

Urban environment mobility KPI framework using IoT devices and 5G drones

Summary

Emerging technologies in ICT allow real-time and near-real-time data collection in various aspects of urban scape, such as environment, traffic flow and asset management. This calls for structured approach on how to use this data in order to advance the quality of life for urban citizens, reduce the footprint of mobility and allow better planning for sustainable development. Advancements in 5G, IoT and edge technology allow to use drones for more than just transportation, but also for remote sensing. This needs classification of fields and defining KPIs to measure the performance.

Research field:	Production and materials engineering, robotics, transport and logistics
Supervisors:	Prof. Dr. Dago Antov Dr. Kati Kõrbe Kaare
Availability:	This position is available.
Offered by:	School of Engineering Department of Mechanical and Industrial Engineering
Application deadline:	Applications are accepted between June 01, 2022 00:00 and June 30, 2022 23:59 (Europe/Zurich)

Description

The technological advances have enabled large-scale data collection and transfer. In order to utilize these capabilities to enhance the quality of life and reduce carbon footprint of urban mobility, the possibilities must be evaluated against a robust framework utilizing the latest advancements in AI, Computer Vision and GIS. The adaptation of spatial-enabled data into KPIs allows to measure and enforce the sustainability of urban developments and reorganizations.

The goal of this PhD project is to examine the use of emerging ICT technologies (5G, IoT, UAV) in the context of urban mobility. Specifically, the project should examine the benefits, risks, opportunities and implications of using these devices in the urban environments and create performance measurement framework.

The thesis should address the following questions: 1) What are the main possibilities for the emerging technologies in urban mobility? 2) How can new technologies complement or replace existing structures? 3) What are the best practices in making use of UAVs and IoT devices in urban mobility? 4) Which capabilities are needed to create suitable environment and infrastructure for the new technologies? 5) How can the performance of these devices be measured in a robust and transferrable way?

Supervisors

Main supervisor: Dr. Kati Kõrbe Kaare
Co-supervisor: Prof. Dr. Dago Antov

Responsibilities and (foreseen) tasks

- Compile an analytical framework for assessing the capabilities of IoT, 5G and UAVs.
- Map possible case studies about the use of new technologies in urban mobility
- Collect data and conduct case studies on the selected cases
- Contribute to comparative data collection by conducting interviews
- Develop KPI framework
- Contribute to the organization of research and practitioner workshops where project findings are presented

Applicants should fulfil the following requirements:

- a master's degree in mobility studies or transport planning



- proficiency in GIS
- a clear interest in the topic of the position
- excellent command of English
- strong and demonstrable writing and analytical skills
- capacity to work both as an independent researcher and as part of an international team
- capacity and willingness to provide assistance in organizational tasks relevant to the project

The following experience is beneficial:

- Experience in mobility studies
- Programming in Python
- Working knowledge of SQL
- Working knowledge of statistics

The candidate should submit a research plan for the topic, including the overall research and data collection strategy. The candidate can expand on the listed research questions and tasks, and propose theoretical lenses to be used.

We offer:

- 4-year PhD position in one of the largest, most internationalized and leading social science research centers in Estonia with a large portfolio of ongoing pan-European and national public administration, digital governance and innovation studies projects
- The chance to do high-level research in one of the most dynamic digital government contexts globally
- Opportunities for conference visits, research stays and networking with globally leading universities and research centers in the fields of public administration, innovation studies and digital government

About the department

The department of Mechanical and Industrial engineering focuses on the engineering side of self driving vehicles, developing new coatings and additive manufacturing developments. The curriculums on Bachelor, Masters and Doctor level have hundreds of graduates each year. We also provide engineering services for industry and our partners, starting with modelling and finishing with production optimization.

In the department there are 8 interlinked research groups. This topic will be under the supervision of research group of logistics and transport. Focusing on the following topics: logistics, mobility and transport planning, supply chain engineering, technical performance measurement, digitalization of supply chains.

The research group focuses on the following research directions:

- Eco-friendly vehicles.

The research aims at reducing the environmental impact of vehicles. The main research object is vehicle-generated noise produced by both an individual vehicle and traffic flow. The design of an individual vehicle explores the possibilities for creating and deploying new and more effective noise absorbing materials. In the applied research, the focus is also on new types of liquid fuel, their technical and economic problems.

- Mobility engineering and traffic planning.

Transport, mobility and traffic related studies are aimed to find the possibilities of safe, seamless and sustainable mobility, the study of the interlinkages between urban logistics and transport and space use. Besides the aforementioned, the keywords include sustainable mobility and sustainable transport, including public transport in the city, region, country and internationally, traffic forecasting, transport studies, mobility schemes, transport network analysis and transport system planning, road safety and surveillance.

- Logistics.

The research relates to smart logistics, freight security, transport pricing and network performance measurement.

- Supply chain engineering.



The studies are related to value chain analysis, supply chain collaboration, sustainable supply chain and demand forecasting.

Additional information

For further information, please contact Kati Kõrbe kati.korbe@taltech.ee and Dago Antov dago.antov@taltech.ee or visit <https://taltech.ee/en/department-mechanical-and-industrial-engineering/research-groups#p29847>



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