Diverse Infocommunication Technologies to Assist Heterogeneous Distributed Systems

Pal Varga

WE live in the age of infocommunication technology boom, where research results are applied in various fields. This first 2022 issue of the Infocommunications Journal presents a colorful blend of technologies used in various fields, most of which can be categorized as distributed systems. The range of application areas is wide: from predicting housing prices through transportation, from cloud-based robotic control through multi-core batch-scheduling to semiconductor supply chains.

Let us have a brief overview of the articles included in the current, first 2022-issue of the Infocommunications Journal.

Qinghe Pan and his co-authors designed and implemented a system based on Lambda architecture to predict the price of second-hand housing. After comparing the performance of various machine learning algorithms, they chose the KD tree model to predict prices in both real-time and batch processing services. Besides, they further suggested that the nearest k neighbours can be used as a housing recommending list. Their implementation of Lambda architecture is based on open Apache components such as Kafka, Spark, Cassandra and Flask, making the setup relatively easy to replicate.

In their paper, Es-said Azougaghe et al. studied the effect of various usage parameters of generalized parallel concatenated block codes based on Reed-Solomon (RS) codes. Their simulation results show that the chosen adapted parameters – such as the weighting factor α, the reliablilty factor β, the reciprocal value of the extrinsic information delivered by the previous decoder ($\alpha(p)$) are effective in providing good the decoding performance. Furthermore, they show the effect of the number of iteration as well as the multi-block M and the interleaver structure on the decoding performance.

Dávid Papp and Regő Borsodi presented a lightweight solution on a transportation-related computer vision problem: how to provide accurate annotation of vehicles for transport analysis. They introduce hybrid re-identification features, which combine latent, static, and dynamic attributes to improve tracking. They propose multiple scenarios to calculate the static attributes, from which the desired ones can be selected, based on the given task requirements.

Hassan Farran, David Khoury and László Bokor provided a comprehensive survey on the blockchain/hash chain technologies in Vehicle-to-Everything (V2X) communications. It is clear from their paper that these technologies can play an important role in various aspects of V2X communications, enabling the resolution of many issues, including traceable key negotiation between vehicles, security issues in V2X communication, simplification of the distribution of participant CA, trust authentication between vehicles, and many others.

Cloud-based control of visual-guided robotic systems are the state-of-the-art in the domain of industrial robotic research. One of the many challenges is related to sending a vast amount of sensory data with low latency under limited networking conditions. Marcell Balogh and Attila Vidács propose a general solution for efficient camera stream transportation in cloud robotic systems. The evaluation of their streaming solution shows better performance by one order of magnitude when compared with the industry-standard ROS solution.

In data flow graphs, the nodes represent processing primitives and edges between them describe the control flow. Processing data-flows with a multi-core system can improve performance significantly, but batch-scheduling is a challenge. Batch processing is one of the elemental data processing methods, and Batchy is a state-of-the-art batch-scheduling framework for high-end programmable software switches. In their paper, Tamás Lévai and Gábor Rátvári extend Batchy with a non-trivial task: to leverage parallel execution. They developed and implemented effective control algorithms to be used in practical data flow graph batch-scheduling, and evaluated it in a real 5G use-case.

Supply chains has scheduling challenges as well, among which the proper planning of Transit Time (TT) is a currently interesting one because this would help minimize delays. Transit Time in this context is the time taken to move goods physically between different locations in a supply chain. Nour Ramzy and her co-authors approached the problem through Knowledge Graphs, and applied their solution to the semiconductor industry. By examining the time violations, experts can study how to update the planned transit time concerning actual transit times to create a non-conservative and reliable demand fulfilment. Their approach is called Knowgraph-TT, as it connects actual and planned TT, shows the gaps via applied queries, and enables an optimized update of planned TT.

Infocommunications Journal wishes peace and perseverance in 2022 to all its readers, reviewers, and authors.

Pal Varga received his Ph.D. degree from the Budapest University of Technology and Economics, Hungary. He is currently an Associate Professor at the Budapest University of Technology and Economics and also the Director at AITIA International Inc. His main research interests include communication systems, Cyber-Physical Systems and Industrial Internet of Things, network traffic analysis, end-to-end QoS and SLA issues – for which he is keen to apply hardware acceleration and artificial intelligence, machine learning techniques as well. Besides being a member of HTE, he is a senior member of IEEE, where he is active both in the IEEE ComSoc (Communication Society) and IEEE IES (Industrial Electronics Society) communities. He is Editorial Board member of the Sensors (MDPI) and Electronics (MDPI) journals, and the Editor-in-Chief of the Infocommunications Journal.