

Towards smart and sustainable urban mobility computing in Tallinn

Summary

TalTech School of Information Technologies, Department of Software Science in cooperation with School of Engineering, Department of Mechanical and Industrial Engineering offers a 4-year PhD position funded by IT-Academy. Supervisor Prof. Sadok Ben Yahia; co-supervisor Prof. Dago Antov.

Research field:	Information and communication technology
Supervisors:	Prof. Dr. Dago Antov Prof. Dr. Sadok Ben Yahia
Availability:	This position is available.
Offered by:	School of Information Technologies School of Engineering Department of Software Science Department of Mechanical and Industrial Engineering
Application deadline:	Applications are accepted between September 01, 2020 00:00 and October 02, 2020 23:59 (Europe/Zurich)

Description

Motivation

Urban mobility computing is a process of acquisition, integration, and analysis of big and heterogeneous data generated by a diversity of sources in urban spaces, such as sensors, devices, vehicles, buildings, and human, to tackle the major issues that cities face [1,2]. In this respect, one of the major application areas of urban computing is to improve private and public transportation in a city and traffic congestion management stands on top of the most compelling challenges.

One of the most sustainable solutions is to start a feedback loop that induces more and more people to make a modal shift away from driving. Nevertheless, in the city of Tallinn making the public transport free did not increase its attractiveness. In this respect, making the public transport more convenient will increase patronage, which means that the service can be run more frequently and for longer hours, making it attractive to more people.

Key interventions to reduce traffic congestion include:

1. Optimise traffic-light management: Traffic signals have been installed throughout road networks to control competing traffic flows at road intersections. These traffic lights divide time between conflicting flows and enhance vehicle safety while crossing road intersections by scheduling conflicting traffic flows. However, traffic signals may decrease vehicles' efficiency in traffic networks.
2. Car sharing and multi-modal solutions: Car sharing has huge potential to improve quality of life and traffic conditions in cities. It offers a car at your disposal without the need of ownership and has the potential to reduce the number of cars in cities without reducing individual mobility. The wide spread of information and communication devices (smartphones in particular) and of social media and web platforms, together with the sharing economy that is growing into a cultural consumption approach, are at the basis of this development. Moreover, smart technology has helped to improve the experience of using car sharing, making booking, accessing and using shared transport easier.

Research Questions

- Sustainable global schema of traffic light management
- Impact of this global schema on the reduction of unbalanced ratio of Public Transport and private transport through the determination of key bus stops.
- Quality of Driving assessment and its consequences on car rental/sharing.
- Car sharing and public transport in Tallinn towards a better multi-modal integration [3]

Methodology

- *Inception phase*: Literature review, discover and comparison of related technologies, running tests for performance analysis.
- *Contribution phase*: Creating algorithms and implementation tools based on them.

Research Outcome

Target scientific channels:

- Journals
 - IEEE transactions on intelligent transportation systems (Impact Factor: 4.106)
 - Journal of Engineering applications, Elsevier (Impact Factor: 3.117)
 - Information Science journal, Elsevier (Impact Factor: 5.024)
 - Transportation (Impact factor 2.073)
- Conferences
 - VLDB (International Conference on Very Large Data Bases)
 - ICDM (International Conference on Data Mining)
 - IEEE Big Data (International Conference on Big Data)

References

- [1] Zheng, Yu; Capra, Licia; Wolfson, Ouri; Yang, Hai (2014-09-18). "Urban Computing". ACM Transactions on Intelligent Systems and Technology. Association for Computing Machinery (ACM). 5 (3): 1–55. doi:10.1145/2629592. ISSN 2157-6904.
- [2] Foth, Marcus (2009). Handbook of Research on Urban Informatics: The Practice and Promise of the Real-Time City. Hershey, PA: Information Science Reference. ISBN 978-1-60566-152-0. OCLC 227572898.
- [3] Ferris, Brian; Watkins, Kari; Borning, Alan (2010). OneBusAway: results from providing real-time arrival information for public transit. CHI '10: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems. New York, New York, USA: ACM Press. p. 18071816. doi:10.1145/1753326.1753597. ISBN 978-1-60558-929-9.



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