At the Group for Cooperative Autonomous Systems, there is an opening for a Master's thesis on the following topic

Evaluation of New Interaction Techniques for Cooperative Autonomous Systems and Vulnerable Road Users in Virtual Reality

or

Evaluierung neuartiger Interaktionstechniken für Kooperative Autonome Systeme und ungeschützte Verkehrsteilnehmer in Virtuellen Realitäten

Introduction

Our cities are undergoing a digital transformation. The connectivity of autonomous vehicles opens up completely new possibilities to realize the Vision Zero. A particularly interesting and challenging aspect is the Vulnerable Road User (VRU) such as cyclists and pedestrians. These road users only partially have the necessary equipment to share their position and own condition with autonomous vehicles. This makes it difficult to achieve the goals of accident-free mobility in urban/shared spaces. Therefore, novel concepts and interaction techniques are continuously researched and developed. To accelerate the innovation process and to realize user studies safely, virtual realities are nowadays used as MVP. The KPI's of such analyses are awareness, response time, trust and intuitiveness of the interaction technique. Also in this thesis, a new interaction in virtual urban space is implemented and evaluated. The goal is to analyze user behavior in different scenarios and validate the feasibility for future products and research.

Research Questions

This work will focus on the following research questions:

- Can the system increase the awareness of VRU's?
- Which scenarios are of most interest for the proposed system?
- Do VRU's trust the system?
- How fast do VRU's react to the system?
- Does the technique cover users with disabilities (vision, hearing)?
- Is the virtual environment immersive enough to evaluate the proposed system?
- Does the system prevent accidents in dangerous situations?
- How to measure KPI's and scalability of the approach?
- What is the future potential of the proposed system?

Tasks

While working on this thesis, the student will be expected to complete the following tasks:

- Get to know relevant related work and previous research.
- Get to know Unity and C#
- Get to know user studies
- Explore and analyze measured study data

Basic Planning

The thesis is designed for a six-month (24 weeks) time frame:

- Literature review and familiarization with Unity (3 weeks)
- Build virtual study environment (4 weeks)
- Implement study design(4 weeks)
- Test study design, finalize system, prepare study(2 weeks)
- Conduct Study (3 weeks)
- Evaluate the results (2 weeks)
- Writing of the final thesis (6 weeks)

Requirements

To successfully complete the proposed thesis, the candidate should be a student of computer science or related field with basic programming experience. User study design and statistical evaluation as well as familiarization with virtual realities will be supported by Maximilian Schrapel.

Contact

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References

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