Prediction of Conflicts in Transportation Services using Real-Time Data

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Abstract:- Smart-cities are intended to provide the comfort and satisfaction of the citizens belonging to it. There has been so many advances in the Smart-cities but still some conflicts affect the smart-ness of the smart- city. The problem of traffic jams in Public Transportation Services like Bus, Trains, Tubes(Metros) due to various unpredictable Realtime conflicts resulting the overall satisfaction of the user. Also, the three parallel services being independent to one another have no communication because of their distinct nature. To overcome such conflicts this paper detects and defines the key issues in smart- city public transport systems. In fact the paper is focussing on the conflicts that arise among the public transport services with three distinct providers. To monitor these services working in smart-cities, a Watch-dog architecture has been used. The Watch-dog Architecture works on detection the conflicts and returns it to the admin user to take proper decision. The Realtime data aggregated from all the three services is integrated and processed to reflect the Runtime conflicts arising in the public transport services. This Watchdog Architecture reflects the result in percentage by focussing on a area where all the three services integrate to result a conflict.

General Terms
Cloud Computing and Processing.

Cloud Hive Ipython.

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1. INTRODUCTION

As the population of large cities grow rapidly around the globe and even increasingly public services are more in demand. With the arrival of new technologies like BigData, Cloud Computing, Internet Of Things, Hadoop; cities are now adapting such technologies for migration purpose to improve the quality of life of an individual as well as for economic support of a city. This term is commonly known as Smart-City. Number of cities are adapting such new technologies in order to build a Smart-City.

One Problem which arises, when many Services operate simultaneously, conflict will arise. Conflicts affect on both sides one as immediate impact on human and other as long term secondary effects. Some of the conflicts are detected while designing the phases of services but out of which many are unpredictable during Runtime i.e. when the implementation has ended, the conflicts could occur. Conflicts occurred at Runtime detection is quite challenging than detecting conflict at the time of designing. Once these Runtime conflicts are identified the its resolving involves both technical and administrational support.

This paper describes the type of the issues that occur in a smart- city in a runtime manner and how such conflicts get reduced using the architecture called Watchdog Architecture. The significant additions of the paper we defined are as follows:

- Conflict Classifiaction.
- An Solution of conflict analysis.
- Evaluation of transportation services conflict which would be resolved at Runtime and the same expected conflict which would arise in the future can be resolved at Runtime.

2. LITERATURE SURVEY

[1] Perera, Zaslavski, Khristen, and Georgakopoulus proposed that Many sensors are being set out all over the globe , at a fast rate. The amount of data continuously generated by the sensors is massive. Though, unless the data collected from all the available sensors provide a valuable insight that will help to address the challenges we face everyday (e.g. environmental pollution management and traffic congestion management), no additional value is created by it.

[2] Sanches, Mu˜nos, A. Galachi, Sotrez, J. R. Santana, Gutierres, Ramdhani, A. Gluhac, Crco, E. Theodoridiz et al. proposed that, An agreed architectural reference model is necessary to understand theidea of Internet of Things,which is based on open protocol solutions and main permitting services that allow interoperability of set out IoT resources across diverse application areas and the deployed infrastructure is being reused horizontally

[4] S. Zygiaris proposed that, Public-controlled integrated urban operating systems are used to understand the smart-city vision so that vendor monopolies can be evaded and unrestricted data to all citizens is offered. The performance of the developed cities depends on the city's bequest as well as on the accessibility and trait of social and human capital.

3. WATCHDOG ARCHITECTURE

The WatchDog Architecture is integrated with various modules from Data Acquisition to conflict Prediction returning final output as the percentage of the chances of rising a conflict in the transport system in a Real Time Environment. The various modules of the Watchdog ArchitectuSre are as explained below.

Data Acquisition(RSDU)

The Process of Acquiring data from the independent data providers such as Trains, Buses and Metros in this case is known as Data Acquisition. The providers provide the data collected from various sensors, The location sensor reflect the location of the transport medium either train, bus or metro.

The temperature sensor senses the temperature of the atmosphere and returns it to the database of the provider which is then collected by the Watchdog Architecture in the data acquisition process. There is no interaction among the three transport services. Both Real-time data and offline data is collected in Data Acquisition

Data Preprocessing

The data acquired in the Data Acquisition process is then processed in the Data Pre-Processing Module. The data consist of Real-Time and offline data as well. A Key:Value pair is maintained of the data collected from all the three providers. In which key is a numerical data which is assigned a value containing categorical data. Pre-processing consist of Data cleaning and Data filtering

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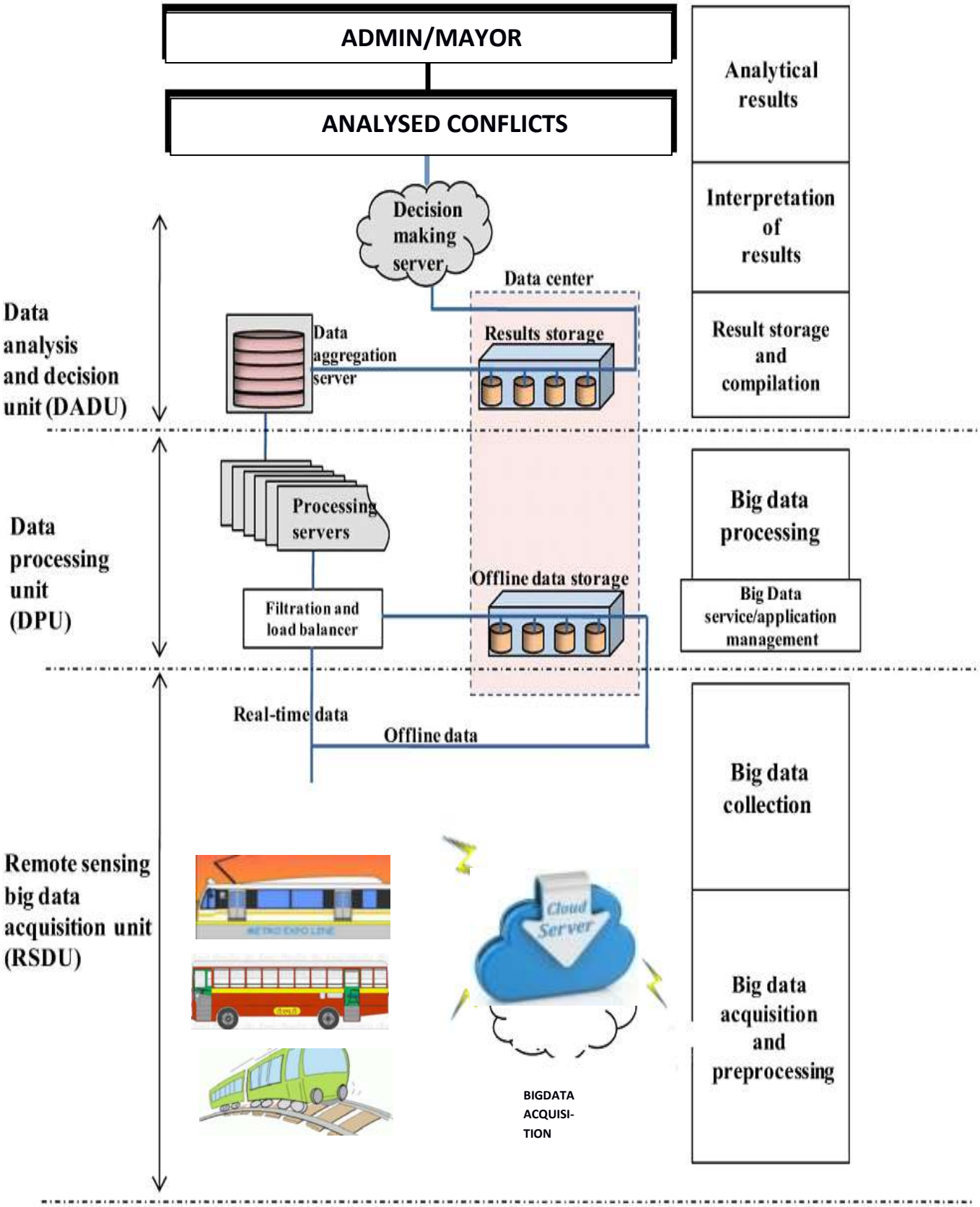

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Data Processing Unit(DPU)

The pre-processed data is processed in the processing module. The processing module integrates and synchronizes the filtered data. Load Balancing is done to manage the Real-time processing. Processing servers are maintained for processing.

Data Analysis and Decision Unit(DADU)

The processed data is analysed and conflict is predicted in this module. A conflict is lack of service in the transport system as shown. The conflict is reflected to the mayor or an Admin who can make a decision over the predicted conflict before the occurrence of a particular conflict. The results are stored for furthur analysis in case of any sensor damage or some other unexpected error.

4. RESULT AND ANALYSIS

The Conflicts which are predicted before their arrival will be displayed in the above format. Where the conflict is predicted in percentage with a reason for the conflict to be arrived by particular services like Bus, Train or Tube (Metro). The conflict is get predicted before its arrival so that the responsible mayor or an admin can take a decision by monitoring the real time data and the real time conflict prediction

TABLE 4.1 CONFLICT TABLE

Services	Conflict Probability	Condition	Conflict
1,2,3	52.5%	Bad weather	All the three services are dispatched to the event while transportation services limit the total vehicles in the area of the event.
1,2	67%	Delay in arrivals due to traffic issues	Buses as well as Trains are dispatched to the area of concert where there is heavy traffic.
1,3	56.1%	Intense pollution of air post Big Events	Two services have different Instructions on the in the same area

5. MOTIVATION

5.1. Proposed work

A lot of sensored and unsensored data is generated from the sensors fitted on the public transportation services(Bus, Train, Metro) that we are considering here. So from all these sensors we acquire their data. This process is called Knowledge Extraction or Data Acquisition Now, this data acquired in an unstructured format. The first job of our system is to organize the data in a structured way. So, basically we acquire the data and convert it into useful information.

Once we have the required information we perform Data Pre-processing technique on it. Data pre-processing involves 2 steps

a. Data Cleaning
b. Data Filtering

In Data Cleaning,duplicate values and noisy data is removed and besides this, the errorneous data is corrected if possible.

In Data Filtering,the unwanted data is removed.

Now,once data pre-processing is done,we move ont to the next step ie. Data Processing.

Data Processing

The data that we get is from the servers of 3 transportation services i.e. Train ,Bus and Metro. We will now synchronize the data from all the 3 servers. In this way we get a proper structured data. This data includes the arrival and departure times. We can also get detailed

information about the glitches in the transportation services .For eg.by comparing the observed and expected arrival an departure values of the particular train , we can get information like, by how much time the train is delayed or if the train failed mid-way and other such information.

Now, moving on, in our smart- city, let's say there is a bus. If the threshold value for delay is set to 30 minutes for bus, and if the bus gets delayed by say 15 minutes, that means the bus got delayed by 50% of the threshold. The bus then ariives 15mins late at the station and passengers get out of the bus and get into the metro which was waiting for that bus. Now the delay due to this bus has an effect on the metro timings in such a way that it arrives late on the next station. Say, when bus got delayed by 15mins, it caused the metro to be delayed by 6 mins (i.e. when the bus got delayed by 50% of the threshold, metro got delayed by 20% of the threshold). So such values are taken and stored in the database for predicting future such conflicts.

Finally, all these conflicts are taken and given to the admin in a structured and organized manner and the final decision making to resolve the conflicts is left upto the admin. This architecture is called as the Watchdog Architecture.

Hence, by using this Watchdog Architecture various runtime conflicts and glitches in the public transportation services in smart-cities can be predicted.

5.2. Issues and challenges

One challenging task in this paper is to identify runtime conflict and to resolve it. The main issue while designing is to integrate services of diff erent transportation services. This approach would help in future to improve the quality as well as economical background of a city.

6. CONCLUSION

The conflicts that arise result into serious issues causing threat to safety and failures of operations in a Smart-environment. The research formulates the issue of conflicts. The main focuses are as follows:

(i) outlines a number of traits of the services giving the issues, (ii) suggests a conflict categorization according to the origin of conflict, (iii) 3 types of transportation services are enlisted (Tube, Bus and Train) and (iv) issues and research challenges of detection and resolution of conflicts are sketched. A watch-dog architecture is also used to intercept actions from all services , detect as well as solve these conflicts. Elevated possibility of conflicts in smart-cities is exhibited through these evaluations that are made using real data.

7. FUTURE SCOPE

The research will prove to be helpful for the smooth functioning of the public transportation services in smart-cities. As the cities all over the world trying to transform themselves into smart-cities, where the main source of transportation is public transport so, such cities will need to manage the various conflicts arising while managing such smart- system. Various conflicts such as delay in arrival due to weather issues or some other issues which needs to be predicted before their arrival can be predicted by implementing this research.

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