Chapter 3

An Application of Big Data Analytics in Road Transportation

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ABSTRACT

Data is being captured in all domains of society and one of the important aspects is transportation. Large amounts of data have been collected, which are detailed, fine-grained, and of greater coverage and help us to allow traffic and transportation to be tracked to an extent that was not possible in the past. Existing big data analytics for transportation is already yielding useful applications in the areas of traffic routing, congestion management, and scheduling. This is just the origin of the applications of big data that will ultimately make the transportation network able to be managed properly and in an efficient way. It has been observed that so many individuals are not following the traffic rules properly, especially where there are high populations, so to monitor these types of traffic violators, this chapter proposes a work that is mainly based on big data analytics. In this chapter, the authors trace the vehicle and the data that has been collected by different devices and analyze it using some of the big data analysis methods.

INTRODUCTION

An important concern today in India is vehicle population which spurs due to rise in population and economic recovery creates a severe pressure on traffic management in the major urban areas of the country. According to a recent survey, the vehicle industry produced a total 23,960,940 vehicles including passenger vehicles, commercial vehicles, three wheelers, two wheelers and quadricycle in the year 2016 between the month April-March which in comparison to the vehicles produced in the year 2015 in between the same month i.e., April- March and it is almost around 23,358,047, registering an insignificant growth of 2.58 percent over the same period last year. The increase in vehicle segment will create a big
traffic problem for this we have to create a system which must be capable of handling the problems, so we are developing one system named it as Smart Transportation Systems (STS) which can be applied to solve or try to minimize traffic problems. STS will consider of all modes of transportation – road, rail, sea and air. The main goal of STS is to develop, evaluate, analyse and integrate new sensor, information, and communication technologies and concepts to achieve traffic efficiency, improve environmental quality, conserve time, save energy, and enhance safety and comfort for drivers, pedestrians, and other traffic groups. The technologies which are based on location information into vehicles, infrastructure, traveller information services and traffic management have proven some improvements in the efficient movement of vehicles & people in USA, Canada, Middle East, European nations, Japan and now they are doing in India also.

During the last years many countries has developed new plans and efficient way, according to their economic geography and cultural geography, to accumulate different elements interrelated to the system. In STS application we use a Traffic Management Centre (TMC) where data from different source is accumulated, studied and is added with the other operational and control idea to control the problems in transportation. Many times, some organisation divides the transportation management according to the network of traffic operation centres. Usually there is a limited spreading of information and data, so the centres can choose multiple options to reach the goals of traffic management. This freedom of interrelated functioning and managing is equally important as the multiplicity of desire and performance of collaborated system. It will also connect different elements of all modes like infrastructure, vehicles & conveyance system.

There are many similar type of STS projects have been developed in some of the Indian metropolis which are having focus on lonely distribution of placed information, advanced toll collection and controlling of the area-wise signal. Nowadays, there are very few fully developed STS applications with traffic management centres in India. So the requirements of STS are strongly needed by environmental demands and socio-economic needs. In India, there are diverse varieties of vehicles and their movement type (pedestrian, bicycle, animal drawn carts, LMV’s, HMV’s) large variety of vehicles (including pedestrian traffic), and poor lane discipline (partially resulting from the first two factors and partially due to cultural reasons) and a very high population density makes adoption of Western STS standards and architecture difficult. So the design of an effective STS function in India will enhance the advancement in technology, interdependency of different branches of engineering like Electronics & Communication, Information & Technology, and Transportation etc. In recent times there are many new technologies related to electronics and communication like Global Navigation Satellite System (GNSS) (Peter J.G. Teunissen and Oliver Montenbruck, 2017), Sensors (KouroshKalantar-zadeh, 2013) and Detectors (Lawrence A. Klein, Milton K. Mills, David R.P. Gibson, 2006). These devices are mainly used for maintaining the coordination between the government and research industry. We must develop a profitable detection system which will be capable of real time road-wise information storage rather than lane-wise storage system. When the system like automatic collection of data is developed, the new data can be stored and used for model development which will make possible STS applications.

STS technique will play an important role in data collection and sharing to ensure such flawless interrelationship. Through this technology we can improve the quality of general transportation that will improvise the usage and aide in transportation management. It is equally important that work force must be able to grow, run and carefully use the present and upcoming technologies for the effective layout and overall application globally. The detailed knowledge of traffic system will be important for the successful implementation of STS in India.