Big Data Implementation in Smart City

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Abstract— **As we all know that the rapidly expansion of big data is playing a vital role in the workability of smart city initiatives by offering one of the most clamant potential for the various smart cities to obtain valuable and worthy information from a massive amount of data produced by the various sources. This brighter future of big data has attracted many government organizations to take consideration to adopt the smart city concept in their cities by implementing the concept of big data applications that supports various smart city components to obtain the desired pursuits of future smart cities so that the living standards of people can be improved. Smart cities are also utilizing the concept of multiple technologies like IOT and all so that the daily life of ordinary people can be changed. Thus the various Government organizations are taking consideration to improve the performance of various fields like park problems, bad health service, energy or electricity, transportation, education, garbage problems and water services by enhancing the quality of life of the citizens by providing them higher levels of comfort. So, it provides most reduced costs and resource consumption with better quality of services to the citizens.**
As various Governments are more focusing on digitization so there is a huge possibilities to produce massive amount of data that can be used to increase the productivity of the business by implementing the concept of big data analytics.

In This paper, we are going to explain how the implementation of big data can be helpful in enhancing the quality of services in the various domains of smart cities to provide a better life to the citizens. We will also discuss about some challenges and problems that can be arise during the big data implementation [1].

Keywords— **Big data, Smart City, Big data Applications in Smart City,**

I. INTRODUCTION

No doubt, the concept of big data with its high influence on the various domains of smart cities can provide the better life to the citizens by improving the quality of services like smart traffic, smart park, smart energy saving, smart education, smart health centre, smart garbage management etc. As we all know that the growing rate of big data is increasing rapidly. All these information or data is producing by millions of active users from the social media whether it is Facebook, twitter, youtube or by some other networking websites and is rapidly increasing day by day with expected size of 24.3 Exabyte (EB) data per month. More than 500 million tweets are posted by twitter only. Acording to the report of 2014, a very huge amount of data are posted by more than 766 million active users daily. At present scenario data challenges can be classified as "Big". It deals with one or more terms like volume, velocity or variety. Recently, it has seen that the rate of global data has increased with rate of 40% per year in which the 5% of data is generating from the IT department only. It is stated that almost 90% of today's data has been generated in the past 2 years only. As a result, many government organizations came into eyes which started to implement big data concept in to the various smart cities projects around all over the world. The big data implementation allows cities to maintain its standards, requirements, principles, and the applications after cognizing the various peculiarities of smart city. These characteristics include resilience, sustainability, good governance, intelligent management of natural resources and city facilities and the enhanced quality of life. There are some well-defined applications and services of the smart city. These are smart parking system, Smart Park, smart health centre, smart traffic management, smart education, and smart energy

saving .All these services can be adapted to smart city easily if we use the concept of big data.

In this paper we are going to review the big data applications and opportunities to utilize it in smart city. We will also discuss about some challenges that may arise during its implementation. In addition, this paper provides the required prototypes for the texture and development of big data in various smart cities with various services and utilities [2].

II. BIG DATA APPLICATIONS IN SMART CITY

As, the big data with its main strength i.e. its high influence can provide the enhanced services to the citizen of smart city. So, on the basis of big data implementation various applications can be come into consideration. These are –
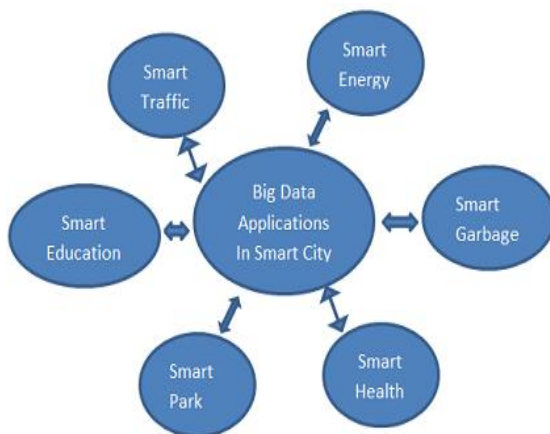

FIG. II. BIG DATA APPLICATIONS IN SMART CITY

A. Smart Energy Management

If some, how the number of people present in a distinctive area in a distinctive time is possible to count automatically then with the help of big data implementation in smart grid the light of the streets can be adjust automatically according to the number of people present which results in lot of energy savings. For example, the smart grid can automatically turn off some of the street light for the scantly populated area. [3].

B. Smart park

It is usually listen that the family went to spend their time in the park has lost their child during the enjoyment. This is the serious matter that can't be ignoring if the organizations are planning to develop smart cities with more security. So, to provide the more secure life to the citizen, the concept of big data can also be used in case of Smart Park. So, to control this child missing problem children before entering the parks are assigned with the sensors enabled bracelets so that the location of children can be easily tracked in case of their missing [4].

C. Smart Garbage Utilization

Utilizing the massive amount of produced garbage is one of the major problems that can arise during the formation of smart cities. More number of houses can cause to produce more garbage that can be solved by implementing the big data concept in smart cities. Manually the produced garbage are collected by the various garbage collector and after loading it into the truck these are fell down to the open Place or river or into the seas which cause to air pollution or water problem and extra cost to clean it. All these problems can be solved very easily if we use the big data concept. In this concept all the resident's dustbins are assigned with a chip card that reminds by sending a notification to the resident's owner cell phone when the certain unit of container crossed. Now it is the owner's duty to suck out all the produced garbage to the garbage cleaning centre. And then all these garbage is used to produce electricity or power for the city after disposing it in an environment friendly way [5].

D. Smart Education

The big data implementation in smart city can easily enhance the productivity of various education systems if some proper smart functionalities of education system are embedded to it. This smart education system can create an environment with fully active learning attitude for the entire citizen to be always updated with current changes of the environment and the society.

The big data implementation in smart education can positively increase the literacy ratio of society by providing the latest and smart study materials to the people. With the help of implementation of this technology in education system the education system can be provided at each and every part of this world whether it is rural area or urban. The better schooling system can be making available for each and every one whether they are reach or poor does not matter. With the help of ICT and big data better knowledge-based society can be made that can enhance the literacy rate of nation easily. Big data in education system is implement mainly by analysing and capturing the useful data of various students, guardians, faculties, administrators and also by analysing the data of various infrastructures like schools, computing, libraries, facilities, universities, educational locations, museums, etc. All these analysed and captured information can be used for providing better trend and models to enhance the services of Education System [6].

E. Smart Heath Centre

Big data can also play an important role to enhance the quality to services in health centre to make it smarter. By analysing the data of previous used and stored medicines the better services can be provided to the patient. On the basis of big data technology once the patient has visited to hospital does not need to go there again and again if he has registered his name there successfully. All the medical facilities can be available to his present address easily and the treatment of the patient can be done online by analysing all the useful information from his house without meeting the Doctors [7].

F. Smart Traffic management

The big data technology can also be used to provide better traffic services to the citizens by reducing the heavy rush or congestion on to traffic. In addition, to provide better traffic services all the cars, motor cars or vehicles can be assigned with RFID chief that will help to regulate and monitor the traffic by sending the accurate information of geo location to the central monitoring unit. So on the basis of this smart traffic system the people coming towards the congested area can be able to know about current

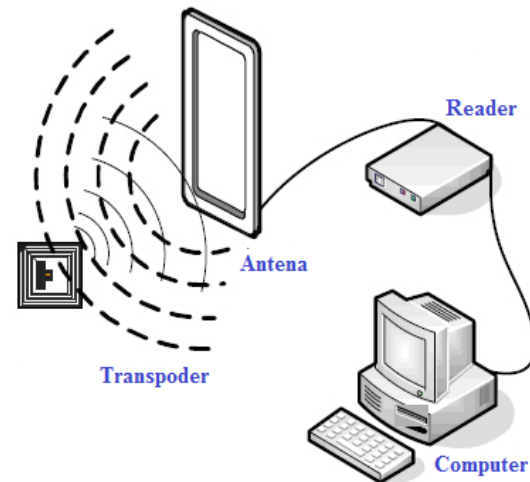status of the traffic and hence the traffic congestion can be controlled [8].

FIG.II *RFID working architecture*

III. CHALLENGES

We may have to face the various challenges during the implementation of big data in to the smart city. These challenges may either be related to the design, deployment or development of big data applications. So, during its implementation in smart city one thing should always be in us mind that the implementation of big data would be challenge free or with at least minimum challenges that could not affect the performance of desired services and applications of the city relying on big data.

Here we are going to address some key challenges that may generate during the implementation of big data [9].

A. Data Storage

Title Data are producing in heavy amount (in Exabyte) so it is quite difficult to store it out in to small area storage like hard disk, CD and pen drive etc. To overcome this challenge, Compression technology is used [10].

B. Data Analysis

The millions of active users on to the various social networking sites (like Facebook, twitter etc.) and E-

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commercial sites (like Flip cart Amazon, Myntra etc.) are continuously generating a very massive amount of data. All these data produced by the millions of active users of internet or by the other sources may be of different in nature. It can either be structured, unstructured or of semi structured type. So analyzation and categorization of these data are quite difficult by the traditional approach and it will also consume a lot of time. So, to overcome this problem, we will have to use some technical approach like scaled out architectures so that the data can be easily analysed and processed [11].

C. Sharing of Data and Information

The sharing of important and useful information among the various departments of city is also a biggest challenge. Each city department and government typically has its own warehouse. Most of the departments are not interested to share their proprietary data at any cost. Some departments do not share their private data due to the security related problems that their data may be misused. So, it is the big challenge to collecting and using the big data to enhance the service quality of smart applications [12].

D. Data Quality

Maintaining the data quality is also a major problem. There are a number of challenges that are associated with the qualities of the data. The database does not provide any standard format to the data that has captured and stored in to the database. Also, there is no universal way to retrieve and store the data automatically in the standard format so that the quality of data remains maintained. Hence the quality of data is not trustworthy [13].

E. Privacy and Security

The, one of the most major issue in the case of implementing the big data in to the various smart cities is to make the people data private and most secured, so that these precious data cannot be misused. The database does not guarantee to provide the more securable and confidentially access of the user's most private data. So, to get rid from this serious problem we need to have a very high level mechanism and security policies that can assure the people to access the data with more security and privacy [14].

F. Cost

This is one of the major challenges of big data implementation in smart city. The unification of big data applications in to the smart city may cause to produce a very high cost beyond the estimated budget. So it is most important to implement all these applications with a price cost effective price within the budget.15]

IV. CONCLUSIONS

This paper explains about the concept of big data implementation in the various domains of smart city to provide the better life to the citizens by improving the quality of services.

The domains of smart city can be, but not limited to are :-

- Smart Traffic
- Smart Park
- Smart Energy Saving
- Smart Education
- Smart Health Centre
- Smart Garbage Management

To form a smart city, a lot of technologies and methodologies should be integrated. The quality of services provided by different technologies may be another challenge for smart city adoption. A fault-tolerant network must be implemented for obtaining the desired target of a smart city. Similarly, data storage and processing management for massive amount of data is also an open challenge. The quality of service provided by big data technologies must be satisfactory and suitable for the smart city prototype before its actual implementation [16].

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