Analysis of Key Fourth Industrial Revolution Technologies and Their Applications

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ABSTRACT

Key technologies of Fourth Industrial Revolution and their innovative applications are expected to bring another technological revolution going forward. The present study takes a close look at the Internet of Things (IoT) among the key technologies of the Fourth Industrial Revolution. In particular, sensor devices, which serve as the core of IoT-based application systems, are analyzed. This study also examines various applications and solutions using IoT-based systems.

키워드

Defense, Fourth Industrial Revolution, Internet of Things (IoT), Sensoz

Ⅰ. Introduction

The IoT, one of the core technologies of the Fourth Industrial Revolution, has continued to advance to allow everyone to have access to the information they want whenever and wherever they are by enabling all objects to connect to the Internet. The IoT enables smart objects to communicate and interact with other objects or humans through various networks while providing a wide range of smart services [1]. Cases in point include smart homes, smart farms, smart cities, smart factories, and other application systems.

Ⅱ. Implementation

Sensor devices are the core of IoT-based systems, and one of the most critical components of these sensor devices is the battery system. According to the high-power consumption of sensor devices, however, frequent battery changes may be required, resulting in significant inconvenience. To overcome this limitation, it is important to develop low-power sensor devices. To this end, various low-power technologies, such as energy harvesting, have been employed [2].

Another critical aspect of sensor devices is the technology for connecting them to other devices. When applied to IoT-based application systems where security is required, in particular, sensor devices must be able to exchange information with monitoring devices through direct communication rather than through the Internet. To this end, information exchange technology with high security is required [3].

Ⅲ. Application

IoT-based application systems can also be very effectively applied to ICT solutions for defense. A case in point is the AI-based battle command system. The key elements of the AI-based battle command system include the multi-layer network system, intelligent data integration system, and intelligent command decision system. Among them, the multi-layer network system transmits and receives data in real-time in multi-layer networks, including space and high altitudes. The intelligent data integration system serves to classify, store, and manage various data collected from the battlefield. The intelligent command decision system visualizes and analyzes the current status of the battlefield based on stored data to enable commanders to learn the current situation and thus make decisions in a quick and accurate manner [4].

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These IoT-based application systems have been employed in practice to implement various defense ICT solutions, including war games, systems to detect potential enemy attacks, and intelligent multiple-warhead guided missiles [5]. A war game is a mock battle involving two or more opposing forces that is designed to simulate battles to determine the feasibility of actual or virtual military operations based on predetermined procedures, rules, means, and resources. The enemy attack detection system is designed to detect the movement of enemy forces using sensors and other devices and give a warning if any movement is detected. An intelligent multiple-warhead guided missile is a guided missile equipped with more than one warheads capable of attacking multiple targets at a time using the sensors embedded in each warhead.

Ⅳ. Conclusion

IoT-based application systems among the key technologies of the Fourth Industrial Revolution were examined. In particular, the core components required to implement sensor devices, i.e., the core of IoT-based application systems, were analyzed. Various IoT-based application systems that have been applied to ICT solutions for defense were also discussed.

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