

A Concept for a Web-based Simulation Environment of a Testbed for Networked and Autonomous Vehicles

(Bachelorthesis)



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Motivation

The Cyber-Physical Mobility Group at i11 provides a platform where the research on algorithms, networked communication and management of autonomously driving vehicles can rapidly be developed and tested.

There are many laboratories that simulate autonomously driving vehicles. Most of them however are denying access to a broad audience by having very restricted access or forcing physical presence of the user.

In almost all cases research is determined to progress faster by having access to respective important and useful tools.

State-of-the-art

Right now the cyber-physical mobility lab offers a locally networked platform consisting of model-scale vehicles, multi-level controllers and a DDS-based communication infrastructure. The software provides the possibilities of simulating and real-world testing of high-level algorithms and communication patterns.

While distributing the software would be an option it is coupled with many requirements such as a packed Linux system and mandatory licensing. This would contradict the argument of accessibility and usability regarding the effortful build process needed to run the software applications whereas a web platform would only require the user to log in and be ready to go.

Goal

My goal is to create a concept of a scalable web platform, capable of providing simulated cyber-physical research and experimentation environments for autonomous vehicles.

The concept will consider resource management and balance, visualization, interaction with the backend systems and vehicles and the creation and maintenance of per-user docker containers.

Proposed procedure

I will begin by identifying and examining the needed software components. This will be followed by extensive conceptualization of the architecture and modifications and extensions to the existing software to adapt to usage over the web.

Apart from that, a method to instantiate and manage the per-user environment will be implemented using explicitly crafted Docker images containing the required extended software setup.

These different software applications will be modular and highly adjustable to facilitate for upcoming requirements regarding expansion of features and scalability.