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Industrial Revolution 4.0 Under Cyber Physical Systems

Siddhant Puthran[1], Karthik Thandande[2]

[1]*Student, Department of Information Technology, B. K. Birla College of Arts, Science and Commerce, Kalyan.*
[2]*Student, Department of Information Technology, B. K. Birla College of Arts, Science and Commerce, Kalyan.*

Abstract - *The Fourth Industrial Revolution is the ongoing automation of traditional manufacturing and industrial practices, using modern smart technology. Cyber-physical systems are technical systems in which networked computers and robots interact with the physical world. By 2050, these systems might be driving on our roads moving alongside us in our daily life and working within our industries. Due to which the scope of interaction, understanding the impact of this system is essential. In this article, we are going to see the overview of the cyber-physical system and what is the cps perspective and how the industries are going to have a heterogeneity principle, and then how the coordination is going to happen from the physical system and information processing. At last, we are going to see what is the future of cyber-physical systems especially in different disciplines, and the long-term goal for this cyber-physical system. Later then we will be having a study about expected benefits and core promises as you all can assume there are many promises made by integrating the cyber-physical system into society including increasing efficiency and sustainability of many of our current practices and create new markets and growth.*

Key Words: Industry 4.0, Cyber Physical System, Industrial Revolution, Smart Systems

1.INTRODUCTION

The Fourth Industrial Revolution is the ongoing automation of traditional manufacturing and industrial practices, using modern smart technology. Large-scale machine-to-machine communication and the internet of things are integrated for increased automation, improved communication and self-monitoring, and the production of smart machines that can analyze and diagnose issues without the need for human intervention.

1.1 Cyber Physical Systems

Cps is a system in which the information processing and the physical processing are so tightly integrated that it is not possible to separate whether the behaviours are the results of both physical laws or they may be working together. Cyber Physical Systems (CPS) *are characterized* as ground-breaking advancements for overseeing interconnected frameworks between its actual resources and computational abilities. ***(01)***

Cyber-physical systems, machines in which a mechanism is controlled as monitored by computer-based algorithms other phrases now might hear when discussing the term internet of things and cyber-physical system are smart along with manufacturing, agriculture, cities, buildings, homes, pills, you name it connected machines will interact, visualize and make decision autonomously. ***(01), (02)***

1.2 Industry 4.0

Technologies like artificial intelligence, autonomous vehicles, or the internet of things are becoming ingrained in our day-to-day lives and even our bodies. Think of voice-activated virtual assistance, Face Id recognition or health care sensors. Schwab first presented his vision of the fourth industrial revolution at the world economic forum's annual meeting in Devos in 2016. By using progressed data examination, organized machines will actually want to perform all the more effective, cooperatively and versatility. Such pattern is changing assembling industry in the future, to be specific Industry 4.0. ***(01), (02)***

Industry 4.0. is about connectivity it's an opportunity to radically change the way industry responds to the needs of society as previous Industrial Revolutions were led by innovations in manufacturing processes and systems the advancement of industry 4.0. will be driven by a smart interconnected pervasive environment. Industry 4.0 acknowledgment might require changes in tasks of creation frameworks and changes can be considered driven by IT. It is prominently contended that Industry 4.0 is a central change to the present status. ***(02)***

2. CPS: - COMPUTING PERSPECTIVE

2.1 Two types of computing systems.

From this computing perspective, we all know that there are two types of computing systems that are desktops, servers, PCs and notebooks, and then embedded system computing. ***(09)*** Wherein 20th century all this was involved in desktop, server pc and notebooks computing services where only millions of microprocessors are going to be used and in the 21st century embedding computing has evolved than the invisible part that embedding part is going to be an invisible part of an environment which is going to transform the industry strategies.

According to statistics, number of microprocessor units per device then the millions of microprocessors which is going to be fabricated in a desktop, whereas billons of

microprocessors are going to be embedded into an embedded process so these cyber-physical systems can apply to the following industries it starts from: -

- Automotive industries
- Aerospace industries
- Consumer electronics
- Health / Medical Equipment
- Industrial automation

2.2 Changes in Cyber Systems

We know that cyber-physical systems are going to have cyber as well as physical systems .so now both cyber systems, as well as a physical system, can interact as well as coordination to achieve the industry revolution 4.0. When we consider the changes in cyber systems, there are rich time models instead of sequencing in nature and then the behavioural invariants instead of the end results. ***(10)*** Then the functionality through interactions of ongoing behaviours instead of a sequence of action components architectures instead of procedural abstraction. Concurrency models with partial orders instead of linearly ordered event sets, this is a characteristic of cyber systems and changes in cyber systems.

2.3 Changes in Physical Systems

We can see those changes in the physical system there we required the precise interaction and coordination protocols and hugely increase the system size with controllable and state variables and dynamic system architecture and adaptive, autonomic behaviours and self-descriptive and self-monitoring system architecture for safety and guarantees this is the way both the interaction and coordination between the physical system and cyber systems. ***(08)***

3. TRANSFORMATION OF INDUSTRIES

3.1 Automotive

We can see that hoe the transformation of industries what the industries currently have a picture and what is the better future by using of these cyber-physical systems. We are going to consider three major industries where the first one is we are considering as automotive industry. So the transformation of industries automotive where the current picture is largely it is focusing on single-vehicle focus so they will be implementing whatever the facility whatever the safety whatever the energy consumption which is going to be incorporated for single-vehicle focus only so Integrating of safety and fuel economy is a current picture, safety, and convenience whatever the “add-ons” as like complex airbag systems and GPS or any other collision avoidance or radar systems which is a current picture of automotive industries. So how the cyber-physical system can be implemented in the better future for the next automotive industries.

In the Manufacturing area, it's used for the auto-monitoring, production control and knowledge sharing in real-time. ***(08)*** multi-vehicle high-capacity cooperative control roadway technologies are often included and therefore the vehicular area network then energy-absorbing smart materials for collision protection purposes and alternative fuels. Technologies like “smart skin”, Integrated photovoltaics, and energy scavenging. Integrated operations of the drive train, smart tires, and active aerodynamics surfaces. At last, the security, privacy certification, regulatory enforcement through that cyber-physical industry revolution 4.0. ***(08)***

3.2 Health care and medicine.

Where the national health information network, Electronic patient record initiative where all the medical records at any point of service can be accessed through various hospitals or any other online E-Resources systems so home care where the monitoring and control through that the heartbeat oximetry that's oxygen saturation blood glucose levels and infusion pumps which suggests the insulin level an accelerometer and wearable networks therefore the surgery of the end of the day it's visiting be as kind of a better look monitoring controls system, multiple treatment stations, during a very single domain and thus the plug and play devices robotic microsurgery which could be guided remotely. CPSs are used for real-time and remote monitoring of the physical conditions of patients to limit patient hospitalization or to enhance treatments for disabled and elderly patients. ***(07)***

3.3 Electric Power Grid

We all know that how the electric power grid as on date where the equipment production it can be implemented employing only tripping the mechanism if any other electrical apparatus which is going to be abnormal or any other hazardous situation, then automatically it will be tripping it so that is the only reactive method we are using it as on date but in future, the Realtime cooperative control of protection devices can be included and the self-healing in nature it will aggregate the island of stable bulk power which will provide protection, market motives, and green computing technologies. And where the issues are standard operational controls, concerns exhibit wide-area characteristics, the context is the market behaviour and power routing transaction and regulations. ***(08)***

4. SECURITY

Modelling has played a significant role in assuring the expected operation of systems within the areas of reliability, dependability, and safety assessment. the advantages of modelling within the design process have

allowed a what if analysis of component failures, dependable modes, and dangerous conditions in systems that don't seem to be yet implemented, thereby saving time, reducing costs, and providing guarantees, whilst managing risk. ***(03)***

Model-based cybersecurity analysis are advancing, there are still several challenges. the primary is moving to mature software implementation of security modelling tools which will be run within already existing systems modelling tools. (***06)*** The second relates to a more general goal, but perhaps more important, of transitioning security into the systems engineering process specified threats and vulnerabilities are addressed together between systems engineers, security analysts, and safety experts. ***(03) (04)***

5. CONCLUSIONS

Finally, we can summarize that the cyber-physical system represents the coming new age in system designing the required technologies as well as the technology changes are going to be fundamental and it is going to be beyond the multidisciplinary design. the impact on the competitiveness is going to be very huge.

Cyber-physical systems are the foundation for the system industry. if we consider the cross boundaries as well as whatever the interaction and heterogeneity, if we can able to implement it, we can able to succeed in implementing the cyber-physical system in industry revolution 4.0.

For the long-term goal, it's visiting transform how we interact with the physical world a bit as the web transformed. How we interact with each other implies that it controls the physical environment from a distant location so building the Cyber-physical system that integrates the computational and object requires a replacement system of a scientific foundation. The fusion of physical and computational science is required so able to achieve the cyber-physical system in a good way, this may produce a big impact on society and national competitiveness. Multi-agent systems seem to be promising thanks to realizing the intelligence for the self-organized reconfiguration management. ***(05)***

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