A SYSTAMATIC REVIEW ON CYBER PHYSICAL SYSTEM

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ABSTRACT

Within the last decade, computational physics (CP) has emerged as a viable avenue to let human beings engage with the virtual environment in new and engaging ways. These linkages, outlined in this article, include machine-to-machine (M2M), wireless sensor networks (WSNs), CPS, and the internet of things (IoT). Finally, we'll look at two newly suggested CPS platforms, each consisting of a new prototype platform for numerous unmanned vehicles using WSNs for navigation and cyber-transportation systems. CPS is a development of M2M that incorporates newer and more sophisticated processes as part of the IoT architecture. Also, we intend to show how improved M2M systems with the capability of making decisions and autonomous control may also meet CPS requirements.

KEYWORDS: Cyber physical system, IOT, Technology.

INTRODUCTION

Wireless and wired systems that connect with other devices of comparable capability have been one of the fastest expanding research topics in recent years. Numerous sectors have seen significant advancements, including machine-to-machine (M2M) communications, wireless sensor networks (WSNs), and wireless body area networks (WBANs) . M2M is a phrase that often refers to communications between computers, embedded processors, smart sensors, smart actuators, and mobile terminal devices that occur without or with little human interaction. M2M connections are justified by two observations: 1) a networked machine is more value than an isolated one; and 2) when several devices are linked successfully, more autonomous and intelligent applications may be developed. As a result, the growth of M2M communications opens up a slew of new prospects for the information business.

According to prior estimates, the effect of M2M communications will continue to grow throughout this decade. For example, some academics project that by 2014, there will be 1.5 billion wirelessly linked devices, excluding mobile phones, without the need for human involvement, resulting in an unparalleled surge of M2M data. At the moment, M2M applications have begun to appear in a variety of industries, including healthcare, smart home technologies, manufacturing systems, and smart grids.

M2M systems may gather a broad variety of data using a variety of sensors by integrating with WSNs. Thus, in addition to M2M interactions, machines may also take action based on the data acquired through integration with WSNs. In the long run, M2M systems equipped with decision-making and autonomous control capabilities may be upgraded to cyber-physical systems (CPS). CPS has recently emerged as a viable avenue

for enhancing human-to-human, human-to-object, and object-to-object interactions in both the real and virtual worlds.

CPS would seem to accept, and even cultivate, the M2M and WSNs domains, since more sensor inputs and greater network connections may be required. As a result, it is important to analyse what has been established in these sectors, forecast what could occur in the field of CPS, and suggest areas that need more study. We seek to accomplish these goals in this essay by describing the distinctive characteristics of M2M, highlighting various CPS cases, and concluding with a discussion of CPS's future problems. To provide the groundwork, we will first examine some existing M2M outcomes. This section introduces M2M and establishes the essential links between M2M and CPS. Additionally, it aids in identifying essential M2M strategies that may be applicable to CPS designs and anticipates which concerns and obstacles need more study in CPS.

While M2M, WSNs, and CPS are relatively similar in many networking features, there are some significant architectural and design philosophy variations. M2M is often used to facilitate communications that do not need or need human interaction. WSNs are optimised for the delivery of sensor-related data. CPS is often multidimensional in nature, spans various sensor networks and the Internet, places a premium on control functions, and tries to create intelligence across various domains.

PROGRESS IN TECHNOLOGY

Numerous research investigations have been conducted lately on the fundamental ideas of M2M and CPS, as well as their usual applications. Both M2M and CPS are used in a comparable area. M2M is a term that refers to communications that occur without or with little human interaction. CPS, on the other hand, places a premium on not just communication but also distributed/real-time control and cross-domain optimization. We will concentrate on their scientific advancements in this section.

M2M applications have already begun to appear in a variety of industries, including intelligent transportation, healthcare, smart robotics, home networks, and smart grids. some investigated the network design problem for M2M communications in a smart grid for a home energy management system and built a hierarchical smart grid architecture. Some presented a three-tiered architecture for residential M2M networks based on radio service ranges and probable uses. In a conversation agent was created to facilitate communication between the sensory agent, the conversation agent, and the decision support agent. Other uses include pollution control facilities, educational experiments, sanitary meteorological services, and integrated video services, among others To significantly cut development costs and accelerate time to market, coordination across standards bodies from diverse sectors is critical. Fortunately, technological standards for M2M are being developed by organisations such as 3GPP, ETSI, IEEE, and TIA. In recent years, organisations' standard bodies specified the network topologies and services necessary to enable the unique characteristics of M2M communications.The advancement of distributed/real-time control, improved network methods, and cloud computing has resulted in the emergence of a CPS. developed as a result of M2M research. CPS has several distinguishing characteristics, including the following: 1) cyber capability embedded in all physical components and resource constraints, 2) close integration, 3) networked at multiple and extreme scales, 4)

complex multiple temporal and spatial scales, 5) dynamically reorganizing/reconfiguring, 6) closed-loop control and high degrees of automation, and 7) operation must be dependable and certified in some calibre. Several accomplishments have been accomplished in the burgeoning CPS sector in the previous few years, which has aided in the growth of CPS. In summary, research accomplishments span several domains, including energy management, network security, data transmission and management, model-based design, control method development, system resource allocation, and services and applications. To facilitate the integration of the physical and cyber worlds, however, a range of concerns and obstacles must be addressed at various stages of the architecture and from various perspectives of system design.

WSN & IOT

The Internet of Things idea has gained traction in recent years because to many prominent applications, including greenhouse monitoring, smart energy metre reading, telemedicine monitoring, and intelligent transportation. In general, the Internet of Things is composed of four primary components: sensing, heterogeneous access, information processing, and applications and services, as well as supporting components such as security and privacy. In essence, WSNs, M2M, and CPS all fall under the umbrella of IoT, since they all need the same components as listed above. The distinctions are limited to the proportion of the design between the four components.

Typically, WSNs are composed of geographically dispersed autonomous sensors that monitor physical or environmental variables and collectively transmit data to a central location over a variety of networks. WSNs, which emphasise information perception through a variety of sensor nodes, are the most fundamental scenario for IoT. WSN theory and applications have advanced significantly during the last decade. The advancements in wireless communication technologies, such as wearable and implanted biosensors, along with recent innovations in embedded computing, intelligent systems, and cloud computing, enable the design, development, and deployment of higher level systems for the Internet of Things.

CONCLUSION

M2representative M's applications have sparked great attention in recent years and will continue to do so in the years to come. The developing domain for CPS has progressively become a reality with the continued development of M2M and WSNs. Developing CPS demands the development of a new science for defining and regulating dynamic processes across diverse networks of sensors and computing equipment. Now, significant implementations of CPS need more theoretical and technological advancements.

We examined the characteristics of M2M, WSNs, CPS, and IoT in this research and identified links between them. Following that, M2M architectures, common M2M applications, and M2M design problems were discussed. On this basis, we presented two CPS scenarios (a prototype platform for multiple unmanned vehicles with WSN navigation and a vehicle making a left turn with CTS assistance) to illustrate how M2M

systems with decision-making and autonomous control capabilities can be upgraded to CPS, as well as to highlight significant research challenges associated with CPS design.

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