

Appendix 1 – Conference abstracts

User studies of self-driving vehicles for the visually and audially impaired: Ethical and methodological considerations

Andersson, Jonas¹; Cook, Steve²; Cullen, Ulrica²; Faleke, Mikael³; Klingegård, Maria¹; Lönnroth, Erik⁴; Ranjbar, Parivash⁵

¹RISE Research Institute of Sweden, Mobility and Systems Göteborg Sweden ;

²Norconsult Astando AB Göteborg Sweden ;

³Västtrafik AB Göteborg Sweden ;

⁴The Swedish Association of the Visually Impaired Göteborg Sweden ;

⁵Örebro University School of Health Sciences Örebro Sweden

Background

Automated and self-driving vehicles, enabled by new technological advancements, have the possibility to improve the life of people with functional impairments such as blindness, deafness, and deafblindness by providing them with the means for independent travel. However, the specific needs of this user group have not yet been considered to any large extent in the design process. More research is needed on how to enable automated vehicles to fulfill their full potential for this user group. From our experience there are several methodological challenges when conducting such studies. In this presentation we would like to highlight strategies for overcoming methodological challenges and increasing the possibilities of this user group to be included in the design of future vehicles; that is, leveraging the societal impact and benefit of self-driving vehicles

Method

From three case studies, reflecting different types of methods (workshop, survey, field study) we discuss the implications that persons with blindness, deafness and deafblindness have for the design and conduct of user studies. We also present strategies for overcoming the challenges associated with these types of impairment. Both practical and ethical considerations for conducting user studies are presented.

Results

The experience gained from the three case studies are organized into the different phases of conducting them: (1) preparation, (2) performance and (3) analysis. This includes information content, format, structure and communication mode. The implications the user group has on the format, structure and time management are presented together with strategies to address those implications in an ethical and practical manner.

Conclusion

There are methodological challenges that can be addressed with (1) an understanding of the constraints set by the user group, (2) proper preparation and (3) study design based on the presented strategies. The methodological and ethical considerations presented in this paper can help researchers and practitioners to facilitate future studies with the visually and audially impaired working towards an inclusive transportation system.

Autonomous transport systems for increased accessibility to societal functions

Steve Cook [Sweden]¹, Mikael Faleke [Sweden]², Erik Lönnroth [Sweden]³, Jonas Andersson [Sweden]⁴, Anna Hedman [Sweden]⁵

¹Norconsult Astando AB, ²Västtrafik, ³Synskadades Riksförbund, ⁴RISE Research Institutes of Sweden, ⁵Västra Götalandsregionen - Sahlgrenska Universitetssjukhus

Background

Autonomous vehicles can potentially enable new transport solutions where more people can travel independently and without accessibility issues. If new transport solutions are designed with a focus on inclusive design, then future transport systems can be accessible for more users creating large advantages for society.

A consortium of organisations in West Sweden have collaborated with the vision of working towards Autonomous and universally designed mobility for increased accessibility to important societal functions.

Methods

A series of projects performed by the consortium have explored the following:

- Which benefits of autonomous transport systems are of the most importance for travellers with reduced vision and produced a framework for measuring future benefits. How a System-of-systems approach can be bridge accessibility gaps in service journeys between public transport and hospital departments.
- Pre-study for a trial of autonomous shuttle-busses at Sahlgrenska Hospital in Gothenburg.
- Guiding for journeys with autonomous vehicles for people with blindness, deafness and deaf-blindness.

Methods

Including design-thinking workshops, user-trials, field studies, service-design methods and innovation processes have been utilised to ensure that user needs have been understood and taken into consideration in design of potential solutions.

Results

The studies have contributed to increased understanding of the needs of users with visual impairments in autonomous transport systems and how public authorities can design services that reduce barriers. Many service improvements and solutions have been identified. Methods for using vibro-tactile communication to guide users to public transport have been evaluated. A plan for a one-year test of autonomous shuttles in a hospital is undergoing an approval process within the regional authority.

Discussion

Insights gained from these projects have already begun to create value. Many solutions can be applied to existing public transport solutions. Increased awareness is required to create future transport solutions with a focus on accessibility for all from the outset.

Guidance for trips with autonomous vehicles for people with blindness, deafness and deafblindness

Parivash Ranjbar [Sweden]¹, Pournami Krishnan [Spain]², Jonas Andersson [Sweden]³, Maria Klingegård [Sweden]⁴

University hospital at Örebro¹, Universidad Politécnica de Madrid², RISE Research Institutes of Sweden³, Folksam AB⁴

Objective

People with blindness, deafness and deafblindness (the target group) have difficulties to travel and it leads to unequal living conditions in society. With autonomous vehicles, there is a great potential to radically increase the sense of freedom and independence and to reduce the stigma associated with the blindness, deafness and deafblindness.

The aim of this study is to investigate the target group's needs during trips with autonomous vehicles and public transport, and to test how guidance technology is experienced at different stages of a trip.

The questions are:

- What are the possibilities and limitations for the target group to travel independently with autonomous vehicles?
- Can vibrotactile guidance enable the target group to travel independently with autonomous vehicles?

Methods

Five persons from each group (deafness/blindness/deafblindness) participated in the tests consisting of interviews and a trip between destinations A and B while two test leaders were observing and documenting the problems and needs the persons. When travelling from point B to A the subjects were guided by the tactile communication systems Ready-Ride, Ready-Move or VibroBraille chosen by the person.

Result

All three target groups needed guidance before, during and after the journey. They were positive towards autonomous vehicles and agreed that tactually guidance was good to send information necessary to travel between point A and B. However, persons with blindness and deafblindness experience the guiding technology as more beneficial than deaf persons, since they can perceive information visually.

Conclusion

Vibrotactile guiding technology has the potential to improve the mobility and thereby quality of life for persons with visual and auditory impairment. In the use case of travelling with public transport, the technology proved most useful for persons with blindness and deafblindness.

