



Project Proposal for Digital Engineering Projects

Project Topic:	Autonomous Mobile Obstacle
Project abbreviation:	<i>AMO</i>
Institute/ Chair/ Research Group:	Institute for Intelligent Cooperating Systems, Computational Intelligence Group / Autonomous Multisense Systems Group
Advisor(s):	Christoph Steup, Benjamin Noack
Preferred group size:	<i>3-5</i>
Desired project period:	<i>April 2022 - September 2022</i>
Required/Desired knowledge:	Required: <ul style="list-style-type: none">• Programming in C/C++ or Python. Desired: <ul style="list-style-type: none">• Experience of working with mobile robots.• Programming in ROS.• Knowledge of kinematics, control, and sensor fusion
Is any external affiliation involved (e.g., industrial partner, affiliated institute)?	
yes <input type="checkbox"/> no <input checked="" type="checkbox"/>	
Which one(s)?	
<u>Project Description:</u>	
General description: Based on the Hamster mobile platform, the Carolo-Cup competition shall be extended by a simulated road user. The Hamster robot is a commercial ROS-based development platform equipped with different sensor systems. Its capabilities include object and obstacle detection, map building, and autonomous navigation. The participants will develop and implement algorithms to simulate an independent road user within the Carolo-Cup competition in this project. The platform to be designed has to adhere to the ruleset, e.g., right of way and speed limits, and has to be adaptable to new rules. The participants have to implement two modi operandi. First, the vehicle shall be able to follow a scripted path and behavior. Second, a fully autonomous mode shall be implemented, including an objective function defining the vehicle's behavior. The behavioral design shall be flexible, which may even include certain rule breaks in order to add further challenges to the Carolo-Cup competition.	

Project goals:

- *Setting up ROS- and Gazebo-based simulation environment for Hamster robot*
- *Development of an independent road user for Carolo-Cup*
- *Extending the Hamster platform by required features*
 - o *Road detection*
 - o *Traffic sign detection*
 - o *Detection of other vehicles*
 - o *Implementation of traffic regulations*
- *Evaluation on Hardware*

Subtasks:

- Installation of ROS and Gazebo environments
 - o Setup of Hamster simulation environment
 - o Setup of development environment
- Implementation of road detection, path planning, and navigation
- Implementation of object detection for traffic signs and obstacles.
- Implementation of Carolo-Cup ruleset
- Evaluation on hardware