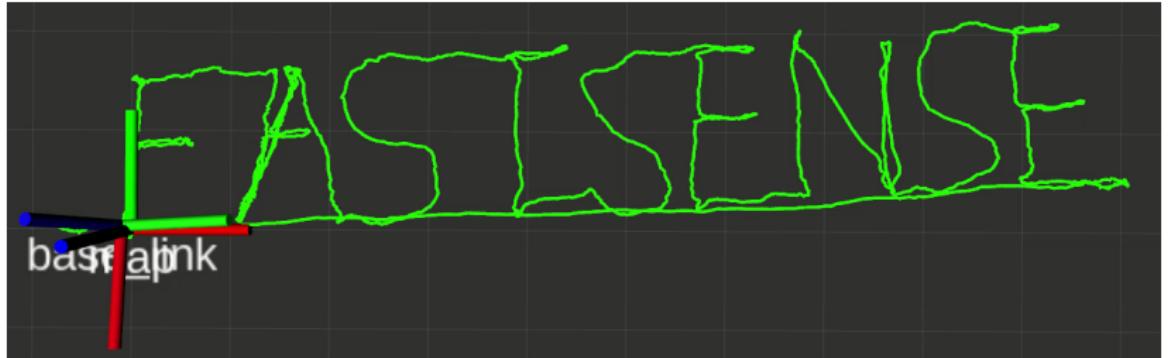


Projektgruppe



Abschlusspräsentation

11. März 2021

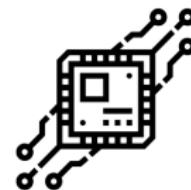
Zielsetzung

Wissensbasierte Systeme
Autonome Robotik



- SLAM
- TSDF Karten
- LVR2

Technische Informatik

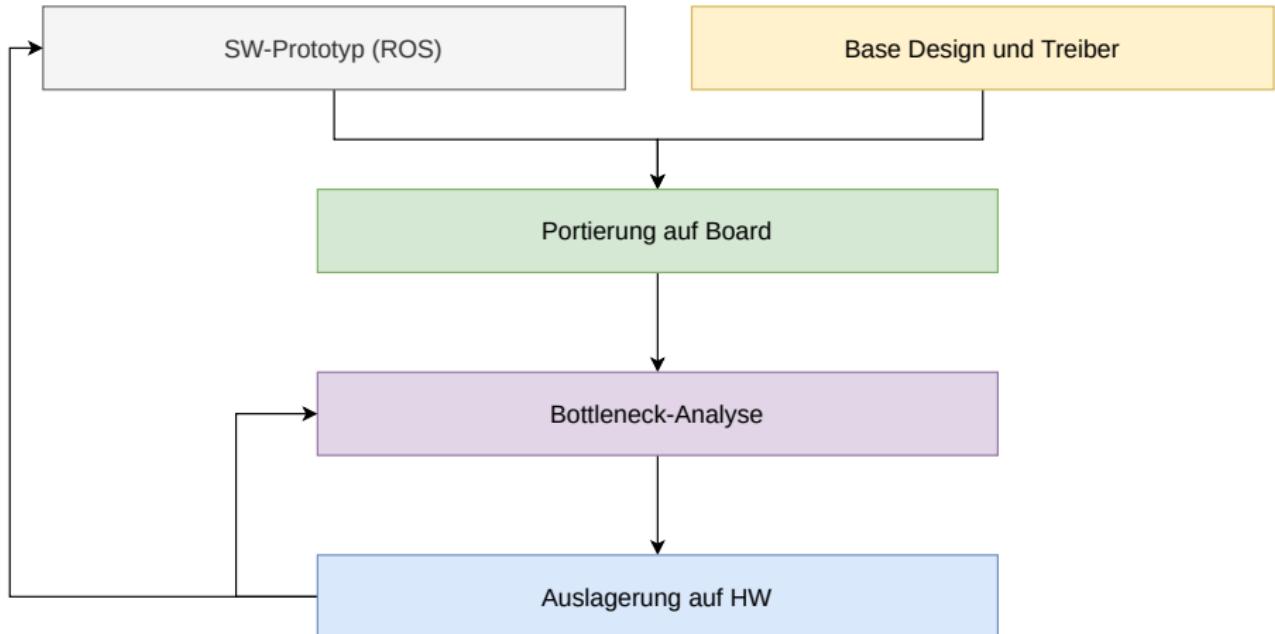


- Hardware Beschleunigung
- FPGAs
- High-Level-Synthese

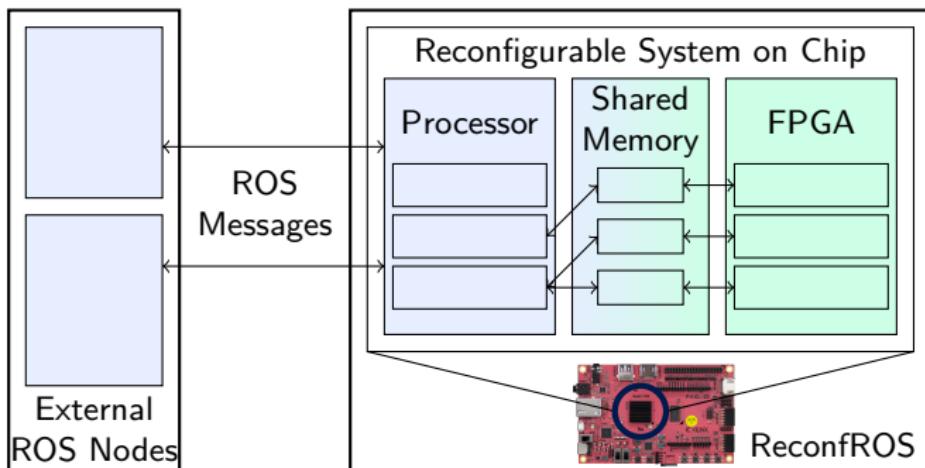
Hardware Accelerated TSDF SLAM

Meilenstein 1

Vorgehen



ReconfROS



Camera image



Removing noise



Trail pixel extraction



Thresholding



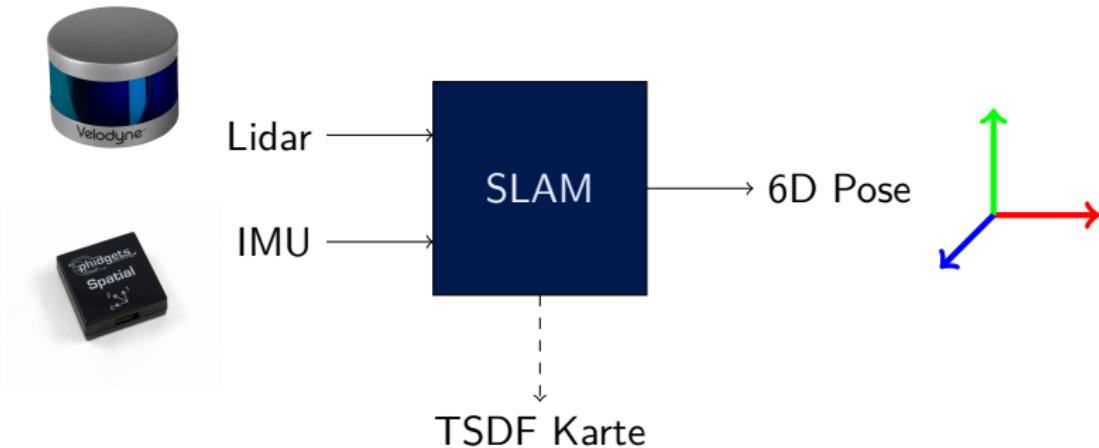
Remove fragments



Trail direction

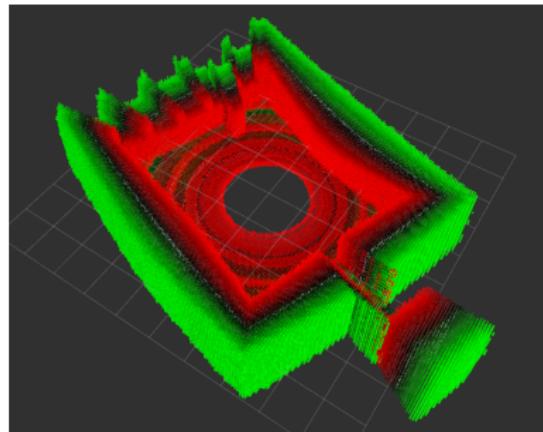
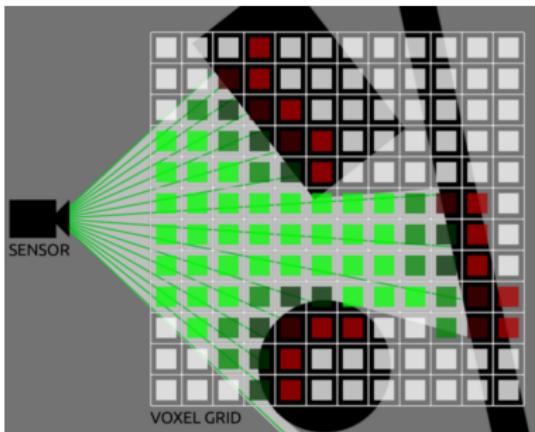
Meilenstein 2

SLAM-Box



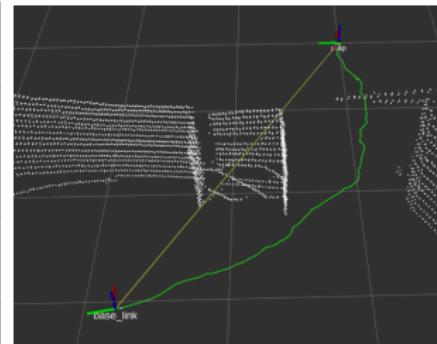
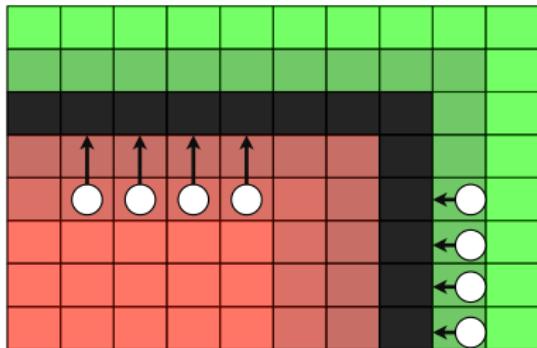
TSDF

- Implizite Oberflächenrepräsentation
- Inkrementell erweiterbar
- Effiziente Meshgenerierung (Marching Cubes)



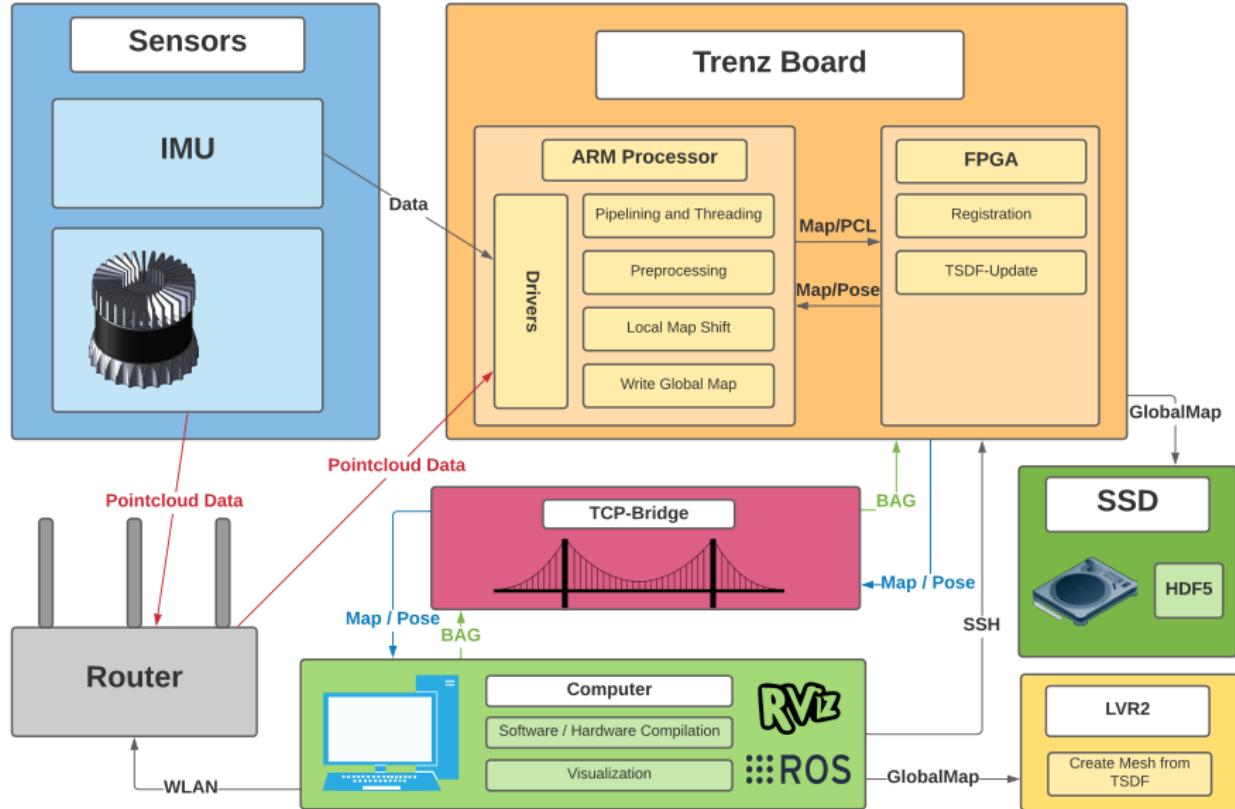
Registrierung

- Point-to-TSDF
- Initiale Rotation (IMU)
- Erzeugt Posegraphen

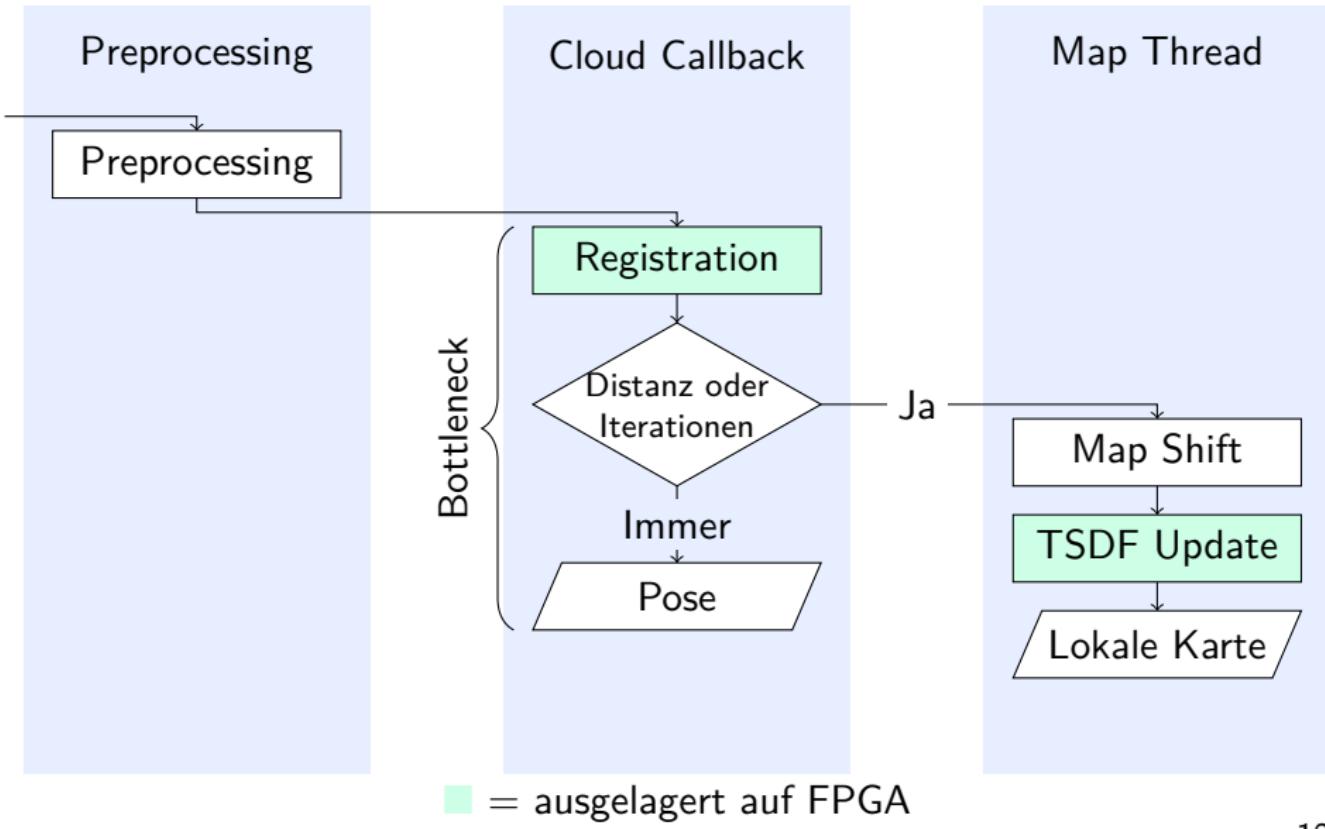


Meilenstein 3

Komponenten

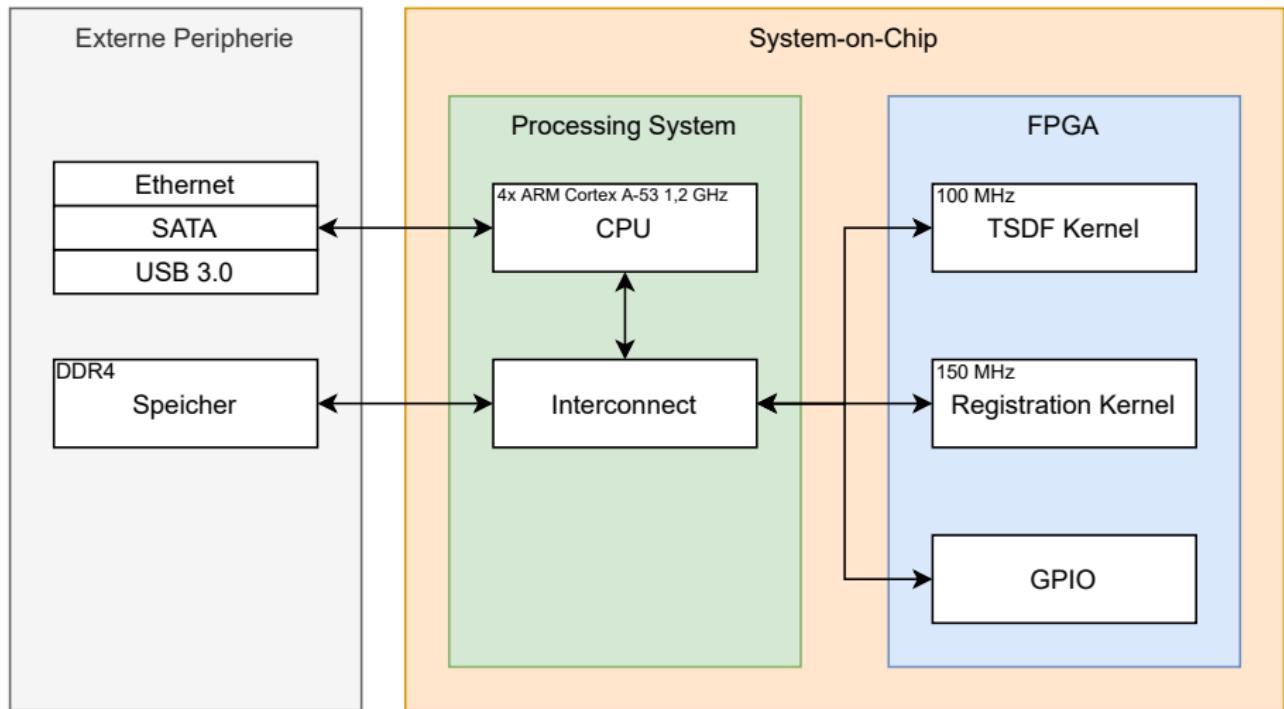


Algorithmus

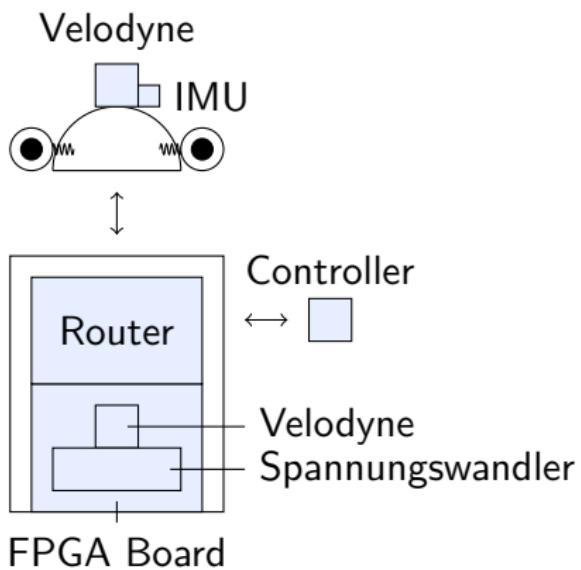


= ausgelagert auf FPGA

Hardware Architektur



Aufbau

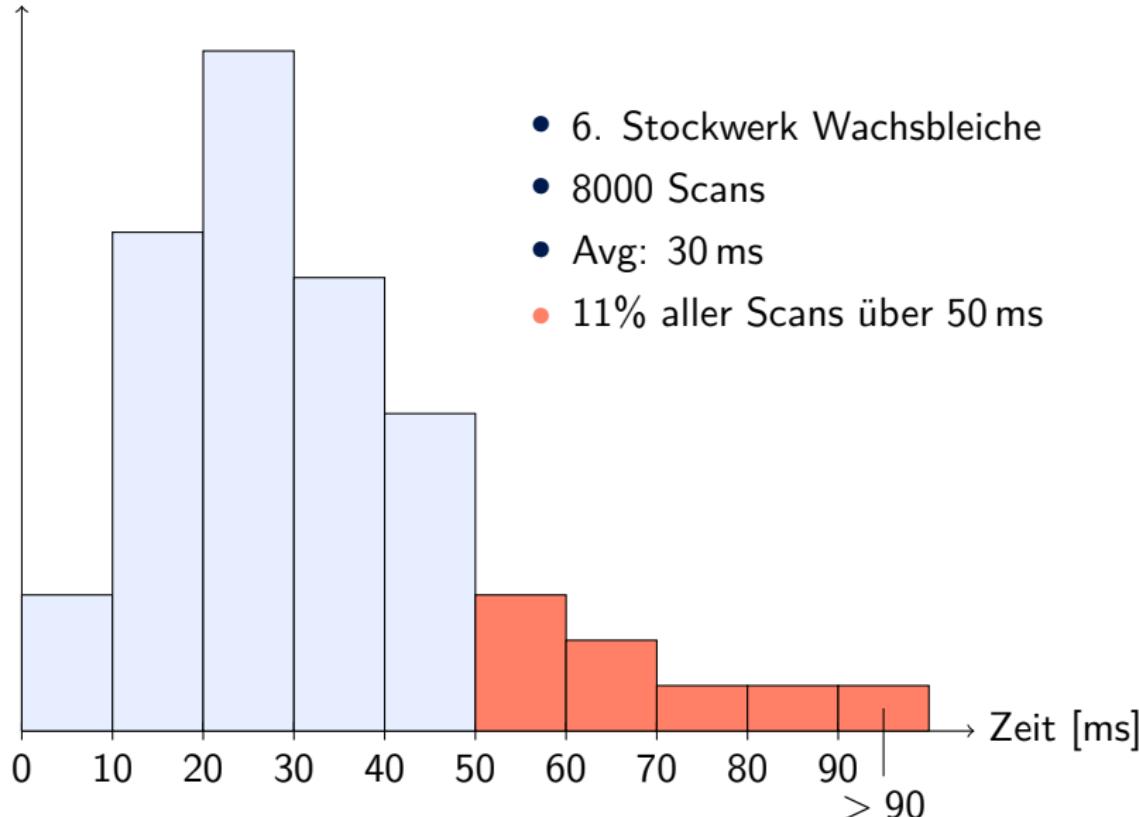


Demonstration

Evaluation

Zeit

Anzahl Scans



Power Consumption



	Idle			Running		
	Mean	Min	Max	Mean	Min	Max
U [mV]	78,7	76	88	89,8	85,7	105,5
I [A]	1,124	1,086	1,257	1,283	1,224	1,507
P [W]	13,488	13,032	15,084	15,396	14,688	18,084

Genauigkeit

- 6. Stockwerk Wachsbleiche
- Distanz: 270 m
- Auflösung: 6,4 cm



→ Differenz: 7,5 cm

Fazit

TODO

- Portables System
- Weiche Echtzeitfähigkeit
- Geringer Stromverbrauch
- Einfache Handhabung
- Einfache Analyse

Ausblick

TODO

- Evaluierung mit anderer Sensorik
- Portierung auf Drohne
- Optimierung des Posegraphen (Loop Closing)
- Paper