Application of Big Data in Forecasting Traffic Flow

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Abstract: According to the traffic situation of a city, this paper sufficiently integrates the relevant information of traffic management of the whole city, analyses and puts forward a set of modern public security traffic flow service system, which can provide effective technical support and help for the reasonable control of traffic system and effectively solve the outstanding traffic management of the whole city. Rationale. This paper mainly studies the practical application of big data in traffic flow forecasting through model design.

1. system architecture
The overall architecture of the system is shown in the following figure:

![System Overall Architecture](image)

Figure 1 - System Overall Architecture

1.1 Technical framework
The analysis of road traffic flow is mainly based on microwave, video, ground inductance coil detection and other methods, taking into account GIS map, weather data and other data, and then comprehensive data analysis. The analysis data mainly includes all aspects of vehicle flow information summary, and then make the overall data evaluation and analysis.
1.2 System deployment design
The main part of the system consists of five modes: storm cluster, application server, Hadoop cluster, prediction module and message server.

Traffic flow information access fully ensures that traffic flow information collected through various channels can be quickly and accurately connected to the system. Computer processing module should ensure the stability and reliability of the calculation.

2. Functional design

2.1 Functional architecture diagram
The functional framework of the system, road traffic flow analysis and prediction system, mainly consists of eight main parts, as shown in the figure.

2.2 Traffic statistics
For traffic statistics, it is usually used to expand the traffic statistics for a certain point, and then set the time period of statistics to minutes.

2.3 Flow contrast
Through the relevant statistics of points, we can make relevant comparisons, which include the comparisons between points, as well as the comparisons between different periods.

2.4 Traffic prediction
Through the combination of traffic flow monitoring and floating vehicle monitoring, we collect and analyze data, and then predict the traffic situation. This prediction includes a variety of contents, such as traffic flow, traffic speed and so on. The forecast time can also be set according to actual needs. Enough to provide information technology support for the city's traffic management.

2.5 Stroke analysis
Travel analysis is to provide the most real-time and reliable traffic service information by analyzing the relevant data of the past through large data analysis for the distance, normal travel time and route of the two assumed coordinate points. Traffic conditions are different in different time periods and different sections of the day, so it is necessary to recommend the best route according to the real-time traffic conditions.

2.6 Flow direction analysis
For the set data points of flow monitoring, the direction of flow can be accurately judged by analyzing the monitoring data of data points. Later, the vehicle license plate recognition system can be added to judge the direction of flow more conveniently.

2.7 Traffic state early warning and forecasting
For the important position of intersections and sections in urban roads, we should timely and accurately understand the speed of vehicles, and then through large data comparison, we can report special situations to traffic command department in time.

2.8 Traffic Travel Traits Analysis
Through the relevant monitoring equipment for the road section traffic situation, the vehicle traffic situation within a certain area, and then combined with the traffic volume, vehicle distribution, flow direction and other aspects, the study of travel characteristics is carried out.

2.9 Evaluation function of traffic operation status
The evaluation of traffic operation status mainly refers to the study of the level of urban traffic in a certain period of time. The dimensions of this evaluation can be divided into many kinds, one is according to time, year, month, day and hour; the other is according to work or rest, peak or flat peak; the third is according to the situation of events, such as bad weather, sudden situation, etc. and the fourth is based on the road conditions in different areas, such as urban main roads, sub-main roads and so on.

Through the traffic flow analysis system, we can analyze according to the relevant information of vehicle operation and large data, and then directly predict the traffic situation of the road network. At the same time, we can analyze and evaluate the real-time traffic situation, such as traffic saturation, traffic capacity and so on.

In addition, the content of the evaluation is graded, and the degree of unobstruction is usually
assessed, as shown in the table below.

Table 1 - Congestion Degree Feedback Table

| Level (example)         | Number of unobstructed sections (examples) |
|-------------------------|-------------------------------------------|
| A: patency              | ≥75%                                      |
| B: basically smooth.    | 60% less than the number of unobstructed sections < 75% |
| C: initial congestion   | 45% less than 60% of unobstructed sections |
| D: congestion           | 30% less than the number of unobstructed sections < 45% |
| E: serious congestion   | 15% less than 30% of unobstructed sections |
| F: Partial or extensive road paralysis | Smooth sections <15% |

3. Business process specification

![Road Traffic Flow Acquisition and Analysis Process](image)

Figure 4 - Road Traffic Flow Acquisition and Analysis Process

The main process of road traffic flow forecasting includes several aspects: first, information collection, second, data upload, third, information data analysis, fourth, information data storage and fifth, related applications.

Information acquisition: Using a dedicated traffic surveillance camera and related terminal equipment, after obtaining relevant food data and fully identifying, the most original information can be obtained.

Upload of data information: adopt fast and reliable related technology to transmit the collected data to the central platform of traffic flow through the form of message.

Analysis of information data: Data analysis is carried out for the collected relevant data and processed according to actual needs, so as to facilitate the use of different applications.

Storage of information data: The distributed storage of large data is adopted to store the adopted data and processed data.

Relevant applications: Predictive analysis model and other content are used to analyze the relevant data of traffic flow, and then the required data content is given to the demander.

4. Summary

In the face of more and more automobile cities, we should make full use of the role of data in
predicting traffic flow, through continuous in-depth data mining and integration, build a road traffic prediction system, fully guarantee the smooth operation of the road traffic system, and lay a technical support for the future development of urban traffic.

Reference
[1] Cai Xiaoyu, Tan Yuting, Lei Cailin, Liu Xiucai. Research on short-term traffic flow forecasting under traffic big data environment [J]. Railway transportation and economy, 2018, 40 (08): 88-93.
[2] Sun Lei, Yang Weiguo, Zhu Junchen. Innovative Application of Big Data in Intelligent High Speed [J]. Information Technology and Standardization, 2018 (Z1): 20-23.
[3] Wei Lingxiang, Chen Hong, Wang Yonggang, Cai Zhili, Zhong Dongqing, Li Yuhua. Short-term traffic flow forecasting method [J]. Journal of Shandong Jiaotong University, 2017, 25 (03): 22-29.
[4] Sun Tongxin, Wang Shikun. Highway traffic forecasting under the background of big data [J]. China Public Safety, 2016 (16): 105-109.