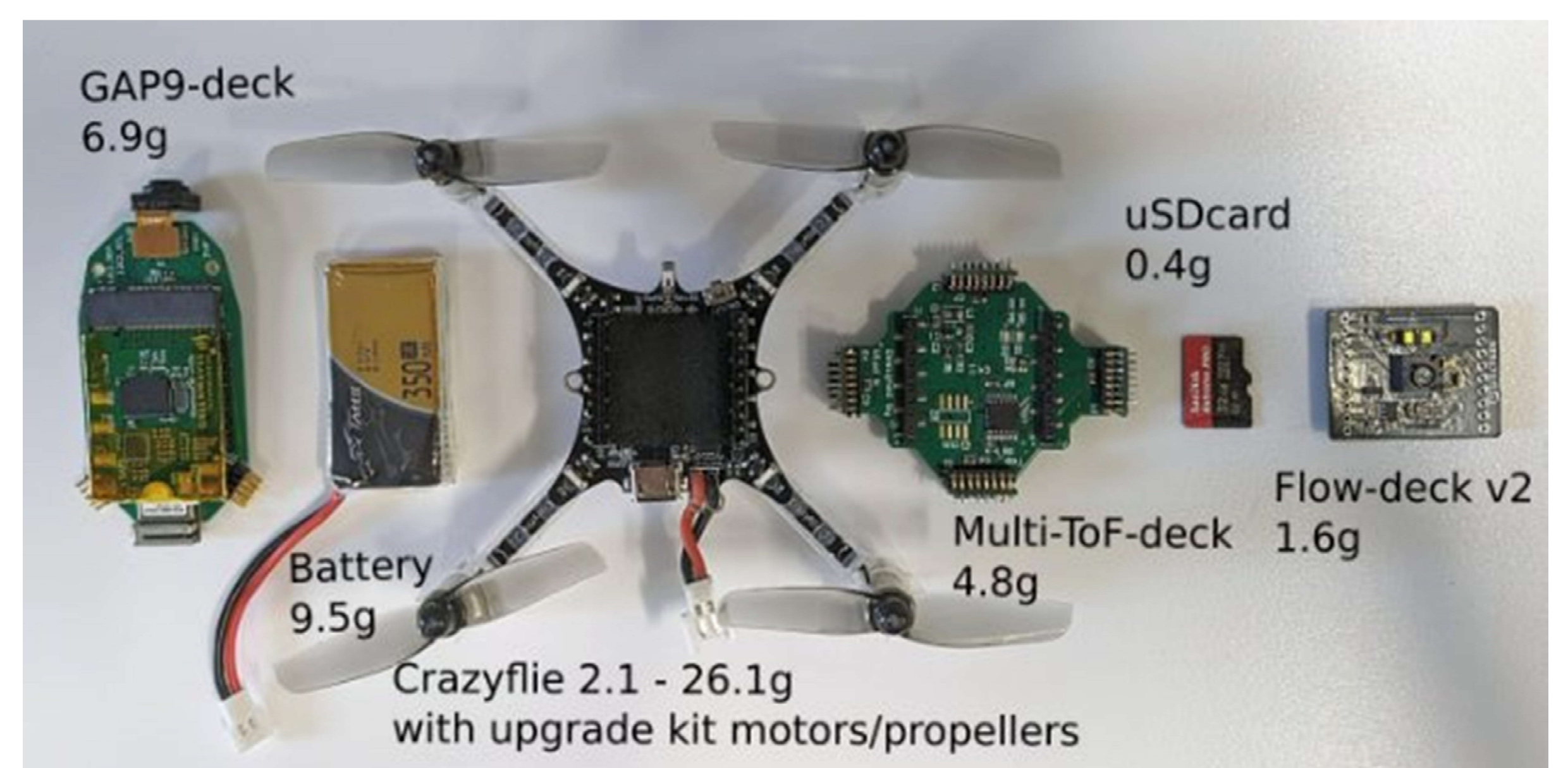


Approach

- MCL in an abstract semantic map
- Onboard deployment of YOLOv5p
- Beam-End model when measurements are within range
- Sensor fusion of ToF measurements and semantic cues

Experiments and Results

- Global localization in a full-scale environment (280m²) onboard and online a nano-drone
- 90% success rate in global localization
- ATE of 0.32m
- Object detection at 20 fps
- Semantic localization in <90mW



Paper



Code



Video