International Journal in Management and Social Science
Volume 09 Issue 11, November 2021 ISSN: 2321-1784 Impact Factor: 7.088
Journal Homepage: http://ijmr.net.in, Email: irjmss@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal

STUDYING ABOUT CYBER PHYSICAL SYSTEM AND ITS TRENDS

MOHAMMAD ISTEKHAR
RESEARCH SCHOLAR SUNRISE UNIVERSITY ALWAR

DR. AMIT JAIN
PROFESSOR, SUNRISE UNIVERSITY ALWAR

ABSTRACT

The term "cyber physical system" (CPS) refers to the increasingly common practice of embedding internet connectivity and sensing/transmitting capabilities into everyday things. Take, for example, a smart-home software that employs CPS gadgets. The IoT's popularity has risen in recent years because to the many benefits it offers, such as reduced workloads, lower prices, higher levels of comfort for users, and reduced energy consumption. The cyber physical system relies heavily on the low-capacity sensor node. These diverse devices communicate with one another across a wireless network to function as either clients or hosts on the internet. Due to storage space, computing power, and energy backup constraints, popular desktop security measures cannot function on these systems.

Keywords: - Cyber, System, Communication, Network, Physical.

I. INTRODUCTION

CYBER PHYSICAL SYSTEM

A cyber-physical system (CPS) refers to a system that combines physical components with computational elements, communication networks, and control algorithms to create a tightly integrated and interconnected system. CPS bridges the gap between the physical world and the digital world, enabling real-time monitoring, analysis, and control of physical processes.

CPS typically consists of three main components:

Physical Processes: These are the physical entities or systems that CPS aims to monitor, control, or interact with. Examples include industrial machinery, transportation systems, power grids, healthcare devices, smart buildings, and autonomous vehicles.

Computational Elements: These elements include embedded systems, sensors, actuators, and other computing devices that interact with the physical processes. They collect data from the

physical world through sensors, process and analyze the data, and generate control signals to influence the physical processes through actuators.

Communication Networks: CPS relies on communication networks to facilitate the exchange of information between the physical components and the computational elements. These networks can be wired or wireless and enable real-time data transfer, command and control signals, and feedback loops between different parts of the system.

The integration of these components in a CPS allows for sophisticated monitoring, analysis, decision-making, and control. CPS applications can range from smart manufacturing and energy management to healthcare systems and autonomous vehicles. They enable more efficient and adaptive processes, improved safety and reliability, and enhanced performance in various domains.

CPS also brings challenges related to system design, cybersecurity, privacy, and safety. Ensuring the security of the communication networks, protecting sensitive data, and maintaining the reliability of the physical processes are crucial considerations when implementing CPS solutions.Overall, cyber-physical systems play a vital role in advancing automation, connectivity, and intelligence in numerous sectors, revolutionizing the way we interact with and manage the physical world.

II. CONCEPTION IN CYBER PHYSICAL SYSTEM

1. Physical system

A prototype is a part of a physical system that has not yet been created. It's less exciting and exciting and more stagnant. Manual manipulation is required. Most significantly, the system can't be managed without the involvement of a person who operates a physical device to complete a job. Using this method, getting anything done takes a while. The environment causes the equipment to malfunction.

2. Computation

Hardware modified with software in order to perform a certain set of tasks. These instructions will need either supplementary hardware or a modification to the existing hardware architecture of the machine. You may turn the system into a smart device by giving it directions and instructions, which it will then obey and carry out. Computation allows for more capable and autonomous devices. Because of computing, hitherto passive gadgets take on new roles. Computation helps to convert a simple physical equipment into an intelligent one by monitoring and controlling its fundamental duty or physical process.

3. Communication

When using more than one tool to complete a job, it's crucial that they all be able to talk to one another. Even if two devices are to perform a sequence of tasks, they must communicate with one another. The Cyber Physical System is able to communicate through both wired and wireless means. Home automation, healthcare equipment, low-powered radio equipment, and so on all make use of communication protocols like Bluetooth (Connectivity Standards Alliance, n.d.), a wireless ad-hoc network that links diverse physical equipment.

4. Information

Computing enables devices to carry out tasks, whereas communication paves the way for gadgets to collaborate. Device data is analyzed and shared with other devices in order to improve both. By improving its ability to make decisions, the gadget becomes smarter as more data is sent into it. In an emergency, the gadget will use data to figure out how to fix the issue.

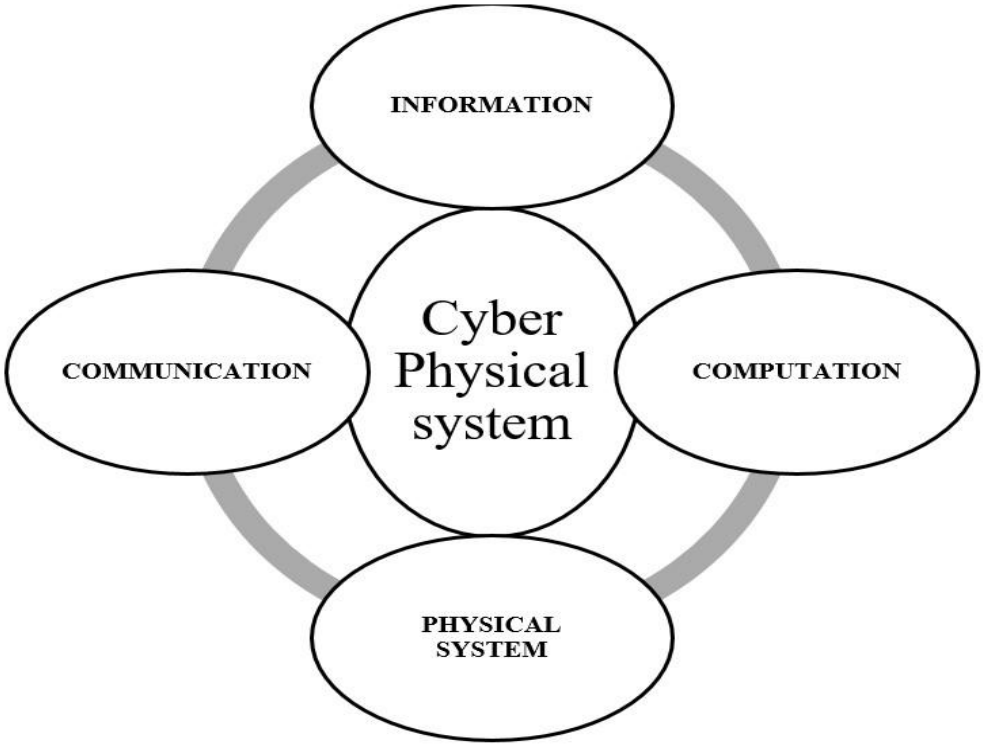

Fig 1.Conceptions in Cyber Physical System

III. CHARACTERISTICS OF CYBER PHYSICAL SYSTEM

As technology develops, smaller and more affordable devices with appropriate processing power, battery life, and storage space become available. This change in thinking makes it possible to include low-scale physical devices, which in turn paves the way for many new uses and possibilities. The four features listed below are all integral to the CPS system.

Artificial Intelligent: Computing technologies based on neural networks will be able to analyze CPS data for useful insights and improved decision-making.

Intelligent computing technology: The incorporation of CPS data into databases and the advancement of its applications will be aided by a wide range of cutting-edge computational technologies, such as cloud computing.

Reliable communication: An IoT network's dependability determines whether or not data about connected items may be accessed at any time through wired and wireless connections.

Physical Awareness: The range of Internet of Things uses is increased by the use of numerous sensors to collect data from the physical world at any time and from any place. The CPS-based network sensors' information collection and network communication capabilities are seamlessly included in.

IV. CURRENT TRENDS IN CYBER PHYSICAL SYSTEM

CPS is useful in a wide variety of contexts because of its features. Which includes features like remote controlling and handling, self-organizing capabilities, sensing of location and information exchange, monitoring of the physical environment, and so on.

As many major countries embark on IoT-based initiatives to better people's lives and increase their quality of life, the global market is ripe with possibilities for CPS. The need for CPS programs has grown as civil society itself has evolved. Modern applications for CPS include smart home systems, healthcare, government and infrastructure, electric cars, and renewable energy. Smart city projects in India will begin in 2015. Smart cities are gaining popularity in many parts of the globe. Several nations have already launched smart city initiatives. There will be around twenty "smart cities" in India. The Internet of Things (IoT) industry is predicted to be worth several trillion dollars by 2020 (Smartcities.gov.in, 2020) due to rising demand for IoT applications including "Smart Governance," "Smart Healthcare," "Smart Homes," "Smart Mobility," and "Smart Environment." Security difficulties (including privacy, authenticity, and access control) and a lack of interoperability between the many technologies now utilized in cities and urban developments are the greatest technical challenges to the adoption of CPS initiatives in future smart cities.

V. CONCLUSION

In conclusion, cyber-physical systems (CPS) represent a significant advancement in technology, bridging the gap between the physical and digital worlds. By integrating physical components, computational elements, and communication networks, CPS enables real-time monitoring, analysis, and control of physical processes.

CPS has a wide range of applications across various domains, including manufacturing, transportation, healthcare, energy management, and more. It facilitates efficient and adaptive processes, improved safety and reliability, and enhanced performance. CPS allows for sophisticated data collection, analysis, decision-making, and control, leading to increased productivity, reduced costs, and optimized resource utilization.

REFERENCES:-

1. Ahmad, I. et al. (2018) 'Security Aspects of Cyber Physical Systems', 2018 1st International Conference on Computer Applications & Information Security (ICCAIS), pp. 1–6.

2. Ashibani, Y. and Mahmoud, Qusay H (2017) 'Cyber physical systems security : Analysis , challenges and solutions', Computers & Security, 68, pp. 81–97. doi: 10.1016/j.cose.2017.04.005.

3. Ashibani, Y. and Mahmoud, Qusay H. (2017) 'Cyber physical systems security: Analysis, challenges and solutions', Computers and Security, 68, pp. 81–97. doi: 10.1016/j.cose.2017.04.005.

4. Bernardi, S. et al. (2021) 'Security modelling and formal verification of survivability properties: Application to cyber–physical systems', Journal of Systems and Software, 171(xxxx), p. 110746. doi: 10.1016/j.jss.2020.110746.

5. Chen, Y., Kar, S. and Moura, J. M. F. (2017) 'Dynamic Attack Detection in Cyber-Physical Systems with Side Initial State Information', IEEE Transactions on Automatic Control, 62(9), pp. 4618–4624. doi: 10.1109/TAC.2016.2626267.

6. Hou, I. et al. (2012) 'Challenges of Cyber physical systems', pp. 1–30.