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Big Data Model Simulation on a Graph Database for Surveillance in Wireless Multimedia Sensor Networks

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Abstract

Sensors are present in various forms all around the world such as mobile phones, surveillance cameras, smart televisions, intelligent refrigerators and blood pressure monitors. Usually, most of the sensors are a part of some other system with similar sensors that compose a network. One of such networks is composed of millions of sensors connect to the Internet which is called Internet of things (IoT). With the advances in wireless communication technologies, multimedia sensors and their networks are expected to be major components in IoT. Many studies have already been done on wireless multimedia sensor networks in diverse domains like fire detection, city surveillance, early warning systems, etc. All those applications position sensor nodes and collect their data for a long time period with real-time data flow, which is considered as big data. Big data may be structured or unstructured and needs to be stored for further processing and analyzing. Analyzing multimedia big data is a challenging task requiring a high-level modeling to efficiently extract valuable information/knowledge from data. In this study, we propose a big database model based on graph database model for handling data generated by wireless multimedia sensor networks. We introduce a simulator to generate synthetic data and store and query big data using graph model as a big database. For this purpose, we evaluate the well-known graph-based NoSQL databases, Neo4j and OrientDB, and a relational database, MySQL. We have run a number of query experiments on our implemented simulator to show that which database system(s) for surveillance in wireless multimedia sensor networks is efficient and scalable.

Keywords: Internet of things (IoT), big graph databases, NoSQL databases, wireless multimedia sensor networks, simulator

1. Introduction

A wireless multimedia sensor network (WMSN) is a distributed wireless network that consists of a set of multimedia sensor nodes, which are connected to each other or connected to leading gateways. Nowadays, smart devices such as mobile phones, smart televisions, and smart watches are equipped with sensors and network connections. Hence, with the advances in wireless communication technologies, multimedia sensor networks are expected to be one of the major components in the Internet of things (IoT).

A typical application for a WMSN is a surveillance system or a monitoring system. Smart city surveillance cameras with 7/24 recording, or one million sensor nodes reporting meteorological data produce data in various formats as video, audio, and text [1]. All that huge structured or unstructured data is considered as big data, which is defined by a number of Vs; *Volume, Velocity, Variety, Veracity, and Value*. Min et al. [2] present a comprehensive survey of big data and they identify that "defining the structural model of big data" is a fundamental problem. Fusing and analyzing big data are challenging tasks and there are many research studies that are related to big

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