Chapter 7
Big Data IoT Analytics for Smart Cities With Cloud Computing Technique

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ABSTRACT

Currently, cities are being reconstructed to smart cities that use an information and communication technology (ICT) framework alongside the internet of things (IoT) technology to increase efficiency and also share information with the public, helping to improve the quality of government services citizens' welfare. This large, diverse set of information called big data is obtained by ICT and IoT technologies from smart cities. This information does not have any meaning of its own but a high potential to make use of smart city services. Therefore, the information collected is mined and processed through use of big data analytic techniques. The environmental footprints in smart cities can be monitored and controlled with the help of ICT. Big data analytic techniques help enhance the functionalities of smart cities and the 4G and 5G network provides strong connectivity for professional devices.

INTRODUCTION

Cities of the world have become crowded and modern techniques and facilities incorporated into a city develop them into smart cities. City populations are slowly growing (Dohler et al. 2011) and the global population of urban areas is predicted to reach 70% in 2050; the incorporation of modern facilities would be needed to solve various problems. The World Health Organization has predicted the development of 37 cities into megacities by 2025, with 22 of them situated in Asia (Enbysk, 2013). Many world cities

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are unable to manage this increase in population. The planning and operation of the expanded cities is inadequate and uncoordinated. In addition, most cities do not have real-time data capturing and processing techniques, and if it is captured, the data is analyzed effectively (Deloitte, 2015).

The development of a smart citiy extensivly improves facilities and quality of the life of its inhabitant. Moreover, the problems of those growing cities will reduce on achieving the status of smart cities. The Internet of Things (IoT) provides a good solution for managing complex situations. A huge amount of IoT devices are connected through high-speed communication networks, and monitoring and controlling is carried out by an intelligent system. It is estimated that, in 2019, 35 billion devices were connected to the internet and enormous volumes of data generated (Datameer, 2016). Gantz and Reinsel (2012) say that 40 Zettabytes of data will be comprised in the digital universe, doubling every two years. This huge amount of unstructured and structured data requires a capability to manage, store, analyze, and maintain security.

A machine learning technique is widely used for learning input data and the generalization of learned patterns of future unknown data (Najafabadi et al. 2015). The data received from different sensors and devices can be classified as unstructured, semi-structured, and structured (Chellaswamy et al. 2017; Datameer, 2013). This unstructured and semi-structured data can be analyzed to enable the provision of new opportunities, whereas the structured data can be accommodated only in a relational database. In the modern information era, the querying database is not a proper option for achieving accurate and suitable information. Big Data analytics provides a successful solution to scrutinize an enormous amount of structured and unstructured data and uses advanced correlation techniques and other insights (Vanolo, 2014).

The technological innovations of Big Data analytics show the way to create sustainable and scalable smart cities, while helping authorities in the assessment of situations and how to take relevant corrective measures. Urban development problems can be solved by introducing new smart cities, which can comprehensively gather information from different sensors and devices. It processes data efficiently and intelligently, and transmits the information safely and widely. It also provides urban monitoring and control, management and operational efficiency, promotes sustainable urban development, and improves urban service levels. Thus, the whole city can automatically sense and monitor and make effective self-decision techniques so city inhabitants can feel the intelligent services and applications available in the city (Neirotti et al. 2014).

In general, the major cities in the world are facing development problems relating to traffic congestion, environmental pollution, and energy shortage against rapid urbanization. Unban data computing based on IoT perception is a new concept related to modern data technology, big data mining, and data analysis technology (Hollands, 2015; Zheng et al. 2014; Yunhe et al. 2016). In urban computing, the units of perceived urban dynamics such as device, sensor, building, vehicle, and road in an urban space are considered (Salim and Haque, 2015). The cooperation of the citizen is a significant factor in the completion of the installation and provision of services. The foremost aim of computing in a smart city is to make elegant improvements in the lives of inhabitants and urban environment through data mining, urban perception, intelligent data extraction, and improved cyclical processes (Zheng et al. 2016; Mir et al. 2018). IoT based framework has been developed by Jin et al. (2017) for realizing smart cities. The framework contains complete information about the city, network support structure to data management systems, sensor-based cloud services, and expresses the way to transform from existing physical network systems (Jin et al. 2014). The remaining portion of this chapter is organized as follows: Section 2 describes the popular smart city technologies. Section 3 presents the Integration of big data, IoT, and

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