Lab Projects

Topic Presentation

Autonomous Multisensor Systems Group
Institute for Intelligent Cooperating Systems
Faculty of Computer Science
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Autonomous Multisensor Systems

Procedure and Requirements

Procedure

- Beginning of Project
  - Define SMART goals
  - Define a Project Timeline
  - Define Milestones
- Project Work
  - Regular Meetings
  - Intermediate Presentations (Milestones)
- Deliverables
  - Implementation with Documentation
  - Project Report
  - Final Presentation

What We Expect:

- Independent Literature Research
- Independent Time Management
- Independent Work

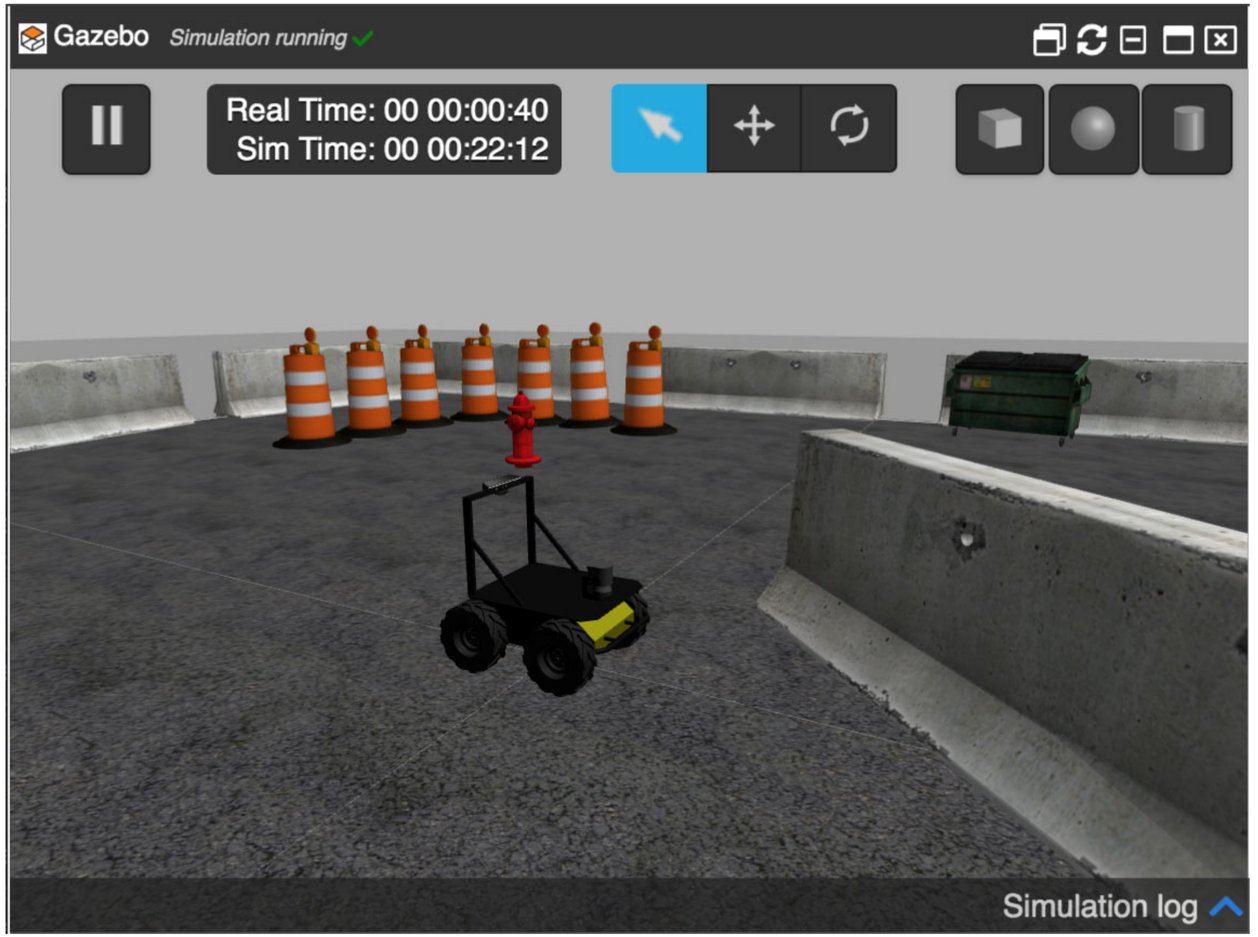
We Provide:

- Resources
- Advice
- Consultations

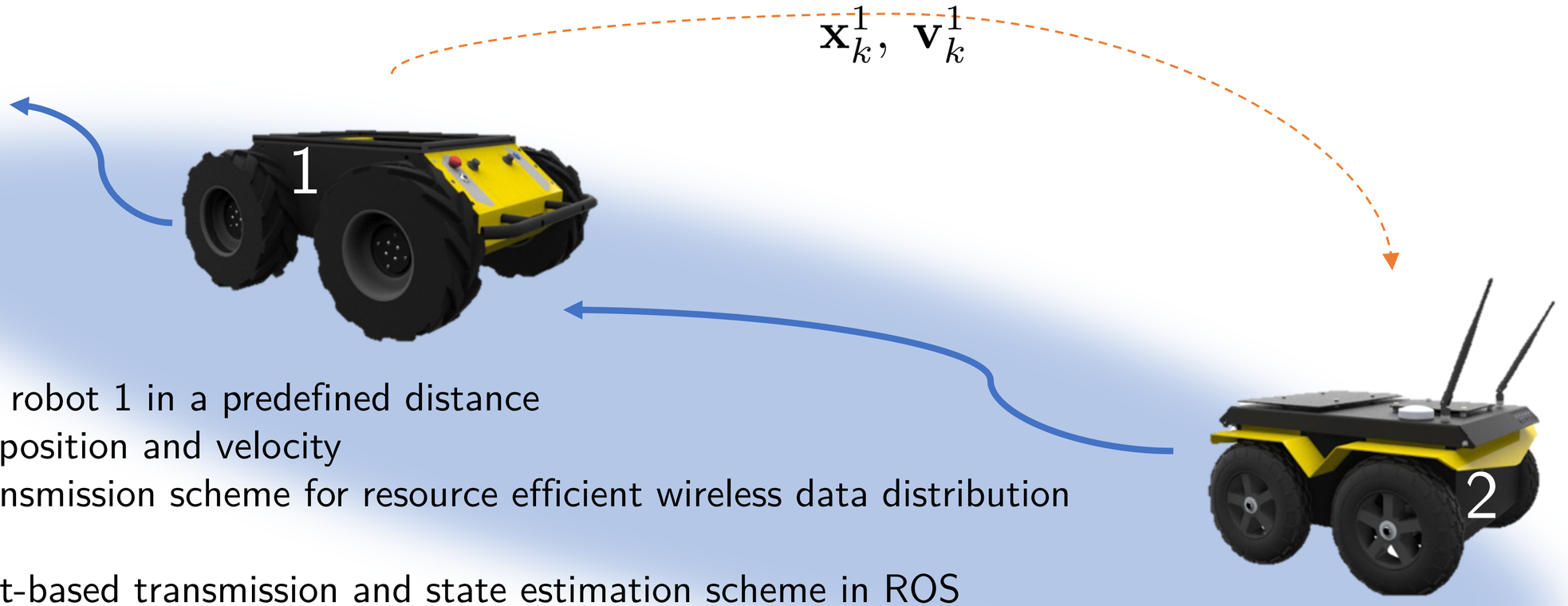
Topics

Digital Twin of Husky

- Goal: ROS Gazebo Simulation
  - Simulated Environment
  - Simulated Perception
- Requirements:
  - ROS programming (C++, Python)



Event-based Robot Platooning



Idea:

- Robot 2 follows robot 1 in a predefined distance
- using robot 1‘s position and velocity
- Event-based transmission scheme for resource efficient wireless data distribution

Goal:

- Implement event-based transmission and state estimation scheme in ROS
- Test it in simulation (Gazebo)/on real robots

Requirements:

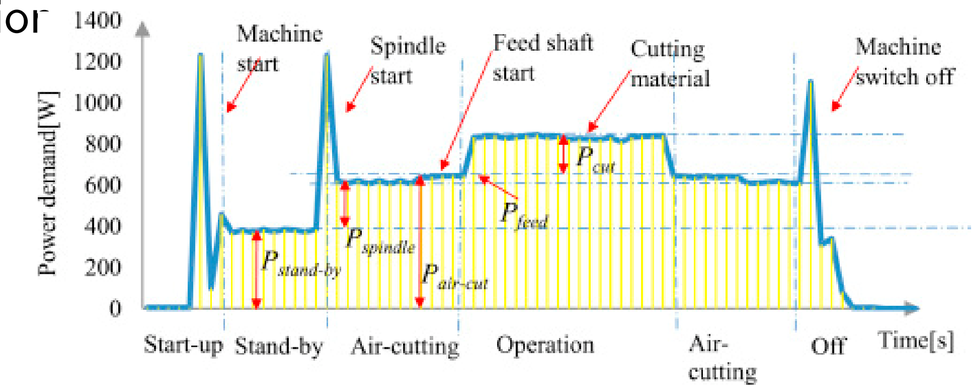
- Understanding of estimation techniques
- ROS Programming (C++/Python)

Transfer Learning Methods on Time Series

- Goal: Implementation of Transfer Learning Methods
  - Apply the Methods to Different Datasets
  - Apply the Methods to Different Targets
- Datasets: Milling Machine to Predict the Energy Consumption During Production Based on CNC Code
- Requirements:
  - Python

Generative Adversarial Networks for Time Series

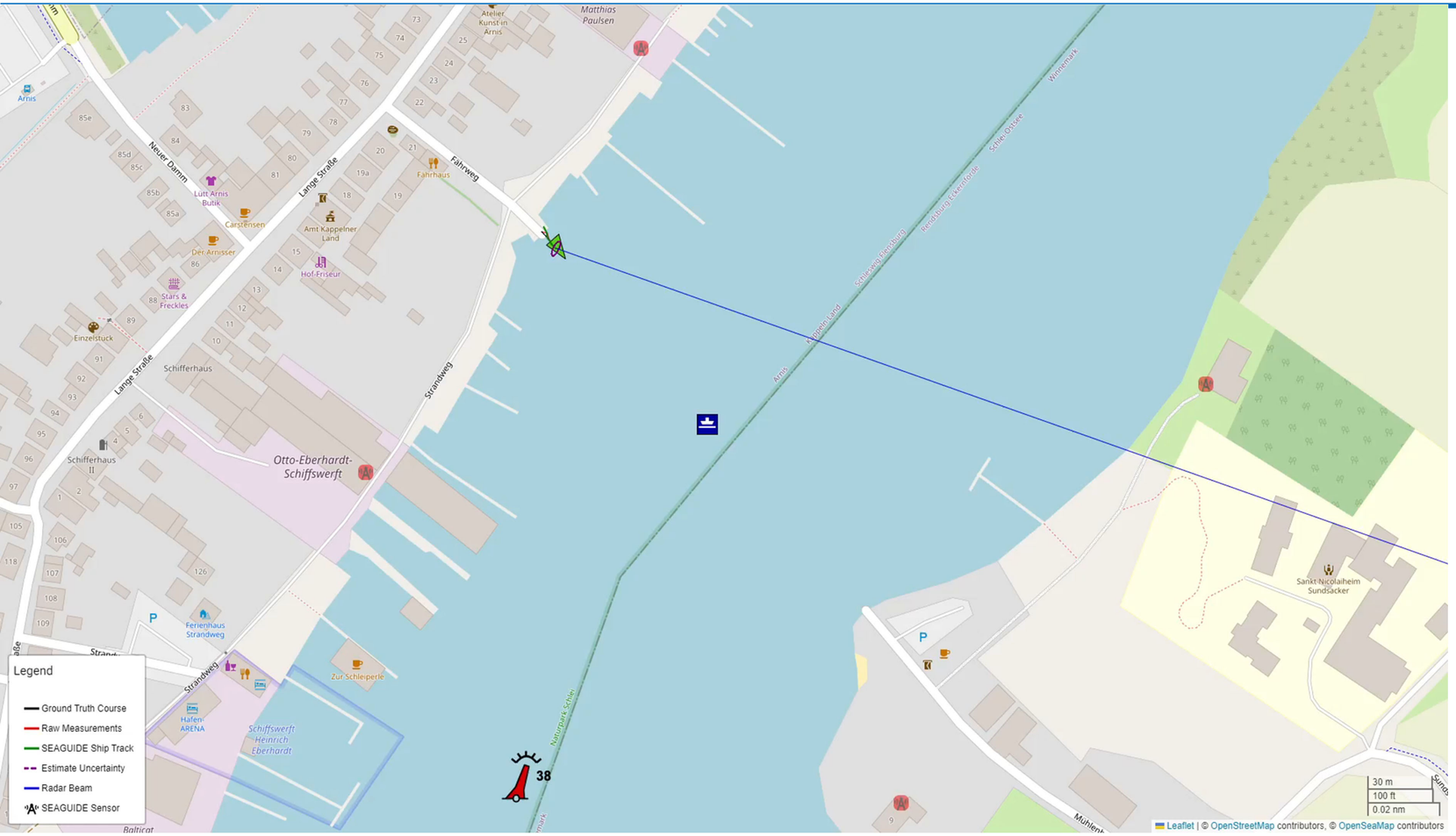
- Goal: Implementation of Various GAN Models
  - Variational Auto-Encoder for Multivariate Time Series Generation
  - TimeGAN

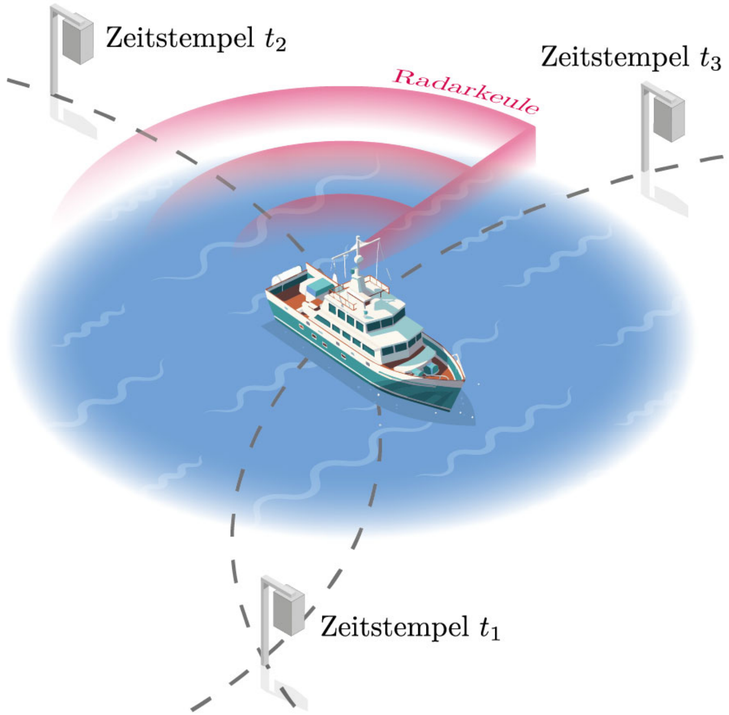


- Features: Milling Machine Movements for Predicting the Energy Consumption

- Requirements:
  - Python, TensorFlow

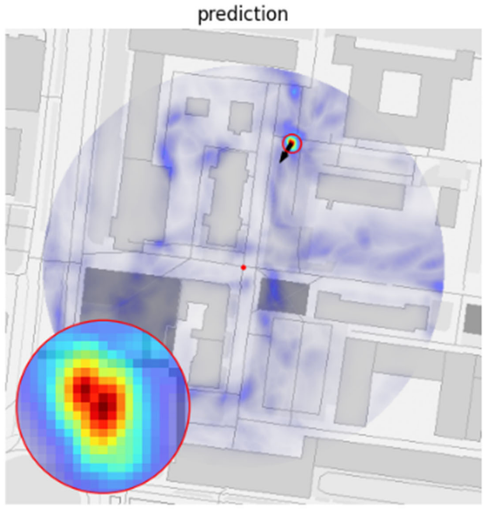
Simulation of Ship Localization System

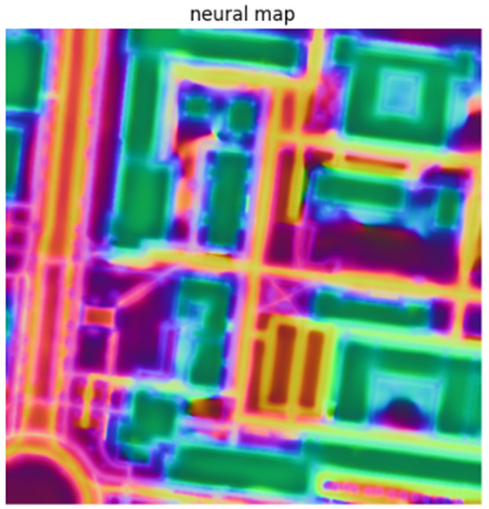


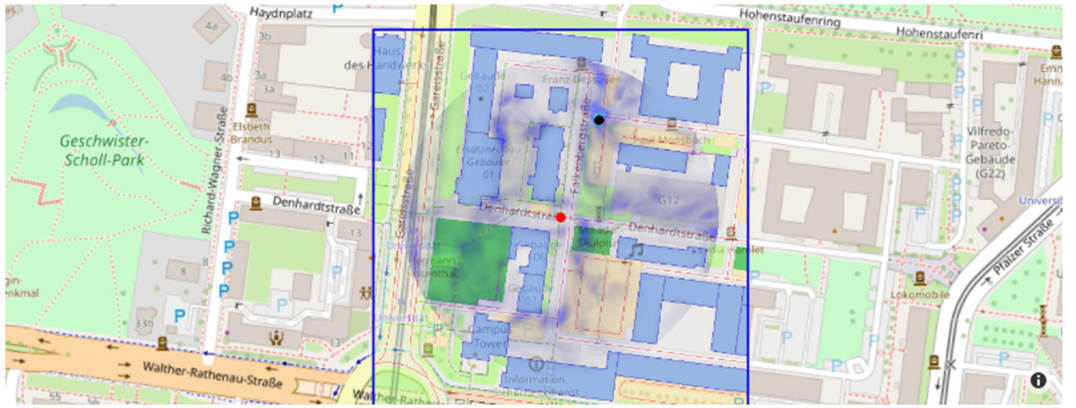


- Goal: Implementation of Particle Filter
  - Performance comparison with other filters
  - Graphical user interface for parameterization
- Requirements
  - Mathematical Understanding of Filtering Methods

OrienterNet Localization







- Goal: Localization and Tracking
  - Data Acquisition and Preprocessing
  - Implementation of Filter Algorithm
- Requirements:
  - Machine Learning / Filtering
  - ROS programming (Python)

Summary

1. Digital Twin of Husky
2. Event-based Robot Platooning
3. Transfer Learning Methods on Time Series
4. Generative Adversarial Networks for Time Series
5. Simulation of Ship Localization System
6. OrienterNet Localization
7. UMD-related Project