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Editorial

Internet of Things and Cyber–Physical Systems

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1. Introduction

The area of the Internet of Things (IoT) and cyber–physical systems (CPS) has created a great opportunity for interdisciplinary research concerning both fundamental theoretical studies as well as their application in practice. Although significant research results and several developments have occurred and been realized over the last few years, several issues remain. The vision of using the Internet of Things to interconnect all types of devices through the Internet is accelerating the digital transformation of enterprises so that they are better prepared to deal with emerging future challenges. Cyber–physical systems also need much attention, as they integrate sensing, computation, control, and networking into physical objects and infrastructure, connecting them to the Internet. Tons of different issues then become significant, including those related to software, hardware, and the link between them.

The papers included in this Special Issue of *Future Internet* highlight some of the emerging issues that are associated with the Internet of Things and cyber–physical systems, both of theoretical and practical importance. They provide the newest research results on 5G networks, 6G networks, and edge computing-based IoT.

2. Contributions

The first paper [1] provides a systematic literature review of the end-to-end intelligent automation of 6G networks. Currently, 6G is being promised as the set of technologies, architectures, and paradigms that will promote digital transformation and enable growth and sustainability by offering the means to interact with and control the digital and virtual worlds that are decoupled from their physical location. The review aims to envision the role of different technologies that will enable us to move towards end-to-end intelligent automated 6G networks. A review of the latest literature is provided, focusing on the orchestration and automation of next-generation networks by discussing the challenges facing efficient and fully automated 6G networks in detail. Additionally, some of the key technologies that will play a vital role in addressing research gaps are defined.

The second paper [2] introduces a real-time flood monitoring system with computer vision through edge computing-based Internet of Things. A system architecture is proposed that uses (1) RGB-D cameras with stereoscopic capabilities to measure the water level in an open environment and (2) image preprocessing techniques to account for chromatic aberrations due to overexposure followed by postprocessing before the depth readings are extracted. Data processing and the extraction of water-level information are performed entirely on an edge computing device, allowing the amount of data transmitted to the cloud server to be greatly reduced. The system has been practically implemented and experimentally validated in the real world under a wide range of weather and lighting conditions.

The third paper [3] focuses on a data-driven analysis of outdoor-to-indoor propagation for 5G mid-band operational networks. It presents a state-of-the-art contribution to the characterization of the outdoor-to-indoor radio channel in the 3.5 GHz band based on experimental data for commercial, deployed 5G networks collected during a large-scale measurement campaign carried out in the city of Rome, Italy. The analysis concerns

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downlinking the outdoor-to-indoor propagation of two operators by adopting two different beamforming strategies and single wide-beam and multiple synchronization signal block-based beamforming. It is the first contribution studying the impact of beamforming strategies in real 5G networks.

The fourth paper [4] explores the characterization of dynamic blockage probability in industrial millimeter-wave 5G deployments. A simple line-of-sight blockage model for industrial mmWave-based industrial Internet of Things deployments is proposed. The model is based on two sub-models, where each part can be changed/replaced to fit the scenario of interest. The obtained results indicate that direct UE-UE communications are feasible in sparse deployments, at small communication distances, or in deployments with highly transparent machines.

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References

1. Moubayed, A.; Shami, A.; Al-Dulaimi, A. On End-to-End Intelligent Automation of 6G Networks. *Future Internet* **2022**, *14*, 165. [CrossRef]
2. Jan, O.R.; Jo, H.S.; Jo, R.S.; Kua, J. Real-Time Flood Monitoring with Computer Vision through Edge Computing-Based Internet of Things. *Future Internet* **2022**, *14*, 308. [CrossRef]
3. Ali, U.; Caso, G.; De Nardis, L.; Kousias, K.; Rajiullah, M.; Alay, Ö.; Neri, M.; Brunstrom, A.; Di Benedetto, M.-G. Data-Driven Analysis of Outdoor-to-Indoor Propagation for 5G Mid-Band Operational Networks. *Future Internet* **2022**, *14*, 239. [CrossRef]
4. Kondratyeva, A.; Ivanova, D.; Begishev, V.; Markova, E.; Mokrov, E.; Gaidamaka, Y.; Samouylov, K. Characterization of Dynamic Blockage Probability in Industrial Millimeter Wave 5G Deployments. *Future Internet* **2022**, *14*, 193. [CrossRef]