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Editorial

Intelligent Mobility in Smart Cities

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1. What Is a Smart City

In recent years, the term "Smart Cities" has become popular in Europe and abroad. There are various definitions of the term, but none of them are generally accepted. IBM was the first technologically leading company to discuss the Smart City Initiative in 2008. They introduced first concept of a Smart City:

"Cities are gaining greater control over their development, economically and politically. Cities are also being empowered technologically, as the core systems on which they are based become instrumented and interconnected, enabling new levels of intelligence. In parallel, cities face a range of challenges and threats to their sustainability across all their core systems that they need to address holistically. To seize opportunities and build sustainable prosperity, cities need to become smarter" [1].

According to IEEE [2],

"A Smart City brings together technology, government and society to enable the following characteristics: a smart economy, smart mobility, a smart environment, smart people, smart living, and smart governance".

The definition of European Commission, which promotes the general interests of the EU by proposing and enforcing regulatory compliance and implementing policies and the budget, is:

"A smart city is a place where traditional networks and services are made more efficient with the use of digital solutions for the benefit of its inhabitants and business. A smart city goes beyond the use of digital technologies for better resource use and less emissions. It means smarter urban transport networks, upgraded water supply and waste disposal facilities and more efficient ways to light and heat buildings. It also means a more interactive and responsive city administration, safer public spaces and meeting the needs of an ageing population" [3].

The last example of definition of Smart City is from Department for Business Innovation & Skills:

"The concept is not static: there is no absolute definition of a smart city, no end point, but rather a process, or series of steps, by which cities become more „livable" and resilient and, hence, able to respond quicker to new challenges. Thus, a Smart City should enable every citizen to engage with all the services on offer, public as well as private, in a way best suited to his or her needs. It brings together hard infrastructure, social capital including local skills and community institutions, and (digital) technologies to fuel sustainable economic development and provide an attractive environment for all" [4].

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When we look at the definitions, several key concepts can be extracted. Such selection of the major principles is summarized below:

1. Technology is a necessary tool, but it cannot be the purpose and aim of Smart Cities;
2. The focus is on providing services for citizens and making cities more livable (e.g., concepts such as 15-min cities);
3. Smart Cities seek to optimize their processes by increasing integration (i.e., synergic effect);
4. Building a Smart City is a process and cannot be simply bought;
5. Changing the way of thinking among not only citizens (e.g., ownership versus shared economy) but also decision makers (e.g., citizens' involvement in projects);
6. Smart city projects shall meet one or more of the following objectives
   a. Improving quality of life;
   b. Using resources more efficient;
   c. Improving city sustainability;
   d. Improving city resiliency and citizens' safety with focus on critical infrastructure.
7. Others

Smart Cities seek to optimize their systems by increasing integration through approaches such as increased interoperability, seamless system integration, and automation. Thus, they have the potential to deliver substantial efficiency gains and eliminate redundancy. To add to the complexity of the problem, it shall be stated that the integration of systems for efficiency gains may on the other hand compromise the resilience of an urban system. This all needs to be taken into consideration when thinking about Smart Cities.

2. How Is Mobility Changing within Smart Cities?

The transportation field must also apply the principles and concepts mentioned above. This cannot be understood without considering its links and effects on other components of an urban system. For example, the links between urbanism and transportation (the so called land use–transportation cycle [5]), urbanism and energy management, and many others shall be taken into consideration. New technologies allow new means of travel to be built, and new business models allow existing ones to be utilized. There is a whole paradigm shift in this context from focusing on mobility (i.e., the ability to travel) and accessibility (i.e., the ability to participate in activities).

While we cannot discuss all of such trends and principles, an overview prepared by the author is provided in the Figure 1.

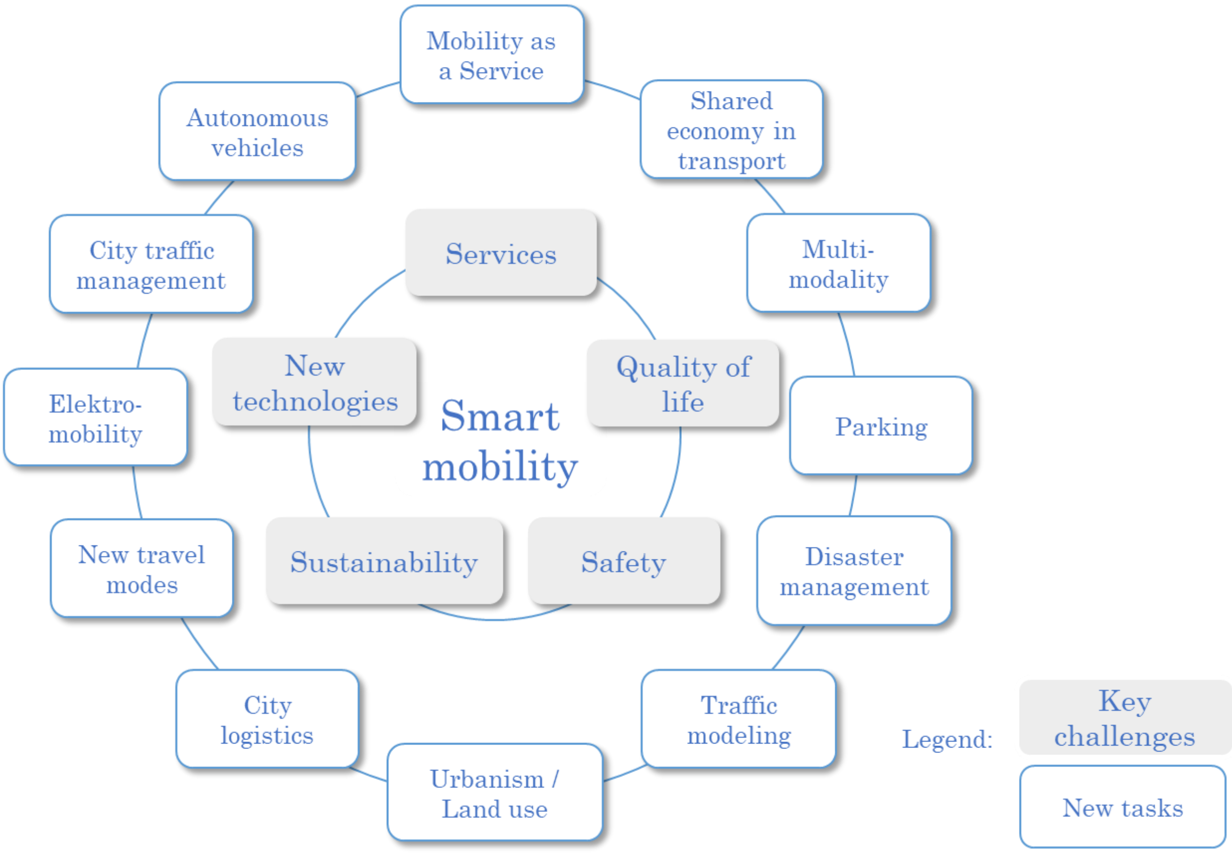

Figure 1. Overview of new trends and challenges within smart mobility (own source).

3. The Approach of This Special Issue

This Special Issue puts together papers with different focuses, but all of them tackle the topic of smart mobility as defined and discussed above.

The topic of integration of mobility into the wider city perspective is addressed within the paper "Interdisciplinary Urban Tunnel Control within Smart Cities" [6]. The paper has two major contributions. First, it provides a systematic view of an urban road tunnel with a focus on the interfaces between the tunnel and the rest of the city and the way they are managed. A tool to consider a sustainable development of a tunnel (i.e., not only traffic flow parameters such as average speed but also environmental and societal characteristics) is provided. The second contribution is that it provides a new urban road tunnel control approach that follows the original methodology and systemic view described in the paper. If the tunnel is controlled autonomously, which corresponds to the current state of the art in many cities, the algorithm decides to close it based on only local parameters. However, the proposed new algorithm takes into consideration not only the traffic situation in the tunnel (as expressed by the parameter traffic density) but also the actual traffic situation within the city (as expressed by its level of service (LOS)). This allows more environmentally, socially, and economically sustainable management of urban road tunnels.

The topic of city logistics using new and environmentally friendly travel modes is addressed in the paper "A Geometrical Structure-Based New Approach for City Logistics System Planning with Cargo Bikes and Its Application for the Shopping Malls of Budapest" [7]. In this paper, the authors provide a new geometrical-model-based way of thinking in organizing city logistics by the use of cargo bikes. Although cargo bikes are popular in many countries particularly in Asia, their usage in European cities is not common. A new approach to managing city logistics is by clearly aiming to improve city sustainability. Within this paper, a model is provided to plan the location of cargo bikes within the capital of Hungary, i.e., Budapest.

Another contribution to the topic of city logistics is in the paper "A Multi-Criteria Decision-Making Approach for Ideal Business Location Identification" [8]. It searches for optimal placement of business within a city. This has a positive effect on the accessibility of activities, as discussed above, and can contribute, for example, to decreasing the number of miles traveled by vehicles, which is an important performance indicator. The paper focuses on the decision-making process and presents a hybrid of two techniques to solve the MCDM problem. The proposed approach is based on the AHP (Analytic Hierarchy Process) and TOPSIS (The Technique for Order of Preference by Similarity to Ideal Solution) approaches. The hybrid approach reduces the computational complexity and requires less manual effort, thus improving the efficiency and accuracy of the proposed approach. Given a set of candidate locations for a new business, the proposed approach ranks the candidates. Thus, the candidate locations with higher ranks are identified as suitable or ideal. Such a decision-making model has the potential to also be applied to other aspects of Smart Cities.

The focus on citizens through services is also one of the key objectives mentioned above. This is true especially when looking at seamless integration of various travel modes. The paper "Exploring Hybrid-Multimodal Routing to Improve User Experience in Urban Trips" [9] introduces a new hybrid-multimodal routing algorithm that evaluates different routes that combine different transportation modes. Hybrid-multimodal routes are route options that might consist of more than one transportation mode. The motivation to use different transportation modes is to avoid unpleasant trip segments (e.g., traffic jams, long walks) by switching to another mode. Another contribution of the paper is in the approach of how to deal with geo-located and anonymized data.

An improvement in the efficiency of transportation services is also enabled through the connectivity of various actors within the field. This belongs to the field of Cooperative Intelligent Transport Systems (C-ITS). The term refers to transport systems, where the cooperation between two or more ITS sub-systems (personal, vehicle, roadside, and central) enables and provides an ITS service that offers better quality and an enhanced service level compared to the same ITS service provided by only one of the ITS sub-systems. Today, pilot implementations of cooperative systems in European countries are being carried out. However, before they are put into full operation, they need to be tested, evaluated, and assessed. The paper "Methodology of Functional and Technical Evaluation of Cooperative Intelligent Transport Systems and Its Practical Application" [10] focuses on the latter two points, i.e., evaluation and assessment of the cooperative systems. For this purpose, a methodology was created that describes the procedure chosen in the evaluation and assessment of cooperative systems in the Czech Republic and a demonstration of its use by way of example. The methodology is focused on three main areas, which in this case are functional evaluation, user acceptance, and impact assessment.

The last paper of this Special Issue, "Comprehensive Analysis of Housing Estate Infrastructure in Relation to the Passability of Firefighting Equipment" [11], focuses on urban emergency management (i.e., resiliency). It provides the assessment and evaluation of the passability in densely populated parts of cities with multi-story housing estates in terms of the operation of the integrated rescue system (IRS) in the Czech Republic. The aim of the research is to minimize the arrival times in order to conduct the intervention as efficiently as possible. The presented problem is caused by the unsystematic development of housing estates and the emergence of secondary problems in the form of the inability of larger IRS vehicles to reach the place of intervention. The vision presented in this document presents a systematic approach to improve the serviceability of individual blocks of flats. The main aim is to ensure passability, even for the largest types of equipment such as fire engine ladders.

While this Special Issue does not solve the problem of mobility within Smart Cities, we believe the papers make an interesting contribution to the field of transportation.

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