Autonomous Tram in Depot

KIT, Siemens Mobility, and Other Partners Start the “Autonomous Tram in Depot” Project, BMVI Funds Research on a Fully Automated Tram Depot with Autonomous Trams

The AStriD project focuses on the technical and legal challenges relating to the automation of tram depots. (Photo: Sandra Göttisheim, KIT)

The AStriD “Autonomous Tram in Depot” project is aimed at reaching the next milestone on the way towards autonomous transport systems: Full automation of a tram depot with an autonomous tram and digital depot operations. This project of Karlsruhe Institute of Technology (KIT) and industry partners will be funded by the Federal Ministry of Transport and Digital Infrastructure (BMVI) under the Modernity Fund (mFUND) program for a duration of three years.

The research and development project will be carried out at the depot of Verkehrsbetrieb Potsdam (Potsdam transport company). It is aimed at developing a digital depot based on the operation of autonomous trams. The project’s technical feasibility will be demonstrated by autonomous service operations at the depot, such as running trams through a washing bay onto a siding. In the medium term, depot automation is to be made commercially viable as the first stage of autonomous tram driving. From its onset, the development project will consider the legal framework conditions necessary for the approval and operation of autonomous trams and the economic framework needed for operations. The AStriD project will start in October 2019 and is scheduled for a duration of three years.
The AStriD project partners are Karlsruhe Institute of Technology (KIT), Siemens Mobility, Verkehrsbetrieb Potsdam GmbH (ViP, Potsdam transport company), the Institute for Climate Protection, Energy, and Mobility (IKEM), Codewerk GmbH, and Mapillary. They have divided the project into the following work packages:

KIT will contribute its expertise in the specification and digitalization of depots, automation of processes, and identification of necessary data. “Automated systems will evolve out of the niche, especially in the field of mobility. I see an ideal field of application in the largely closed environment of the depot,” says Professor Eric Sax, Head of the Institute for Information Processing Technology of KIT. “We look forward to contributing our latest research results to AStriD and implementing them in a tram depot.”

Siemens Mobility GmbH will develop the autonomous tram in the depot, which will be integrated into the data and system landscape via the data hub provided by the partner Codewerk and localized and tracked using a Mapillary digital map. “AStriD is the next big milestone on the way to autonomous trams. By automating time-consuming shunting operations in the depot, we want to better support our customers in ensuring sustainable value creation over the entire lifecycle and in guaranteeing availability,” says Sabrina Soussan, CEO of Siemens Mobility.

ViP will provide the tram and depot infrastructure as well as access to required data, systems, and facilities, and evaluate the results from the point of view of a depot operator. “We are pleased that Potsdam has once again been selected for a project. A practical demonstration of the measures that could be promptly implemented will be helpful for us and the whole industry. We will be checking to see whether and how time-consuming shunting operations in a depot can be fully automated. This is an interesting option for our present depot as well as for a possible further base of operations located in the north of Potsdam,” says Monty Balisch, Managing Director of ViP.

IKEM will analyze and assess legal and economic issues in the project. “The fact that the driver is absent as a reference point for behavioral requirements, responsibility, and liability presents major legal challenges and, specifically, challenges to operation approval. For commercial use scenarios, calculating costs, and planning deployment, on the other hand, you cannot simply assume that the driver is eliminated as a cost position. Other functions in the system will gain importance, and the new technology must also be considered as a factor in operations and costs. In fact, there will be a completely new operator model for the depot, and the project will develop this model..."
and support it with cost estimates to the extent possible. IKEM will answer these questions that will come up in the project in cooperation with the project partners and the relevant external parties,” says Matthias Hartwig, Team Leader Mobility, IKEM.

Codewerk specializes in industrial systems and, among other things, develops software for data communication in rolling stock. In this project, Codewerk will handle the cloud and edge components for integrating the data of all systems. “Automated driving has the potential to make rail a more attractive transportation option. With AStriD, we at Codewerk want to invest in a climate-friendly technology and strengthen our competitive position,” says Christian Grund, Managing Director of Codewerk.

Mapillary will provide the project with a cloud-based online platform for the collaborative collection and provision of street images and relevant information. The data will be analyzed with artificial intelligence and processed to provide digital maps. “The spectrum of mobility is changing, and in coming years both autonomous cars and trams will be operating in the streets and making completely new demands on digital maps. Maps will no longer be needed by people wanting to reach a destination only, but also in digital form for different types of vehicles operating autonomously along their routes. This is where Mapillary's expertise in analyzing images of public space comes in. By using artificial intelligence to analyze images, we enable the tram to autonomously recognize and understand its surroundings,” says Peter Kontschieder, Scientific Director of Mapillary.

About mFUND of BMVI

Under the mFUND research initiative, BMVI has been funding research and development projects on data-based digital applications for Mobility 4.0 since 2016. In addition to providing financial support, mFUND relies on various types of events to promote networking of players from politics, business, and research and to provide access to the mCLOUD data portal. Further information is available at https://www.bmvi.de/EN/Topics/Digital-Matters/mFund/mFund.html.

More about the KIT Information · Systems · Technologies Center: http://www.kcist.kit.edu

Being “The Research University in the Helmholtz Association,” KIT creates and imparts knowledge for the society and the environment. It is the objective to make significant contributions to the
global challenges in the fields of energy, mobility and information. For this, about 9,300 employees cooperate in a broad range of disciplines in natural sciences, engineering sciences, economics, and the humanities and social sciences. KIT prepares its 25,100 students for responsible tasks in society, industry, and science by offering research-based study programs. Innovation efforts at KIT build a bridge between important scientific findings and their application for the benefit of society, economic prosperity, and the preservation of our natural basis of life.


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This year’s anniversary logo recalls the milestones reached by KIT and its long tradition in research, teaching, and innovation. On October 1, 2009, KIT was established by the merger of its two predecessor institutions: the Polytechnic School and later University of Karlsruhe was founded in 1825, the Nuclear Reactor Construction and Operation Company and later Karlsruhe Research Center in 1956.