

Projektgruppe FastSense

# **Abschlusspräsentation**

11. März 2021

# Zielsetzung

- Autonome echtzeitfähige Kartierung
- FPGA-basierte Hardwarebeschleunigung
- Einfaches, handliches System
- Anbindung an bestehende Systeme (LVR2)

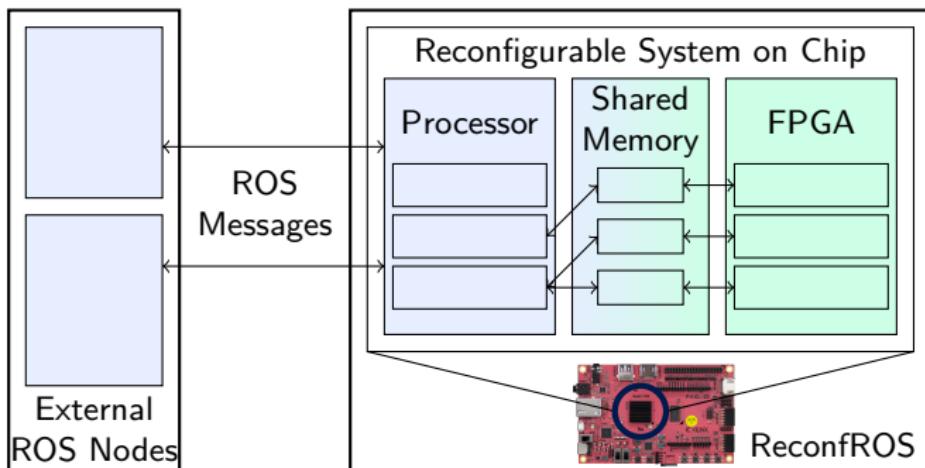
# MS1: Trail Detection

TODO

# SLAM-Box

TODO

# Vorgehen



Camera image



Removing noise



Trail pixel extraction



Thresholding

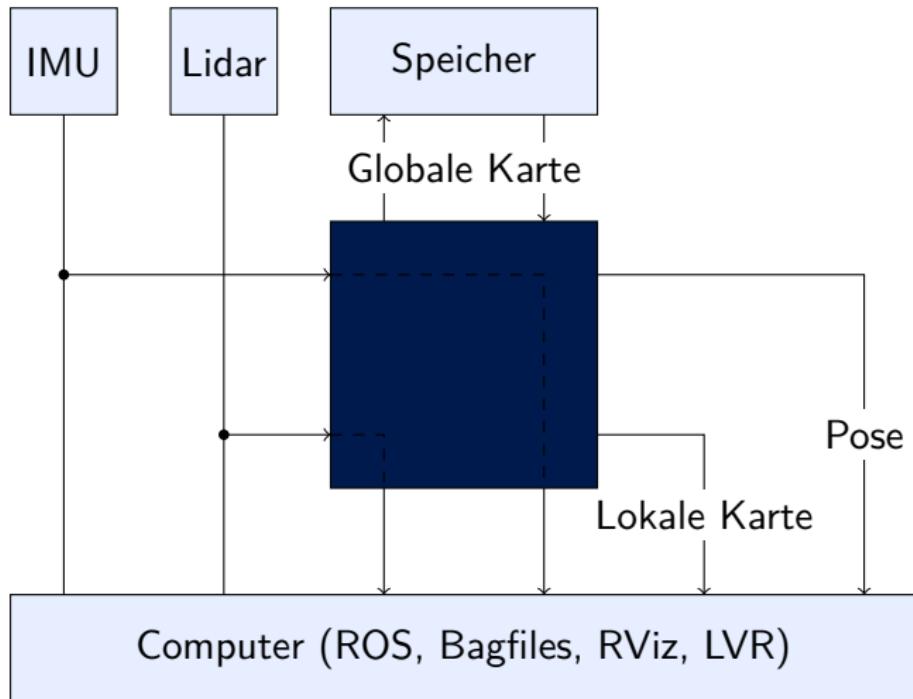


Remove fragments

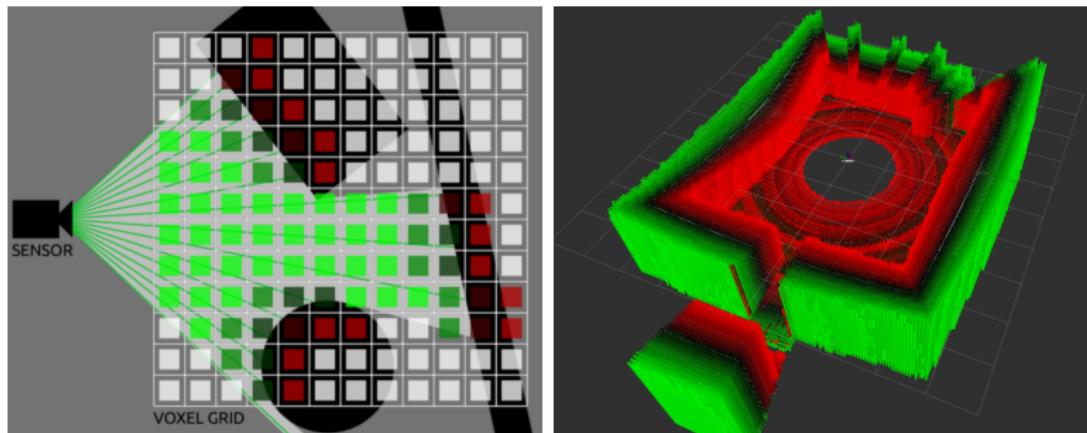


Trail direction

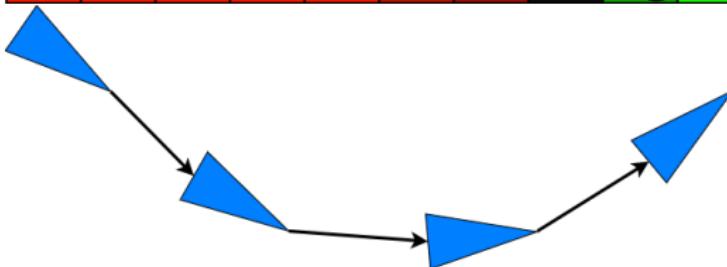
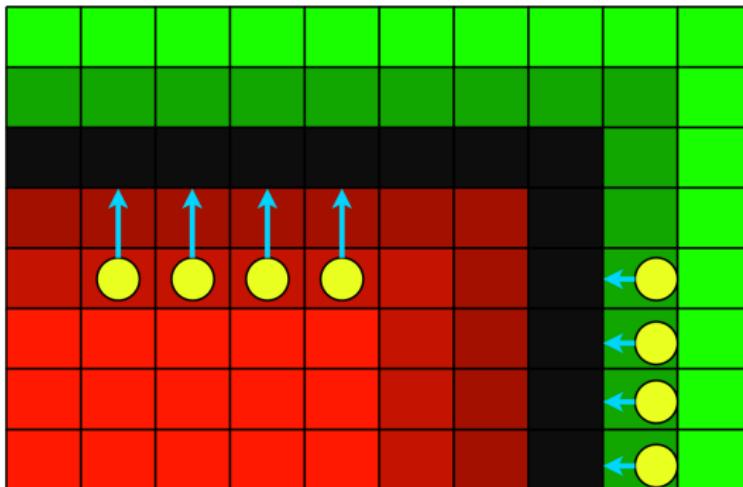
# SLAM-Box



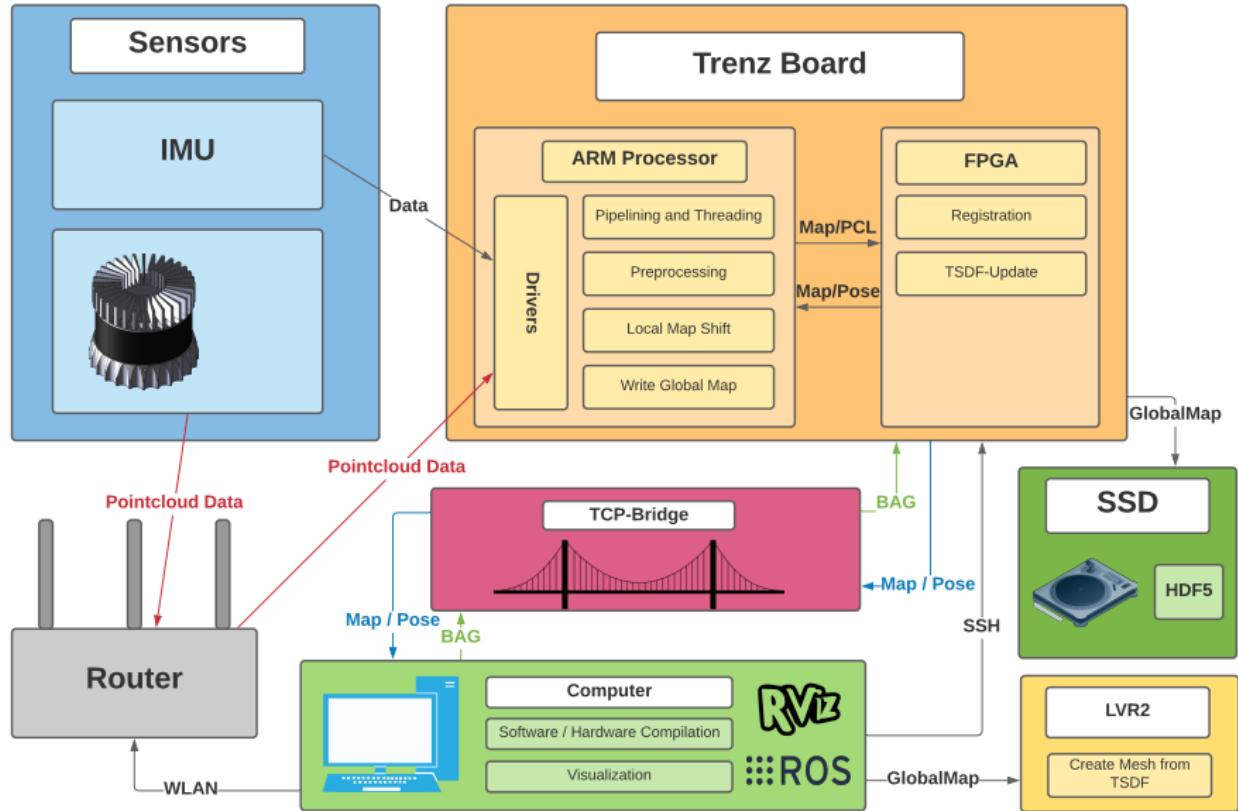
# TSDF



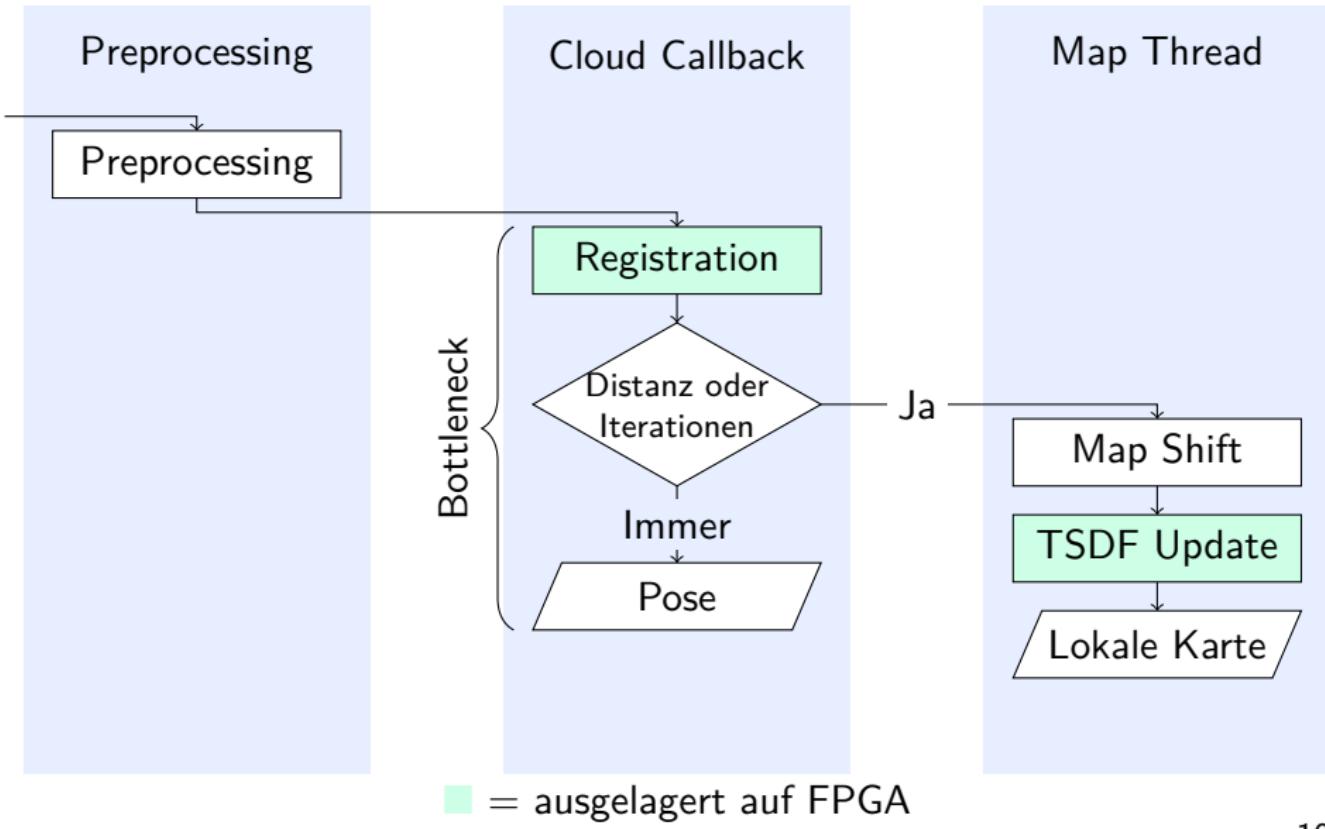
# Point-to-TSDF Registrierung



# Komponenten

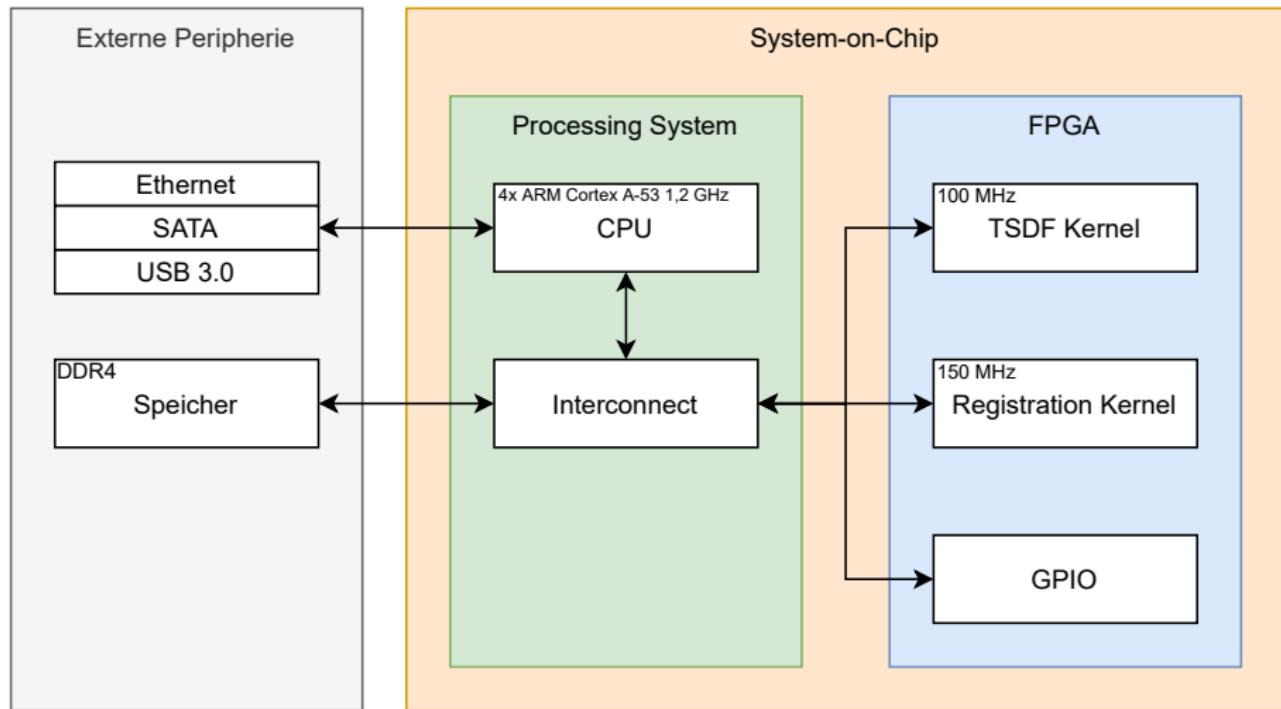


# Algorithmus

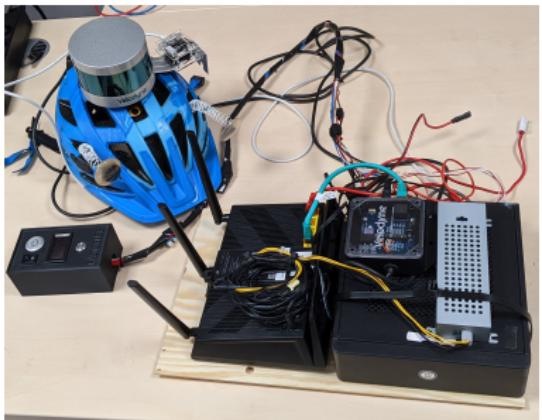
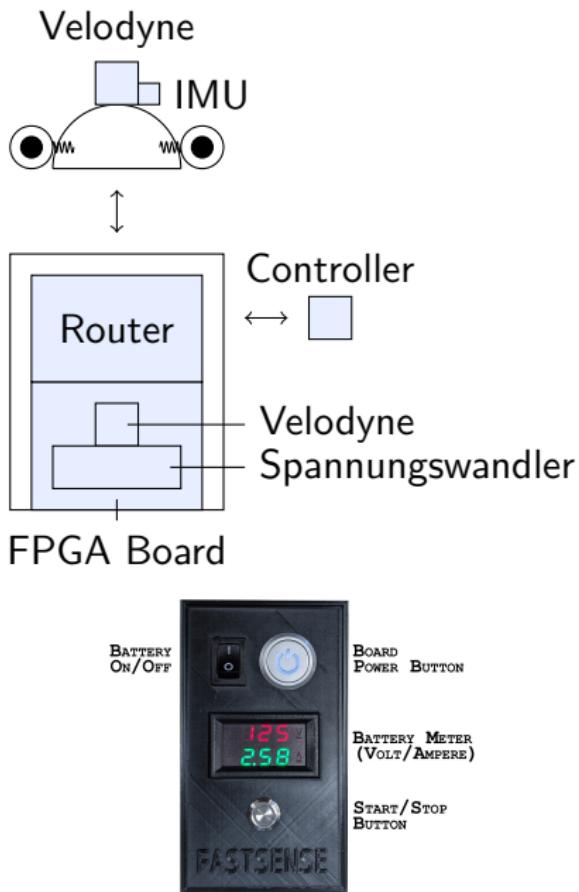


= ausgelagert auf FPGA

# Hardware Architektur

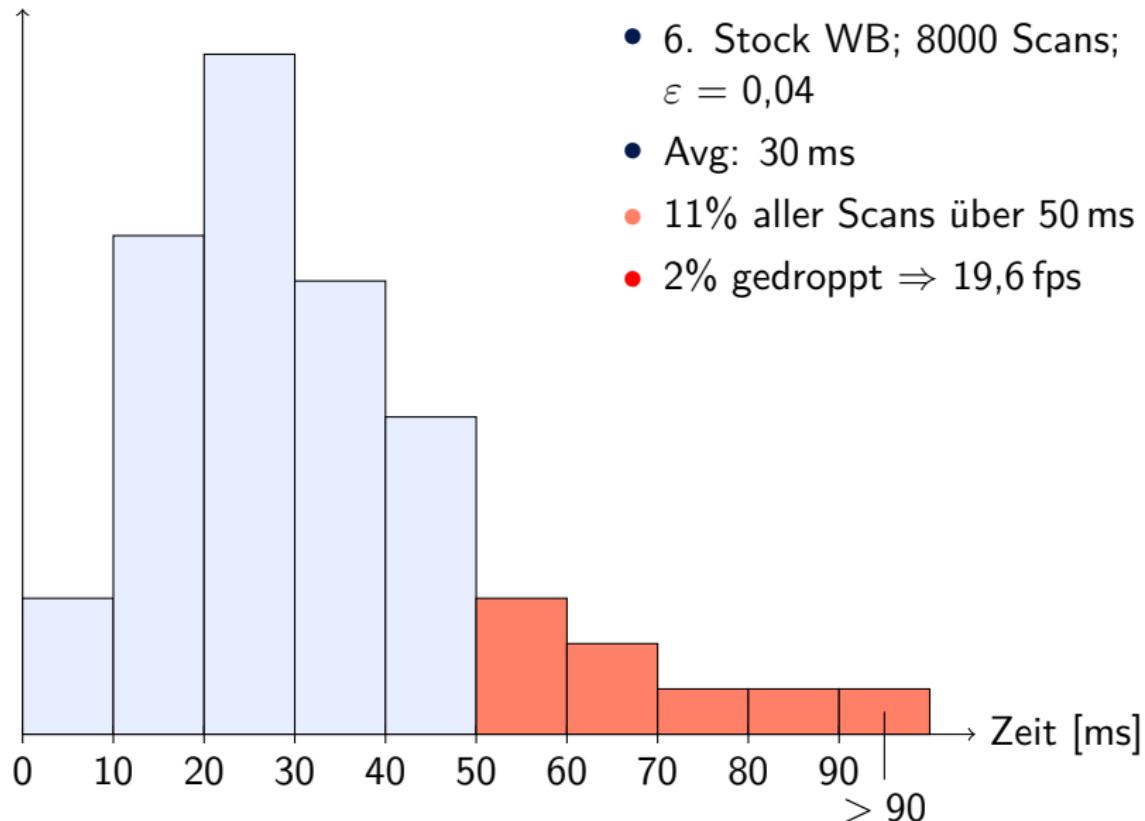


# Aufbau



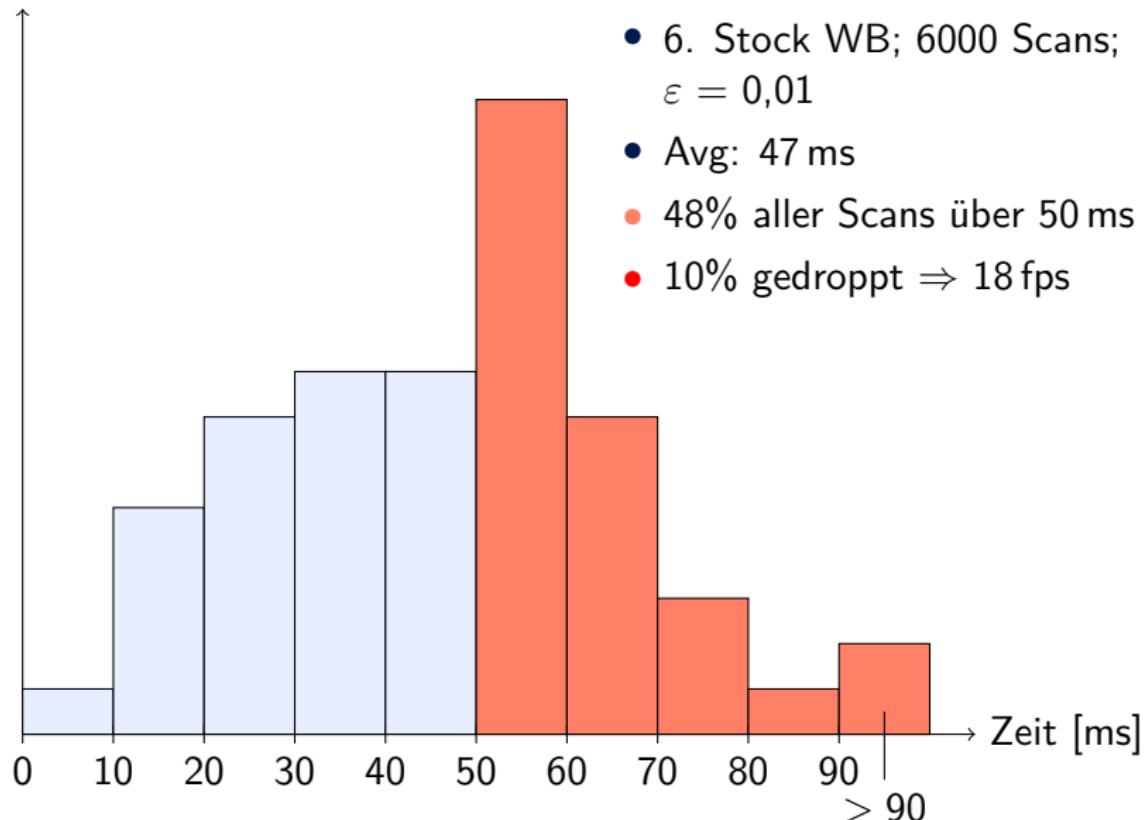
## Evaluation: Zeit

Anzahl Scans

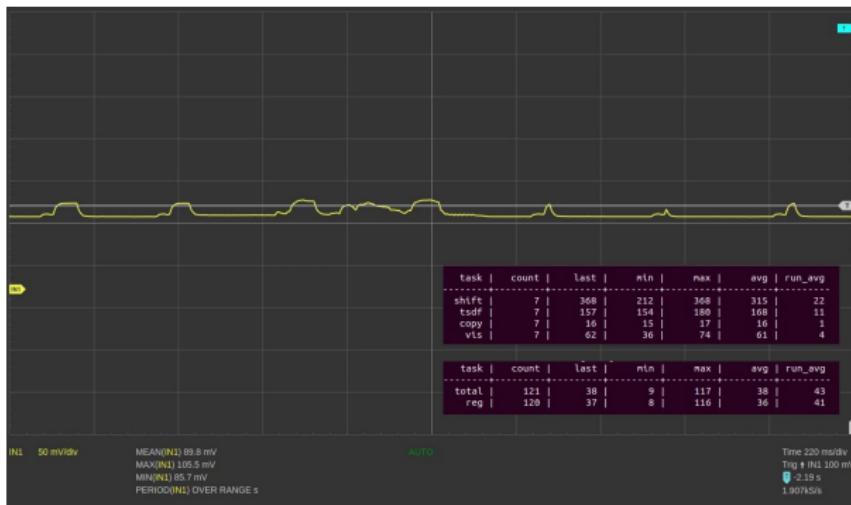


# Evaluation: Zeit

Anzahl Scans



# Evaluation: 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	<b>15,396</b>	14,688	18,084

# Evaluation: Genauigkeit

- 6. Stockwerk (Distanzabweichung in Meter)

$\varepsilon$	0,01	0,04
	0,0615	0,0505
Geschw.	langsam	schnell
	0,0505	0,0437

- gesamt (langsam,  $\varepsilon = 0,04$ ): 0,075349

- 8 Meter Labortest (Distanzabweichung in Meter)

	hin	zurück	gesamt
langsam	0,0548	0,0650	0,0861
schnell	0,1676	0,0459	0,1320

# Fazit

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

# Ausblick

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