1st Workshop on Evaluating Intelligent and Ubiquitous Mobility Systems – EvalIUMS

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Abstract: Evaluation of peoples' mobility and intermodal transport is crucial for understanding mobility and traffic in general and leads to new challenges from the perspective of computer science and especially Human-Computer Interaction.

Keywords: Evaluation; Mobility Experience; Mobility Infrastructure

Ubiquitous Mobility Systems: Complex and Highly Interactive Systems of Systems in Mobility

Huge amounts and varieties of travelers move in different travel chains all over the globe. The interplay of such different systems, like car and bike sharing, local and long-distance public transport and individual transport, must be adapted to the needs of the travelers and their situations, which also lead to different information needs, different interaction possibilities and different behavior.

Intelligent traveler information systems must be created and developed in a way that makes it easier for travelers to plan, book, execute and adapt an intermodal travel chain and to interact with the different systems, i.e. systems of systems. Innovative means of transport are developed, such as electric vehicles and autonomous vehicles as well as the sharing economy and intermodal apps. To achieve the acceptance of these systems, human-machine interaction must be fundamentally redesigned to work in mobility.

Focus on Mobility Modes and Ubiquitous Systems

The first Workshop on Evaluating Intelligent and Ubiquitous Mobility Systems (EvalIUMS) accumulates the different approaches for analyzing and evaluating aspects of the four different mobility modes: walking, cycling, driving and using public transport. The objectives of the Workshop were to exchange findings and lessons learned when applying analysis methods and tools for evaluation of mobility systems as well as the participation of users and represent an opportunity to connect these approaches.

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EvalIUMS aimed at giving an insight into modern evaluation techniques of IT-based mobility systems with a focus on intelligent and ubiquitous systems that can improve planning and the evaluation of implemented measures. The overall goal of the evaluation methods is to increase mobility experience and quality in dimensions such as user comfort, usability, safety and the overall user acceptance in urban mobility.

A New Field of Research for Equipping Mobility Researchers and Professionals Evaluation Tools

The concept of EvalIUMS considered the target groups of young researchers in the field of mobility and evaluation, urban and city planners, planners of public transport as well as developers of intelligent transport systems, including Intermodal Transport Control Systems (ITCS), sharing and mobility apps.

Therefore, EvalIUMS was designed for exchanging experiences and collectively identifying points for future joint work as well as starting the definition of a research agenda. To realize the proposed concept, even in the difficult conditions of a virtually held workshop, the workshop was split into an impulse session, the paper presentation session and the extensive discussion session. To ensure the quality and novelty of the submissions the program committee reviewed the applicants' papers and, if necessary, requested required editing and improvements. The members of the program committee were researchers, practitioners from the economy as well as interested persons active in relevant areas of expertise of evaluating mobility systems.

Focus on Evaluating Systems in Non-motorized Transport

EvalIUMS was successful in uncovering current challenges in the evaluation and assessment of modern mobility systems. The workshop focused on the evaluation of the infrastructure of non-motorized transport users such as pedestrians, cyclists as well as public transport users.

In the four position papers presented, different approaches of participation and evaluation were described and discussed. The summaries of which can be found below. A discussion of upcoming challenges and future cooperation completed the workshop.

Sensor Data Collection of Comfort-related Influences on Bicycle Traffic

In this work an objective data basis for the comfort of bicycle paths is created. Referring on conducted studies, precise conclusions about the comfort on partial routes are drawn based on this data and made available to the user on an individualized basis. In addition, made

available to the user on an individualized basis. For this purpose, the factors that influence the comfort of bicycle routes, both positively and negatively, will first be considered. Subsequently, it will be determined how these factors can be can be automatically recorded with the help of a sensor apparatus. Design and programming of the sensor module, as well as the consistency of the collected data will be evaluated based on a field test, in order to determine their suitability for the creation of such a "bicycle information system".

Analysis of Cycling Traffic with a SensorBike with Ubiquitous Sensors

An approach to survey cycling traffic using ubiquitous sensors in the form of a SensorBike is presented. The aim is to record the cycling traffic from the perspective of the cyclists in order to gain new approaches for the promotion of cycling. Based on first experiences from surveys with the SensorBike, their use cases as well as the challenges for data collection and evaluation are presented. The possibilities but also the limits and challenges of the survey with a SensorBike will be discussed.

Active, Mobile Travel Companionship in Public Transport – Connection Establishment of Mobile Devices and Mobile Public Displays

This paper will discuss the advantages of a continuous, stable connection between a public display in a public space and a private smartphone. It will focus on active travel guidance and the flow of communication from start to finish. It explains what happens to the data during a trip and the role of the platform for route calculation. In this paper concepts for establishing connections between private mobile devices and mobile public displays, currently investigated in the research project SmartMMI[2]. Based on requirements determined by personas and scenarios, a first prototype in the form of a smartphone application will be developed to simulate the connection setup. This will allow initial statements to be made about the demands that need to be placed on such a system.

Analysis and Comparison of the Gaze Behavior of E-Scooter Drivers and Cyclists – Depending on Road Surface Quality in a Real Test Environment

In this paper, an eye tracking study to evaluate the gaze behavior of e-scooter drivers and cyclists on high and low quality road surfaces were contributed. Therefore, the surface quality were recorded with sensors and the different surfaces put in relation to the gaze behavior. The eye movements of the participants were analyzed to identify gaze patterns. A significant difference in the attention distribution of the two investigate means of transport.

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[2] Research project Model-and Context-based Mobility Information on Smart Public Displays and Mobile Devices in Public Transport: https://smartmmi.de/project/

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