FACHHOCHSCHULE
WIENER NEUSTADT
Austrian Network for Higher Education

Workshop Mobile Robotik

Technik macht künstlich intelligent

DI Dr. Alexander Nemecek
Leitung Studiengang Robotik

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robotikfhwn

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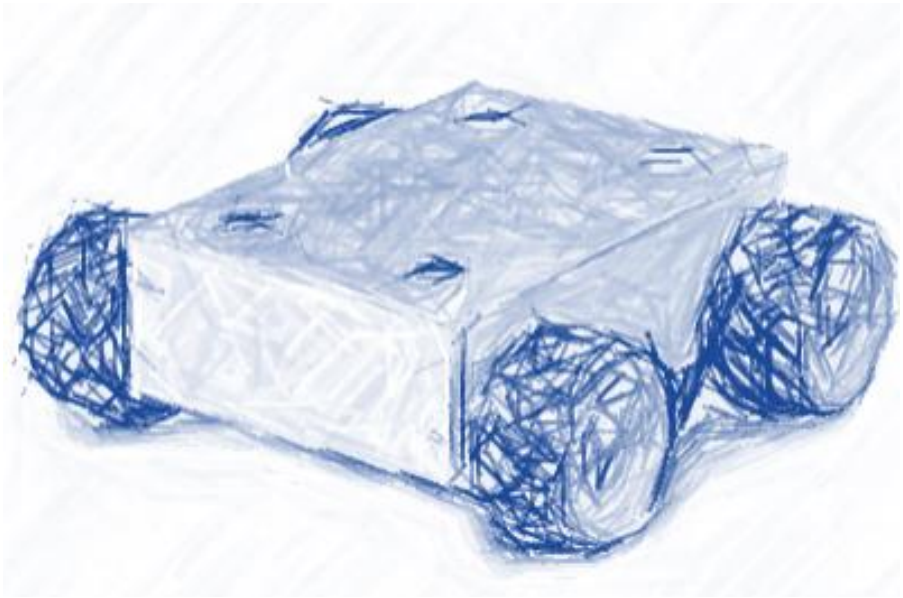
Inhalt

- Fachhochschule
- Mobile Roboter
- Software
- Sim #1 – Pfadplanung
- Sim #2 – Lidar Scan
- Sim #3 – Navigation
- Sim #4 – SLAM

Simulation mit <30 Zeilen Code



Fachhochschule

Fachhochschule

WIRTSCHAFT TECHNIK SPORT SICHERHEIT GESUNDHEIT

FACHHOCHSCHULE WIENER NEUSTADT
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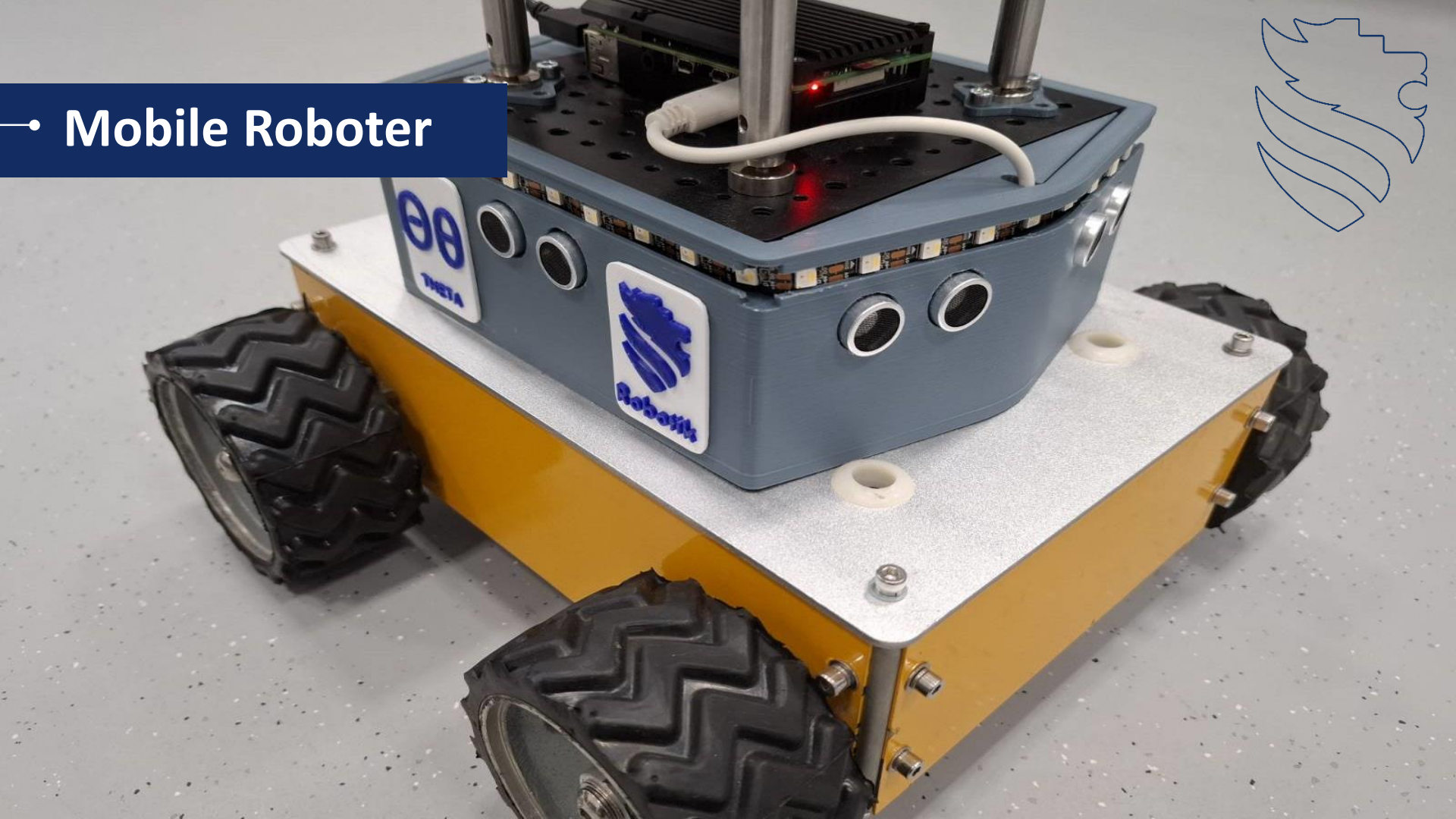
Allgemeine Informationen

- 15.000+ Absolventen
- 4.000+ Studierende
- 1.330+ Referenten
- 100 Partnerhochschulen
- 80+ Nationen
- 4 Standorte
- 5 Fakultäten
- 37 Studiengänge

- Fachbereiche und Institute
- Bibliothek
- Forschungstochter FOTEC
- International Office
- FH Activities
- FH Start-Up Center
- Mensa, Wohnheim, …

Next – Mobile Roboter

Mobile Roboter



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Mobi – Plattform

Antrieb	Rad, Kette, Omniwheel
Power	Lithium Ion, 12V & 5V reguliert
Sensorik	Ultraschall, Lidar, Inertial, 2D- & 3D-Kamera, Positionierung
Software	Linux Ubuntu, ROS, Python
Controller	STM-µC, Rasperry Pi 4
Schnittstellen	Wifi, Bluetooth, LAN, CAN
Abmessungen	302mm × 308mm × 112mm
Masse	Roboter 9kg / Last 15kg
Anwendungen	Lehre, R&D

Software

Software

Mathworks – MATLAB©

de.mathworks.com

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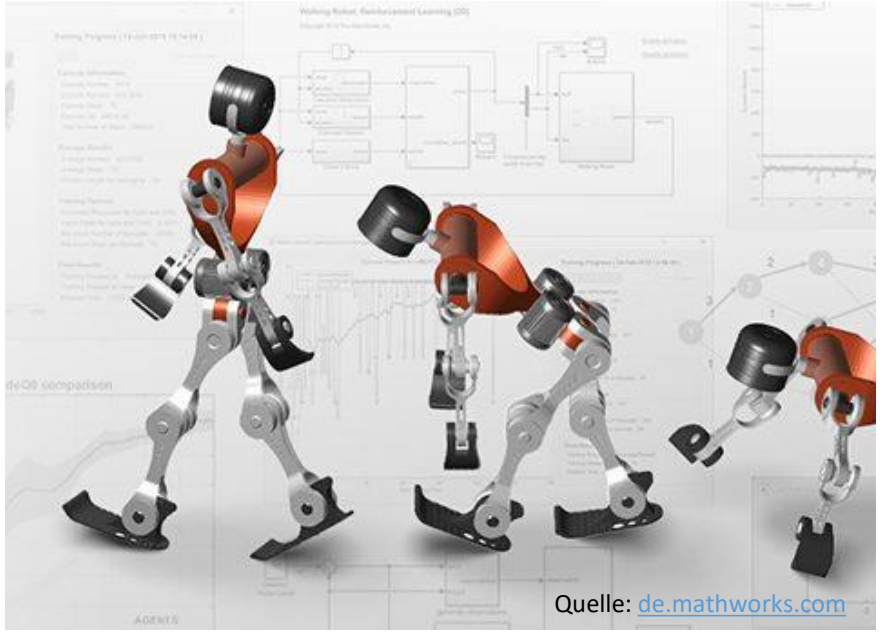
Software	MATLAB	MATrix LABratory
Download	Homepage	
License	Campus, free trial 30 days	
Installation	PC local	

MATLAB ist *die* Plattform für Programmierung und numerische Berechnungen, die von Millionen von Ingenieuren und Wissenschaftlern zur Analyse von Daten, Entwicklung von Algorithmen und Erstellung von Modellen verwendet wird.



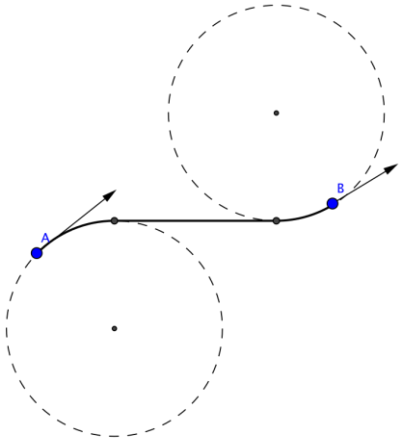
Quelle: de.mathworks.com

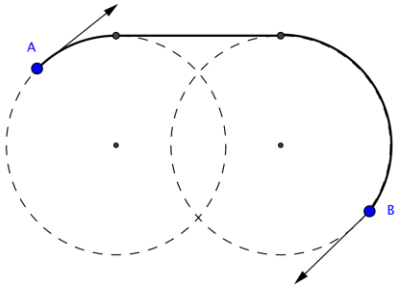
#1 – Pfadplanung

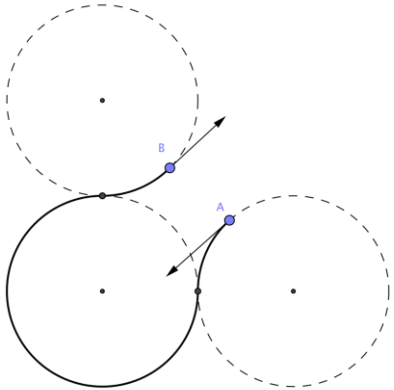
#1 – Pfadplanung

Dubins-Pfad

… ist der kürzeste gesuchte Vorwärts-Pfad eines mobilen Roboters der einen Anfangs- und einen Endpunkt in der xy-Ebene mit beschränktem Wenderadius *r* verbindet.







#1 – Pfadplanung

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Start = [0, 0, 0°] Ziel = [1, 1, 180°]

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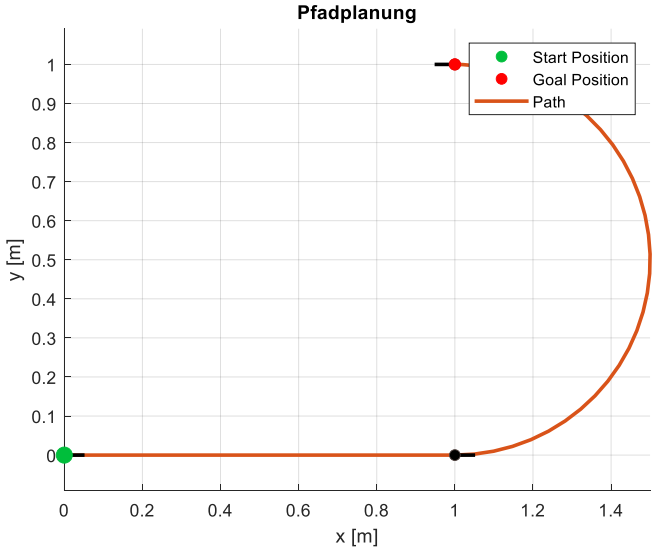
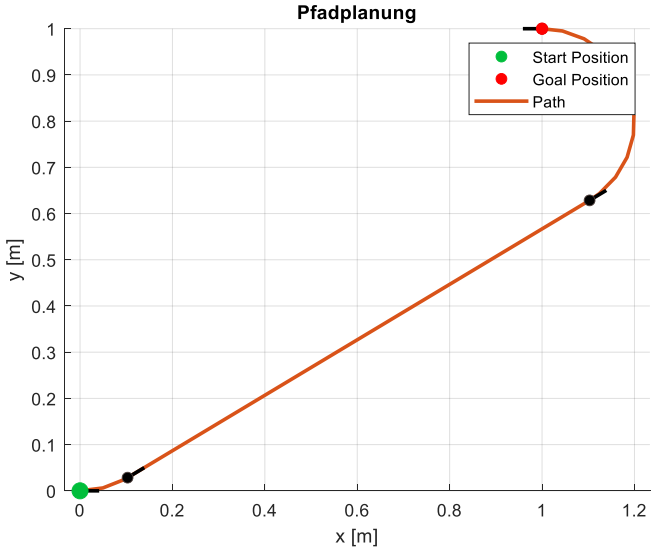


min. Wenderadius r = 0.5m



min. Wenderadius r = 0.2m

#2 – Lidar Scan

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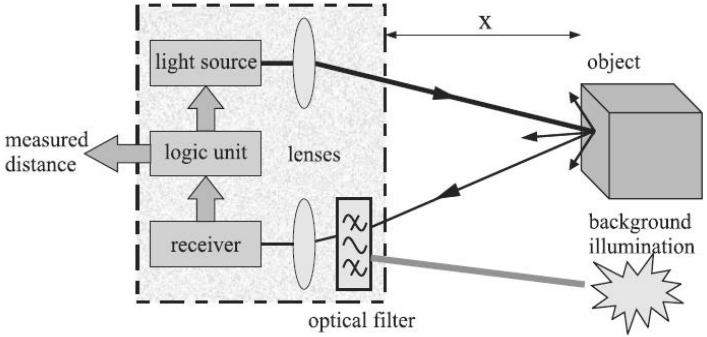
Light Detection And Ranging – Lidar

Time Of Flight – TOF



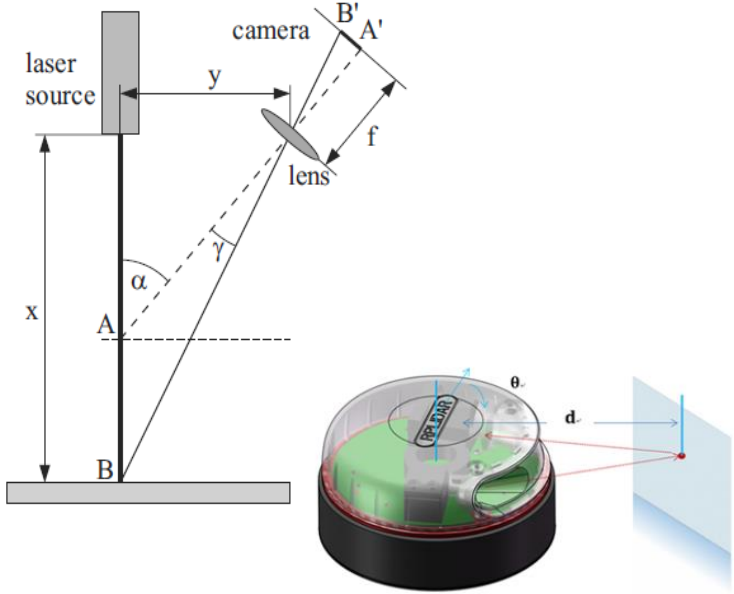
$$x = \frac{c\, t_{TOF}}{2}$$

$\Delta x = 1\text{cm}$

$\Delta t_{TOF} = 7\mu s$ … Ultraschall

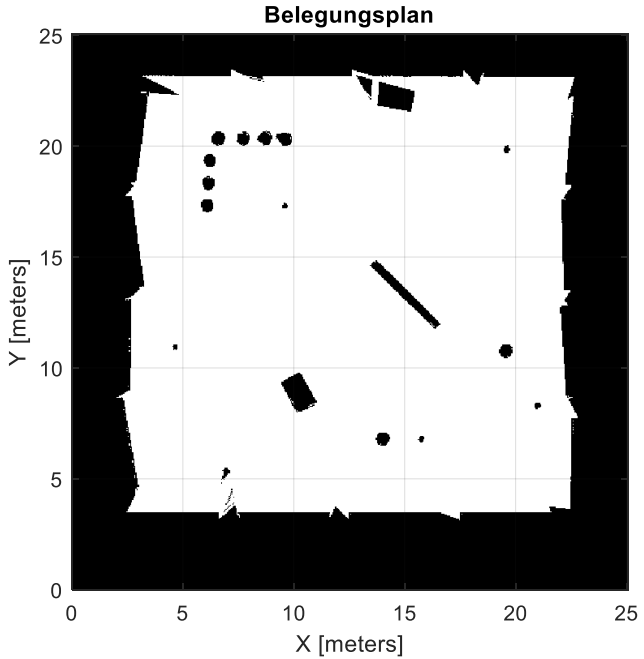
$\Delta t_{TOF} = 67ps$!!! … Licht

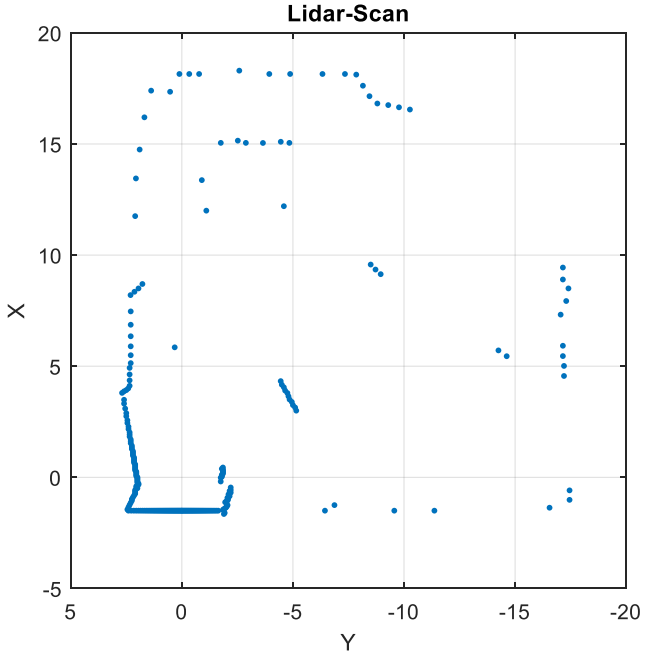
Triangulation



#2 – Lidar Scan

Belegungsplan

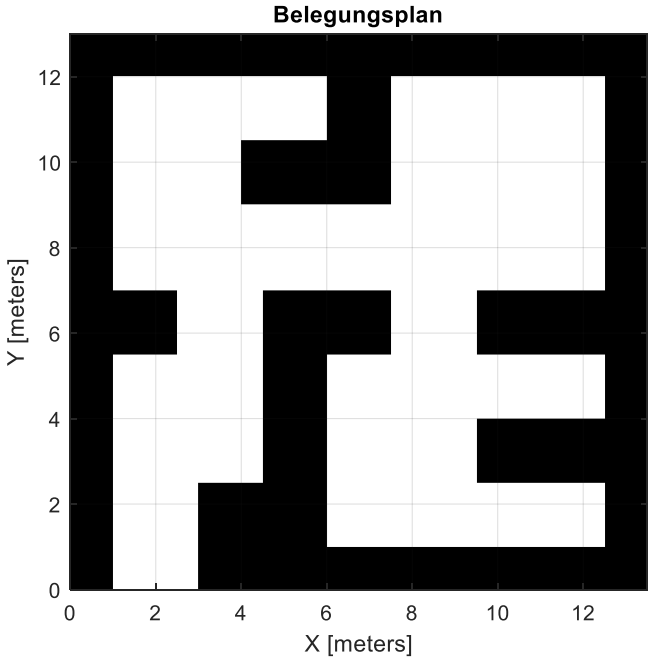


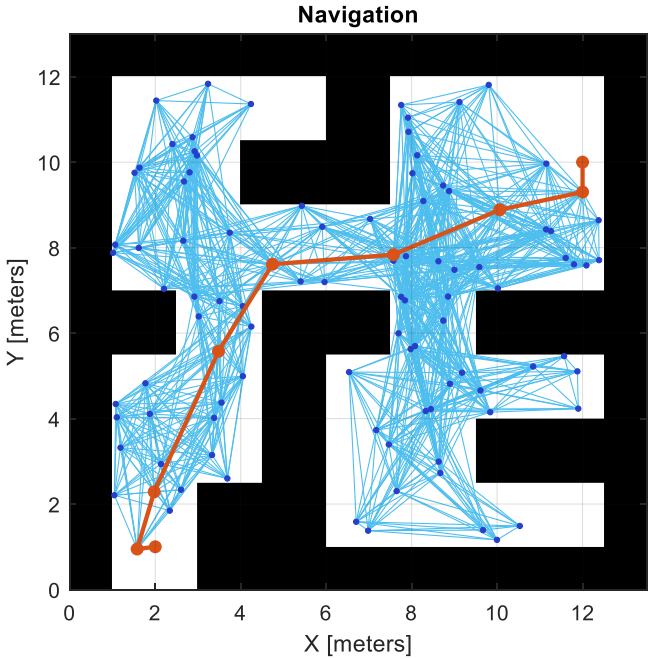


#3 – Navigation

#3 – Navigation

Start = [2, 1] Ziel = [12, 10]





#4 - SLAM

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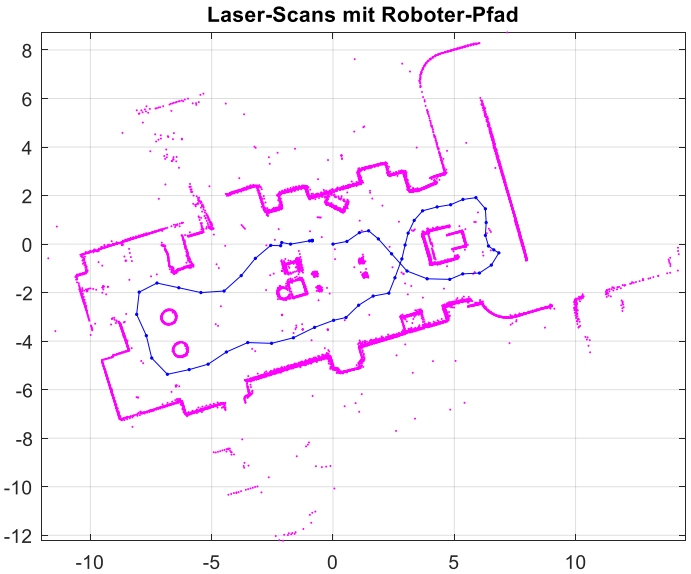
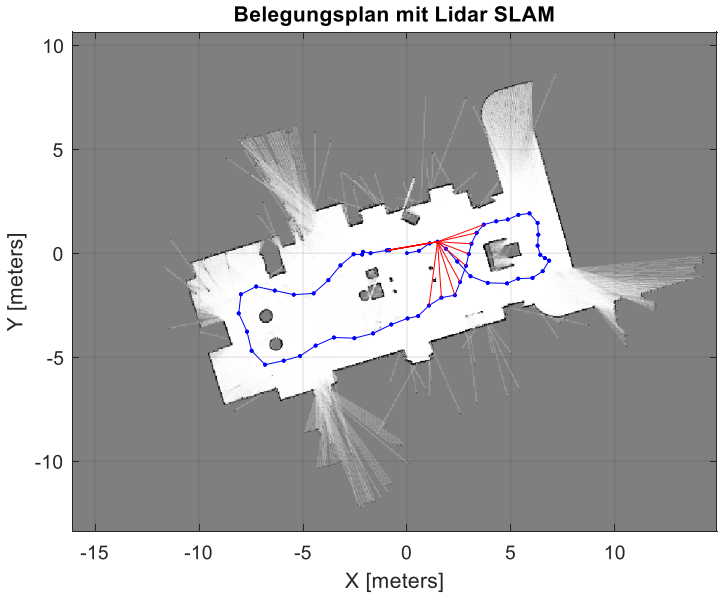
Simultaneous Localization and Mapping





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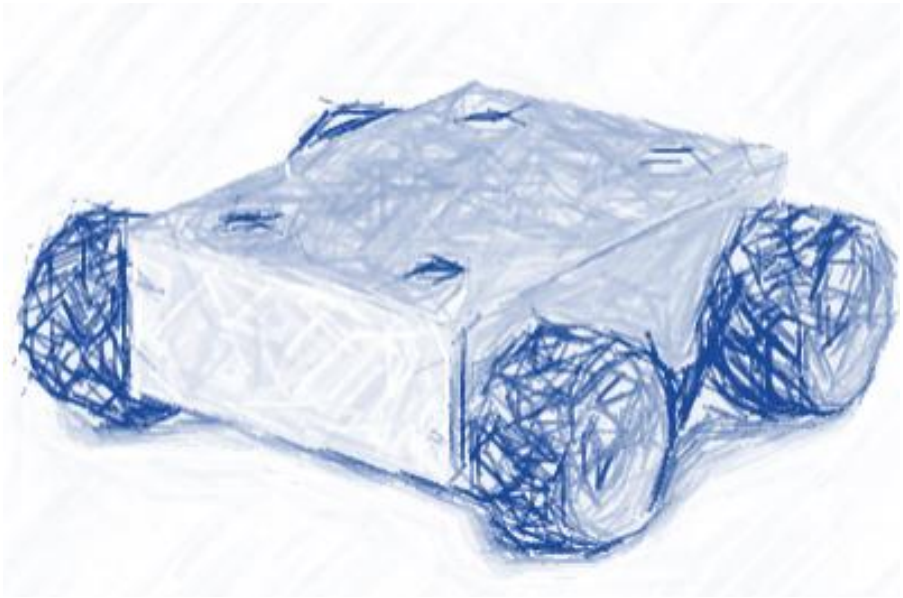

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TECHNIK MACHT KÜNSTLICH INTELLIGENT

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