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RESEARCH REPORT

Unsettled Issues in Remote Operation for On-road Driving Automation

Sven Beiker, PhD

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About the Editor

Sven Beiker, PhD, is the Founder and Managing Director of Silicon Valley Mobility, a mobility consulting and advisory firm that specializes in technical diligence, product roadmaps, and business models for mobility topics. The engagements span start-ups, investors, and corporations in mobility and adjacent industries. In addition, Dr. Beiker is a lecturer at the Graduate School of Business at Stanford University, where he instructs students on strategies for start-ups and corporations in the field of automated, connected, electrified, and shared mobility.

With well over 20 years of experience gained during his tenure at McKinsey and Company, Stanford University, and the BMW Group, Dr. Beiker is dedicated to the future of the automobile and personal mobility. His mission is to improve sustainability, safety, efficiency, and convenience in vehicles and how consumers use them. He combines perspectives from technology, business, policy, and human factors.

Dr. Beiker also serves on advisory boards of several start-ups in the mobility space, as an advisor to the German American Chamber of Commerce in San Francisco, and as an advisor/co-editor to the Lecture Notes in Mobility of Springer Science+Business Media. He is a continuing contributor to the SAE EDGE™ Research Report series.

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Unsettled Issues in Remote Operation for On-road Driving Automation

Abstract

On-road vehicles equipped with driving automation features are entering the mainstream public space. This category of vehicles is now extending to include those where a human might not be needed for operation onboard. Several pilot programs are underway, and the first permits for commercial usage of vehicles without an onboard operator are being issued. However, questions like "How safe is safe enough?" and "What to do if the system fails?" persist. This is where remote operation comes in, which is an additional layer to the automated driving system where a human assists the so-called "driverless" vehicle in certain situations. Such remote-operation solutions introduce additional challenges and potential risks as the entire chain of "automated vehicle, communication network, and human operator" now needs to work together safely, effectively, and practically.

And as much as there are technical questions regarding network latency, bandwidth, cybersecurity, etc., aspects like human workload, attentiveness, and situational awareness also need to be clarified. Furthermore, on an even higher level, experts still debate the relevance of remote operation to launch automated vehicles—with various expert opinions ranging from they are "essential requirement" to "not advisable." At the same time, many experts assume that virtually any company aiming for vehicles with SAE Level 4 driving automation is considering at least some form of remote operation.

This report aims to highlight those unsettled issues and introduce solutions that are evolving. Similarly, developing standards and regulations are also summarized, which are needed to provide frameworks for the deployment of such driving automation with remote operation.

NOTE: SAE EDGE™ Research Reports are intended to identify and illuminate key issues in emerging, but still unsettled, technologies of interest to the mobility industry. The goal of SAE EDGE™ Research Reports is to stimulate discussion and work in the hope of promoting and speeding resolution of identified issues. These reports are not intended to resolve the challenges they identify or close any topic to further scrutiny.

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