Lecture Notes in Networks and Systems 393

Mohamed Ben Ahmed · Anouar Abdelhakim Boudhir · İsmail Rakıp Karaş · Vipul Jain · Sehl Mellouli *Editors*

Innovations in Smart Cities Applications Volume 5

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Preface

On the research area, the potential of the smart cities axis is much higher, as many cities are still at the start of their digital transformation. Because of this, the research field is known as a main driver of innovation and creativity, in order to create multiple applications in the future smart cities, ranging from safety to health, including mobility, the environment, agriculture, water, buildings, and infrastructure.

In the same way, urban governance calls for research and development of more concerted and transversal approaches, closely involving citizens and businesses in the development of smart cities. In addition to the research development, the aims of this book are also to participate in developing new uses, whether internally or toward the citizen who will be in the next and future population of those smart cities. This must attract those uses to know how they will and they can be the smart people of the next generations.

This edited book edition titled "Innovations in Smart Cities and Applications" continues providing the last researches and applications that involves the new technologies for smart cities. This edition is the fruit of the accepted and presented works in the fifth International Virtual Conference on Smart City Applications (SCA 2021) held on October 27–29, 2021, in Safranbolu, Türkiye.

SCA 2021 conference regroups original research, achieved works, and proposed architectures on the main topics of the conference. The scope of SCA 2021 covers a variety of topics with an intersection with smart cities, geo-smart information systems, education, health care, economy and digital business, building and home automation, environment and agriculture, and information technologies and computer science.

Many thanks are addressed to participants and researchers and to all keynote speakers for their valued and rich scientific talk at the conference session.

We are deeply grateful to all organizing committee members from both sides, Moroccan and Turkish teams, to all program committee members and reviewers, to all chairs of sessions for their efforts and the time spent in order to evaluate the contributions and to the success of this event.

We also would like to acknowledge and thank the Springer Nature Switzerland AG staff for their support, guidance, and for the edition of this book.

To close, we hope to express our sincere thanks to Pr. Janusz kacprzyk, Dr. Thomas Ditzinger, and Ms. Viradasarani Natarajan for their kind support and help to promote the success of this book.

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Keynotes

Zero-Touch Management and Orchestration of Network Slices in 5G and Beyond Networks

Adlen Ksentini

Abstract. 6G systems are expected to serve a massive number of extremely heterogeneous network slices that cross multiple technological domains (i.e., RAN, edge, cloud, and core), posing significant challenges to classical centralized management and orchestration approaches in terms of scalability and sustainability. Within this context, a distributed and intelligent management and orchestration system is mandatory. This keynote presents the challenges related to the management and orchestration of network slices in 5G and beyond mobile networks. Based on these requirements, a hierarchical, distributed, and AI-driven management framework is introduced, featuring a zero-touch service management concept.

Biography: Prof. Adlen Ksentini is IEEE Communications Society Distinguished Lecturer. He received his Ph.D. degree in computer science from the University of Cergy-Pontoise in 2005. From 2006 to 2016, he worked at the University of Rennes 1 as Assistant Professor. Since March 2016, he has been Professor in the communication systems department of EURECOM, Sophia-Antipolis, France, where he leads the Network Softwarization group. He is involved in several European Union projects related to network slicing and 5G, such as the 5G!Drones and MonB5G projects

Smart Cities Strategies: Critical Success Factors

Domingos Santos

Biography: Domingos Santos holds a degree in Environmental Engineering (New University of Lisbon), a master's degree in regional and urban planning (Technical University of Lisbon) and a Ph.D. in environmental applied sciences (University of Aveiro). He is Professor of the Polytechnic Institute of Castelo Branco (IPCB) where he has taught curricular units in the field of social development planning, development programs and projects, innovation and entrepreneurship, as well as sustainable development. He has developed teaching activities in the framework of cooperation and mobility programs, in University of Valladolid—Faculty of Economic and Business Sciences and University of Extremadura, both in Spain; Lithuania Business University of Applied Sciences; and, in Brazil, at Dom Bosco Catholic University and University of Santa Cruz do Sul.

Design for Energy: Prosumer Buildings

Yusuf Arayici

Northumbria University, UK

Biography: Yusuf Arayici is Professor in construction project management at Northumbria University. With an international outlook, he previously fulfilled an academic management role as Dean. He also successfully completed his research fellowship TUBITAK (Research Council of Türkiye) in Digital Construction. Since 2000, his research projects have ranged from building information modeling to sustainability. He has led substantial research groups over a prolonged period of time through continuous cycles of research with funded research projects, has graduated many Ph.D. and MSc students, and has published more than 100 papers and five books. Currently, he is researching on AI-supported heritage BIM.

Smart Buildings to Smart Cities—The Role of BIM and GIS Integration

Mohsen Kalantari

University of Melbourne

Biography: Mohsen Kalantari is Associate Professor in geomatics and Associate Director at the Center for SDI and Land Administration in the Department of Infrastructure Engineering at the University of Melbourne, Australia. He teaches BIM, land administration systems, and spatial analysis. He is also Co-Founder of Faramoon, a start-up focusing on the automatic generation of building models from point clouds. His research covers the geospatial information value chain, including sourcing and capturing fit-for-purpose data, engineering data models for optimized storage and visualization, organizing, disseminating geospatial data, and leveraging geospatial data by integrating it with other data.

Smart Sustainable Urbanism

Bakr Aly Ahmed

North Dakota State University, USA

Biography: Bakr Aly Ahmed has nearly 27 years of academic and teaching experience in architecture and design criticism. Prior to joining the faculty of NDSU, he has completed his Ph.D. in environmental design and planning from Virginia Tech and a master's in architecture focusing on the prefabrication of building and the mass production of housing projects. In parallel, he has maintained a professional practice of consultant and design work in numerous projects which included beach resorts, housing developments, and mix-use urban projects. His research interest focuses on sustainable design modeling, environmental capacity measurements, and simulation modeling for pedestrian movement in large buildings.

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Smart City

Smart City Research Between 1997 and 2020: A Systematic Literature Review

Souad El Hilali and Ahmed Azougagh

Abstract Smart city has been a subject of great interest in research and practice. Since its first appearance in early 1998, the Smart City concept is still unclear in terms of context and perspective. The aim of this article is to track the evolution of this emergent field of research between 1997 and 2020 through a systematic literature review based on the Theory method.

Keywords Smart City research · Systematic literature review · Grounded theory · Evolutionary perspective

1 Introduction

The economic development and the technological advances of the second half of the twentieth century have contributed to the promotion of urban development. Thus, it has led to a rural migration of the population to cities that can offer their inhabitants more opportunities for work, education, quality of life, etc. [1–3]. Similarly, according to Florida [4] and Kourtit [5], current trends indicate the third revolution in urban development. Cities are no longer only clusters of inhabitants but generators of creative and innovative potential. However, this rapid growth of the last thirty years has resulted in many challenges related to limited resources, pollution and, social inequalities. Therefore, there is a need for more innovative management of cities [6, 7]. Several approaches can be considered to address these challenges. Some approaches rely on the use of information and communication technologies [8, 9]. Other approaches rely on human capital including learning, creativity, cooperation among relevant actors, and the generation of new knowledge [10, 11]. Cities that have succeeded in addressing these challenges in a smart and innovative way have achieved the label of "Smart City". This concept is gaining

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growing attention from academics and practitioners becoming the new paradigm of smart and innovative urban development [12].

This article presents a systematic literature review on the smart city. The systematic literature review is based on Grounded Theory method. The objective of our literature review is to analyze the existing literature and to see how it has evolved over the last decades to contribute to the advancement of knowledge in this field. We expect that this literature review—which aims to cover a large part of the literature—will bring out relevant concepts and eventually research questions.

2 Method

2.1 A Systematic Literature Review

The art and science of gathering information from primary data is a very critical but often unaddressed area of research. Systematic literature reviews are an indispensable tool in today's research practice. According to Tranfield [13], they differ from narrative reviews by their use of a scientific, transparent, and replicable process. These literature reviews make it possible to reduce bias through an in-depth search of the various studies undertaken on a particular subject. These types of reviews, being well structured and probative, give users confidence and are a source of information about the evolution of knowledge on a given subject [14]. Systematic literature reviews do not provide answers but they do record what is known and what is not known concerning the research question [15]. In this article, we will apply a systematic and rigorous approach to conduct a literature review using Grounded Theory [16] as an analysis process.

2.2 Grounded Theory Approach for Reviewing Literature

Grounded Theory. Grounded theory was founded by the two sociologists Glaser and Strauss in 1996 in American hospitals as a result of their experience with near-death patients [13]. The main question the two authors asked was: how to generate a theory from data collected and analyzed in a rigorous manner. The goal of a grounded theory approach is to generate theories. In other words, a researcher who adopts a grounded theory approach is guided by data.

Grounded theory is based on data. Data may be empirical or theoretical. In fact, grounded theory can be used in conducting literature reviews as a method of analysis. The use of this method in literature reviews consists of searching, selecting, analyzing, and presenting data from the literature in a rigorous manner in order to highlight a concept or develop new theories. There are two schools of thought in grounded theory, the Glaserian school [14] and the Straussian school [15] which gave rise to the Charmazian grounded theory [16] after an epistemological break from positivism to constructivism. We will adopt the Straussian school of thought to evoke grounded theory in systematic literature reviews.