Chapter 4
Interoperability in Internet of Media Things and Integration Big Media: Conceptual Model and Frameworks

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ABSTRACT

Multimedia-related things is a new class of connected objects that can be searched, discovered, and composited on the internet of media things (IoMT). A huge amount of data sets come from audio-visual sources or have a multimedia nature. However, multimedia data is currently not incorporated in the big data (BD) frameworks. The research projects, standardization initiatives, and industrial activities for integration are outlined in this chapter. MPEG IoMT interoperability and network-based media processing (NBMP) framework as an instance of the big media (BM) reference model are explored. Conceptual model of IoT and big data integration for analytics is proposed. Big data analytics is rapidly evolving both in terms of functionality and the underlying model. The authors pointed out that IoMT analytics is closely related to big data analytics, which facilitates the integration of multimedia objects in big media applications in large-scale systems. These two technologies are mutually dependent and should be researched and developed jointly.

INTRODUCTION

Internet of things (IoT) and big data (BD) are used in a variety of applications. The key value of IoT technology is the innovative processing of collected data, which is increasingly becoming multimedia. The Internet of multimedia things (IoMT) currently drives a large number of research and development

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efforts related to multimedia communication and big media (BM) (Nauman, 2020). It is very important to jointly analyze the latest trends. Advanced applications that connect IoT and BD analytics have been in focus. IoT is a usable technology and at the same time a significant driver of innovation (Vermesan, 2013; Stankovic, 2014). It is obvious that the Internet of multimedia objects and big data are evolving step-by-step and transforming many areas of everyday life. We would like to point out that these technological achievements are mutually dependent and joint development is necessary in the future (Seng, 2018).

The rapid development of IoT embeds a large number of sensors in a number of devices from personal to industrial machines that are connected to a reliable Internet. Embedded sensors collect a variety of data, including process, transportation, medical, personal, and mobile equipment. This is crucial for the adoption of IoT applications in multimedia big data development. BM have different characteristics compared to typical BD as a result of different heterogeneities, data types (video, audio, images, interactive 3D models) and unstructured features.

IoT can be seen as a global infrastructure that enables advanced services by interconnecting (physical and virtual) facilities based on interoperable computing and communication technologies (ICT) that are in development (Al-Fukaha, 2015). The basic IoT concept is to connect the vast majority of systems with a common infrastructure. Within the large IoT field, applications and services of IoMT enable the delivery, interpretation, representation and analysis of multimedia content are a special challenge. IoMT is a particular type of objects with all multimedia characteristics, which by definition may sense or act in the physical/virtual environment. Applications and services are designed and implemented based on cloud technology, content streaming and caching, big data for multimedia analytics. New challenges in real-time multimedia communication within the IoMT system are the following: acquisition of multimedia data from objects, communication protocols and standards, analysis of multimedia content and event detection, security and privacy, multimedia processing and storage, distributed/centralized perceptual multimedia compression, scalable encoding of data sources with low delay, scalable management of big data in IoT systems.

The variety of research work associated with IoT convergence are reviewed in (Milovanovic, 2017) and are mainly focused on standardization activities, frameworks, and emerging applications. Interoperability is considered as the most important enabler in integration of IoMT ecosystems, so it is comprehensive survey on IoT interoperability is given in (Wu, 2020) from different perspectives.

The chapter is organized as follows. The fundamental concepts of multimedia-centric IoT and big data are presented in the first part. The conceptual model of IoMT and big media is outlined in the second section. Next, MPEG IoMT standardization process and reference architecture for big data applied to media are presented. The IoT and big data integration for analytics is proposed in the fourth part. It should be noted that there is a close relation between multimedia IoT analytics with big data analytics, which facilitates the integration on multimedia objects in big media applications in large scale systems. These two technologies are mutually dependent and should be developed together.

CONCEPTUAL MODEL FOR BIG MEDIA

In the continuous development of multimedia technology, IoT is becoming one of the main sources of big data. The multimedia data thus collected are heterogeneous and unstructured. Data collection for an IoT application includes data acquisition, compression and formatting. Data acquisition is carried out in several areas such as Internet of multimedia things and Industrial IoT (IIoT) (see Figure 1). Designing a