Chapter 13
Applying a Methodology in Data Transmission of Discrete Events From the Perspective of Cyber-Physical Systems Environments

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ABSTRACT

Most of the decisions taken in and around the world are based on data and information. Therefore, the chapter aims to develop a method of data transmission based on discrete event concepts, being such methodology named CBEDE, and using the MATLAB software, where the memory consumption of the proposal was evaluated, presenting great potential to intermediate users and computer systems, within an environment and scenario with cyber-physical systems ensuring more speed, transmission fluency, in the same way as low memory consumption, resulting in reliability. With the differential of this research, the results show better computational performance related to memory utilization with respect to the compression of the information, showing an improvement reaching 95.86%.

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INTRODUCTION

Cyber-physical systems (CPS) are computer and collaborative systems, which consist of a combination of a software component with mechanical or electronic parts. Whose operations are monitored, coordinated, controlled, and integrated by communication and computing cores; such as control, monitoring, data transfer, and data exchange are generally performed via the internet in real-time. By analogy with the internet, which has transformed the way humans interact with each other. Cyber-physical systems transform how people interact with the physical world around them, in which it's possible to cite for example transportation, health, manufacturing, agriculture, livestock, energy, defense, buildings, and others. Bearing in mind that economically speaking, still, several challenges await overcomings (Shu et al, 2016, Chaâri et al, 2016, Xiong et al, 2015, Besselink et al, 2016, Shu et al, 2016, Chaâri et al, 2016, Liu et al, 2017).

Smart devices are making increasingly enhanced with expanded capabilities, and having as a positive factor that they are low-cost technologies. It is still considered that several of these smart devices rely on high-speed wireless networks, which can be used together with cellular networks 4G. Considering the advent of the Internet of Things (IoT), where each connected object can retrieve information from the environment, manage it, and share it with other devices or users. CPS creates an increasingly consistent synergistic environment (Tao et al, 2017, Jeschke et al, 2017).

Cyber-physical systems are a fundamental part of the 4.0 industry, just as they are important to robots, the Internet of Things, and networked machines, being clear and practical examples of cyber-physical systems. The IoT is a functional, distributed environment comprised of a variety of intelligent devices that detect the environment and can act on it, and with the assistance of the CPS. These devices have the efficiency of monitoring the external environment, collecting data and information about the real world, and generating an environment with ubiquitous computing allowing each connected device to communicate with other connected devices. IoT aims to make the Internet more comprehensive, resulting in the devices being interconnected and collaborating, working either as single sensors or as a set of sensors. Thereby creating intelligent macro term signals that can act as whole systems (Tao et al, 2017, Hermann et al, 2016, Lee et al, 2015).

CPSs are used wherever complex physical systems require communication with the digital world allowing optimization and efficiency in their performance, which play an important and growing role in the industrial process and in the production control (creating intelligent factory). In particular in the context of the IIoT (Industrial Internet of Things), and are also used in energy supply, traffic control, and transport assistance, assisting drivers and operators, as well as in the range of several other areas (Lee et al, 2015, Wang et al, 2015).

As already said, a cyber-physical system is a system composed of collaborative computational elements, integrations of computation, networking, and physical processes. Which includes sensors and components to move or control a mechanism or system, the actuators. Allowing the system to acquire and process the data to connect the CPS to the outside world to control physical entities with economic and societal potential impact. Where such data is made available to the network-based services that use these actuators to directly impact the measurements made in the real world. Leading to the merging of the physical and cyberspace worlds into the Internet of Things (Lee et al, 2015, Mosterman & Zander, 2016).

The computing elements articulate, chain, communicate, interconnect, and relate with digital sensors, interconnecting all the structures distributed intelligent in the environment to achieve deeper knowledge. Thus, allowing a more precise action, monitoring the actuators, and even the virtual and physical