

May 16, 2024

INGENIEURPRAXIS / FORSCHUNGSPRAXIS

Implementation of ROS2 for Autonomous Racing on a 1:16 Model Car for the NXP-Cup

Problem description:

The company NXP offers an annual event for students to build an autonomous car, known as the NXP-Cup [1]. The Chair of Automatic Control will provide a platform car for students to participate in this competition based on the Robot Operating System (ROS) [2]. ROS is a prominent software architecture for mobile robotics and autonomous racing.

Therefore, this project aims to establish a ROS software architecture on the NXP controller NavQPlus [3]. The car should be capable of accelerating to a desired velocity and steering according to ROS topics. A velocity sensor must be installed on the vehicle for a car speed measurement. Additionally, camera data should be accessible in ROS.

Furthermore, there is the opportunity to participate in the next NXP-Cup in spring 2025. (Please indicate in your application whether you can take part in the NXP-Cup and attach your CV and grade report.)

Requirements:

- Interest or experience in working with hardware, e.g., sensors and motors
- Interest or experience in working in ROS2

Work schedule:

- Get familiar with ROS [4] [Week 1-2]
- Setup ROS on NavQPlus [Week 3]
- Write ROS-Node for hardware interaction (drive, steering, camera) [Week 4-6]
- Implement speed control for the car [Week 7-8]
- Report [Week 9]

[1] NXP Semiconductors. Nxp cup, . URL <https://nxpcup.nxp.com/>. accessed: 21.04.2024.

[2] Steven Macenski, Tully Foote, Brian Gerkey, Chris Lalancette, and William Woodall. Robot operating system 2: Design, architecture, and uses in the wild. *Science Robotics*, 7(66), 2022.

[3] NXP Semiconductors. NavQPlus, . URL <https://tinyurl.com/4r79dn4h>. accessed: 21.04.2024.

[4] Josh Newans. Playlist building a mobile robot. URL <https://www.youtube.com/playlist?list=PLunhqkrRNRhYAffV8JDIF0atQXuU-NnxT>. accessed: 21.04.2024.

Supervisor: Michael Fink (michael.fink@tum.de)

Start: XX.XX.2024

Delivery: XX.XX.2024

(D. Wollherr)
Priv.-Doz.