Chapter 2
Data Management for IoT and Digital Twin

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ABSTRACT

The internet of things (IoT) is a dynamic and global network infrastructure in which "things"—subsystems and individual physical and virtual entities—can be identified, autonomous, and self-configurable. "Things" are expected to communicate with one another and with the environment by exchanging data generated by sensing, as well as react to events and trigger actions to control the physical world. A digital twin is a synchronised virtual representation of real-world entities and processes. Understanding the data management challenges for DT is critical to understanding the data issues. Data management is a common issue in existing systems, ranging from product design to asset management and maintenance.

1. INTRODUCTION

With the expansion of Cyber Physical System (CPS) and internet technology, and also largescale computation and advanced analytics in recent years, the notion of Digital Twin has steadily received widespread interest in smart manufacturing, Napoleone et al., 2020, Negri et al., 2020. With the expansion of Cyber Physical System (CPS)

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and internet technology, and also largescale computation and advanced analytics in recent years, the notion of Digital Twin has steadily received widespread interest in smart manufacturing, Alam and El Saddik, 2017a. The Digital Twin virtual models use these data to update the simulated physical model in real time and transmit control orders to help physical systems optimize and make decisions. The employment of a digital twin in the design, production, operationyste, and maintenance of a complex system is common. In the product life cycle, Schleich used the Digital Twin model in the design and production phases, as well as model conception, presentation, and implementation concerns, Alam and El Saddik, 2017a. During the operation of the crane, Zhidchenko et al., 2018 created the Digital Twin model to forecast the movement of the mobile crane in real time. Glaessgen and Stargel, 2012, proposed a Digital Twin paradigm as a health management cyber system to ensure the safety and reliability of future NASA and U.S. air force vehicles. Direct process quality measurements are sometimes unavailable or infrequent when modelling physical smart manufacturing sms or products, G̈unther et al., 2016, Yun et al., 2020a. Furthermore, the applicability of currently available engineering tools to smart manufacturing with data-driven controls remains a gap. Model non-convergence can be caused by factors such as a disparity between virtual and physical manufacturing, or out-of-sync communications due to hardware latency, resulting in isolated, fragmented, and sluggish data management, Tao et al., 2018a.

2. OVERVIEW OF IoT

Information and communication technology (ICT) has complete power over our everyday routines and habits. It becomes an important part of our life-critical infrastructure, enabling the connectivity of various heterogeneous devices in various ways. Personal computers, sensing, surveillance, smart homes, entertainment, transportation, and video streaming are just a few examples. It's no secret that the Internet is a constantly evolving organism. As wireless communication trends accelerate, so does innovation in Internet connectivity and mobile broadband. Devices that communicate without relying on physical infrastructure are becoming more common, more intelligent, more powerful, more interconnected, smaller, cheaper, and easier to deploy and set up. There is a new future direction for ICT in society: the Internet of Things (IoT) (IoT). The Internet of Things (IoT), formerly known as Machine-to-Machine (M2M) connectivity, is now a hot topic in the telecommunications industry and academia. The IoT paradigm, its concepts, principles, and prospective benefits are examined in this research. Focused on the primary IoT technologies, developing protocols and wide-spread use cases.

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