

Exploring the Safe System in a World of Autonomous Vehicles

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Abstract

The Safe System is built on the principles that death and serious injury are an unacceptable trade-off, having considered that humans make mistakes and that humans can only tolerate certain forces. There are five key elements: Safe Roads; Safe Speeds; Safe Vehicles; Safe People and Post-Crash Response. The introduction of autonomous vehicles is leading to a shift in the way the road safety challenge should be framed. This paper discusses, with real world application, the way in which the Safe System should be adapted for an AV world.

Introduction

This research aims to address the challenges that road safety will face with the introduction of Autonomous Vehicles (AVs). It answers key questions that face the industry including “Will all the effects be beneficial?”, “How can road safety and the Safe System adapt and respond to this challenge?” and “How will each users groups role in the Safe System need to adapt?”

Many publications predict that the introduction of AV technology will have significant benefits (ITS World Congress, 2016), including the potential to reduce road trauma by anything up to 95% (Willimason., 2016). This research considers the journey to that point including the effect of taking control out of the driver’s hands and how this impacts road trauma levels. The research focusses on the relationship between AVs and vulnerable road users, which is a particular challenge (Siulagi et al., 2016; Vissers et al., 2016). Through considering the framework of the Safe System the research aims to identify the complementary and conflicting elements of Safe System in an AV world and how the approach could adapt to protect vulnerable road users.

Levels of Automation

The journey to a fully autonomous transport network is mapped out by the levels of vehicle automation. Experts have defined six levels (SAE, 2016):

- Level 0 – No automation
- Level 1 – Driver Assistance
- Level 2 – Partial Driving Automation
- Level 3 – Conditional Driving Automation
- Level 4 – High driving Automation
- Level 5 – Full Automation

At this point the research is considering all phases of the transition but this presentation will focus particularly on Levels 3 and 4. These stages of automation represents a particular challenge for road trauma reduction. The authors have also identified the vulnerable road user group as a particular focus when considering these stages of automation (Siulagi et al., 2016; Vissers et al., 2016) and this will again be a particular focus of the research presented.

Mapping the Safe System

The first task in the research is to map the key individuals or groups in control of each of the five Safe System pillars for the existing and Level 3 case.

Table 1. Mapping the Safe System for Level 3 Automation

	Current	Level 3/4
Safe Roads	Road authority	Road authority
Safe Speeds	Road authority and Driver	Road authority and Vehicle/Driver
Safe Vehicles	Manufacturers	Manufacturers
Safe People	Driver and other road users*	Other road users* and driver
Post-Crash Response	All road users and emergency services	All road users, AVs and emergency services

* This could include: non-automated vehicles or vulnerable road users (e.g. motorcyclists; cyclists; pedestrians).

Application

The authors have developed an adapted safe System framework, using the above mapping. As a part of the presentation the authors will present the process undertaken to develop this methodology and apply it for sites which previous Safe Systems Assessments have been undertaken. The authors will then present the hurdles and limitations of the adapted framework as well as how they envisage it being utilized in the future.

References

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