New Traffic Event Detector Layout Scheme and Data Accuracy Analysis

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Abstract

Event detection technology mainly focuses on fixed detection technology such as microwave detection, geomagnetic detection, new coil detection and video detection, and mobile detection technology such as GPS vehicle, mobile phone vehicle, license plate recognition and electronic tag recognition. Although the new detection technology is still under further development, the current application mainly depends on the above-mentioned information collection methods. In terms of the layout and application of traffic detectors, the existing fixed detector layout methods mainly focus on the layout of a single type of traffic detectors. The layout of detectors is determined by analyzing the relationship between the effect of data acquisition under different layout schemes of detectors and the spacing of detectors. Case. Although domestic research on the application of detector combination has begun to explore, the existing research results only study the types of detector combination, analyze the advantages and disadvantages of several common combination schemes of detectors on expressways and the applicable conditions, and only qualitatively explain which detector should be selected, but not Quantitatively explain the number of detectors to be laid out, the specific location and the distance between detectors to be laid out in combination. There is not much research on how to select different types of detectors for encrypting the sections with detectors.

Keywords

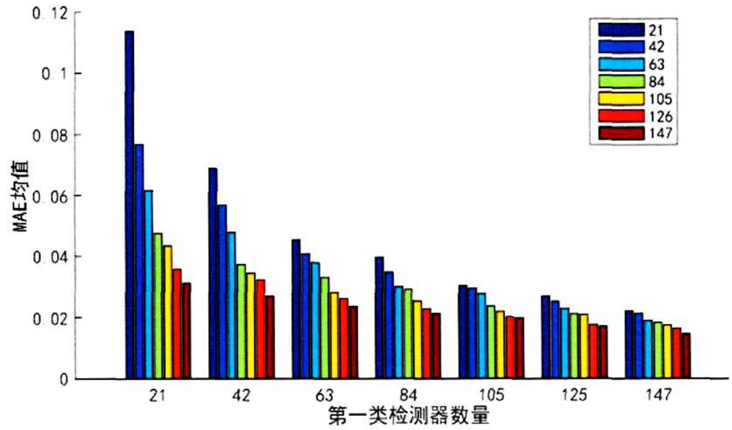
New Traffic, Data.

1. Introduction

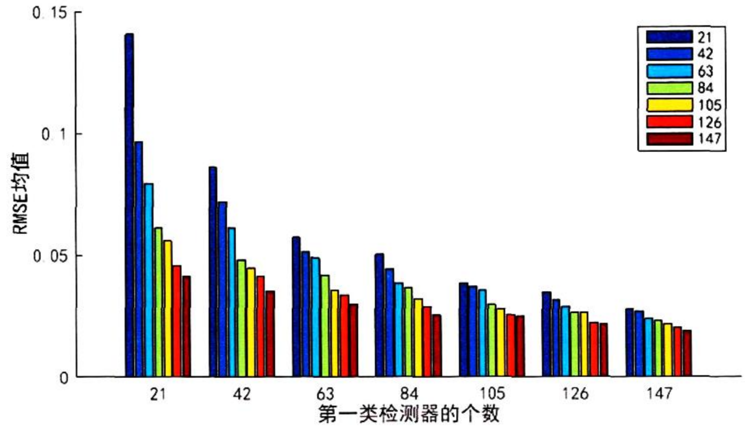
This paper mainly analyses the data obtained by IP-GA method. The advantages and disadvantages of detector combination layout scheme are evaluated by MAE and RMSE. MAE can better reflect the actual situation of the estimation error. The smaller the value, the smaller the deviation between the estimated value and the actual value, that is, the closer the estimated value is to the real value. RMSE is very sensitive to the very large or very small errors in the estimates, and can well reflect the accuracy of the estimates.

2. Detector Layout Scheme and Data Accuracy Analysis

Fig. 1 compares the changes of MAE and RMSE mean of travel time under different combinations of detectors. In the figure, the X-axis represents the number of detectors of the first type, and in the legend, the number of detectors of the second type increases from 21 to 147. It can be seen from these two graphs that when the number of detectors of the first type is constant, the MAE and RMSE values decrease with the increase of the number of detectors of the second type. Similarly, when the number of the second type detectors is constant, the error value will decrease with the increase of the number of the first type detectors. This shows that the accuracy of travel time estimation increases with the number of detectors increasing. This change trend is slightly different from that of MARE, because MARE is a relative value. It mainly evaluates the same group of data obtained by different models, which can better judge the quality of the model, while MAE and RMSE mainly compare the errors of the data itself, which can better reflect the accuracy of data estimation and the accuracy of data estimation or no.



(a) MAE 路段均值



(b) RMSE 路段均值

Fig. 1 Variation of MAE and RMSE Errors under Different Layout Schemes

Figure 2 compares the variation of errors with the composition of detectors and with the increase of the total number of detectors under the same number of detectors. The abscissa is the total number of detectors, and the ordinate is the MAE mean. The error curves of the same number of detectors are connected by lines of the same color. The number of detectors of the first type increases from left to right, and the number of detectors of the second type decreases accordingly. As can be seen from the figure, when the total number of detectors exceeds 105, the average error is basically less than 4%, and the influence of different detector composition on the error is not very great. However, it can be seen that the error decreases with the increase of the ratio of the first type detector (high accuracy), which is consistent with the above research results. When the total number of detectors is less than 105, the error value is higher than 4%, and increases rapidly with the decrease of the number of detectors. When the number of detectors increases from 42 to 63, the error varies greatly, and then the error range decreases as the number of detectors increases. In order to observe the distribution of detectors, Fig. 3 shows the spatial distribution of detectors in various combinations when the number of detectors increases from 42 to 126.

In Figure 3, the abscissa represents the composition of detectors, i.e. the number of detectors in the first category and the number of detectors in the second category, and the ordinate represents the coding of the section units where the detectors are located along the traffic direction. From the distribution of detectors in the graph, it can be seen that when the number of detectors is all 21, there is no detector layout in a long range of roads, which leads to an increase in the estimation error of road traffic parameters; when the total number of detectors is 63 (21-42, 42-21), the coverage of the detectors has increased, but the distribution of the spacing is uneven. When the number of detectors is 84 (21-63, 42-42, 63-21), the coverage of road sections increases, and the spacing of detectors is more uniform, but there is still no location in a large area of road sections; when the number of detectors is 84 (21-63, 42-42, 63-21), the number of detectors is 1. 05 (21-84, 42-63, 63-42, 84-21), the range of non-detector points is further narrowed. The difference between the overall distribution and the number of detectors is not very large, but the latter encrypts the detectors further for some sections. Compared with the error distribution in Figure 2, the error of detector combination 105-21 is the smallest among the selected schemes, and the spatial distribution of detector is more uniform. The error of detector combination 42-84, 63-63 is not very different from that of combination 63-42, 84-21, and there is not much difference in spatial distribution. Therefore, if funds permit, we can choose the layout scheme with high proportion of the first type detector, such as 105-21, 84-21 and 63-42. Otherwise, we can choose the scheme with relatively high proportion of the second type detector, such as 42-84 or 63-63, according to the corresponding accuracy requirements.

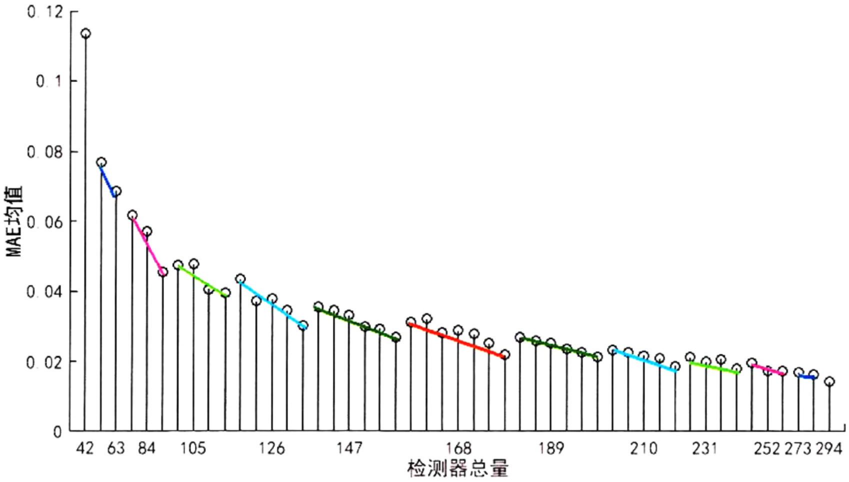


Fig. 2. Variation of errors under different number of detectors

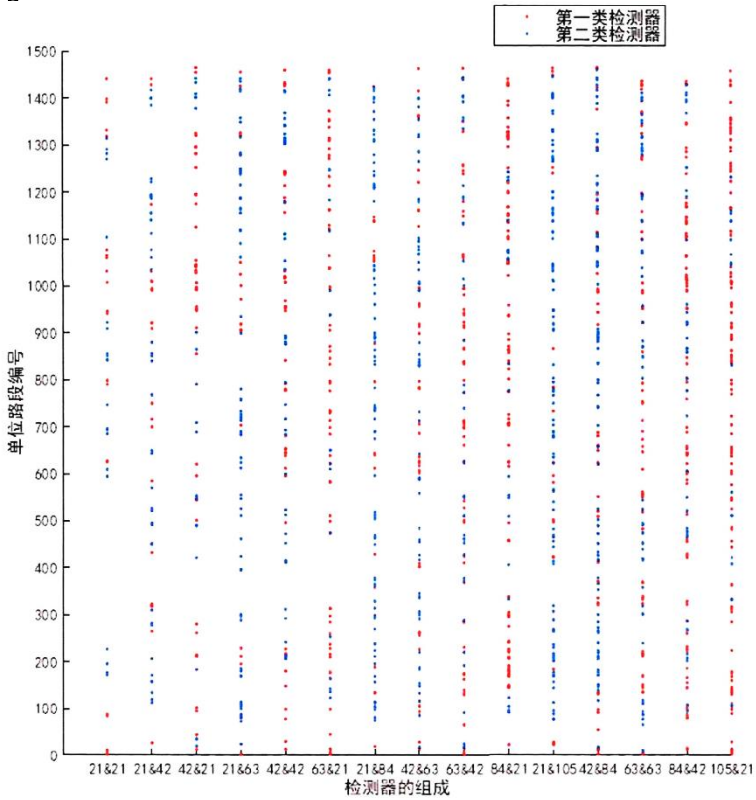


Fig. 3 Distribution of detector combinations

3. Conclusion

In conclusion, not only the spatial distribution of detectors affects the detection effect of data, but also the composition of detectors. When installing detectors, the above two factors should be considered comprehensively, and the appropriate combination scheme and layout scheme should be selected according to the financial situation.

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