

Chapter 34

The Implementation of Industry 4.0 by Using Industrial and Service Robots in the Production Processes

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ABSTRACT

From the very knowledge of Industry 4.0, its implementation is carried out in all segments of society, but we still do not fully understand the breadth and speed of its implementation. We are currently witnessing major changes in all industries, so new business methods are emerging. There is a transformation of production systems, a new form of consumption, delivery, and transportation, all thanks to the implementation of new technological discoveries that cover robotics and automation, the internet of things (IoT), 3D printers, smart sensors, radio frequency identification (RFID), etc. Robotic technology is one of the most important technologies in Industry 4.0, so that the robot application in the automation of production processes with the support of information technology brings us to smart automation (i.e., smart factories). The changes are so deep that, from the perspective of human history, there has never been a time of greater promise or potential danger.

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INTRODUCTION

The World Economic Forum – WEF (held in Davos in 2016) has referred to the changes on the global industrial and digital scene as the fourth industrial revolution. The term “Industry 4.0” first appeared in 2011 at the Hanover Fair in Germany. In 2016 the World Economic Forum (Geneva, Switzerland) has published a book by professor Klaus Schwab, called “The Fourth Industrial Revolution”. Industry 4.0 is a vision of the advanced industrial production that is already being realized by implementing new technologies in the automation of production processes, and data exchange and processing. Within the Fourth industrial revolution, a new value chain is being formed that relies primarily on Cyber-Physical Systems (CPS), which is also the second name for the Internet of Things, and its associated service most commonly implemented in the cloud (Cloud Computing). Discussion and analysis of the fourth industrial revolution aims to increase the awareness of the comprehensiveness and speed of the technological revolution and its multiple impact. It is necessary to create a framework for thinking about the “Industry 4.0” that outlines key questions and highlights possible answers. In other words, it is necessary to create a platform for achieving public-private cooperation and partnership on emerging issues related to the technological revolution. It is a well-known fact that a large number of industrial and service robots have been installed in production processes in all industrial branches, especially in the metal and automotive industries. First-generation industrial robots have been installed in the production processes, which had to be separated by fences to avoid injuries to workers during the production process. The development of new technologies has introduced collaborative robots, as well as AGV (automated guided vehicle) service robots, which is one of the most significant qualitative shifts in the automation of transport operations, production, assembly lines, warehouses, and all operations where it is necessary to transport certain positions in the production process. Their application is motivated by technical and economic reasons, such as: improving the quality of finished products (machining, etc.), decrease in fall (during assembly process), increase of homogeneity rate - constant quality (in all processes related to robotic application), repeatability, increase of the speed safety (in aggressive, flammable, explosive and other areas, with a high degree of robot protection), reduction of the required workforce in routine and reproducible processes, minimizing production costs and overall maintenance, meeting the demands of competition and more stringent quality standards (Karabegović, Karabegović, Mahmić, & Husak, 2019; Karabegović, & Husak, 2018; Schwab, 2016; Karabegović, 2018; Crnjak, Veža, & Banduka, 2017; Karabegović, Karabegović, Mahmić, & Husak, 2017; Karabegović, Karabegović, Mahmić, & Husak, 2015; Nikolić, & et al, 2017; Pelster, & Schwartz, 2017; Aquin, 2017; Kusmin, 2016; Bechtold, Lauenstein, Kern, & Bernhofer, 2014; Davies, 2015; Bunse, Kagermann, & Wahlster, 2017; Ostrgaard, 2015; Matthias, 2014; Shikany, 2014; Ecker, 2015; Naheme, 2017; Beaupre, 2015). In addition to other technologies, robotic technology and its implementation in all segments of society is one of the foundations of the fourth industrial revolution. Interaction and co-operation are needed to create a positive shift in the implementation of “Industry 4.0” to enable individuals and groups from all parts of the region participating in the implementation to benefit from the ongoing transformations.

INDUSTRY 4.0 – THE CONCEPT

The following industrial revolutions have been recorded worldwide so far: the first industrial revolution that occurred with the invention of the steam engine in 1784, the second industrial revolution with the

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