Real-time traffic congestion control with mobile devices and HANA

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Abstract

The explosive growth in the number of vehicles in China is making lives better than before. At the same time, urban cities are suffering from heavy congestion in the city center. The booming of mobile devices, which deeply changes citizen's lifestyle also, provides more ways to relieve the congestion. The observation of Macroscopic Fundamental Diagram (MFD) existence in urban area verifies the feasibility of the adaptive control approach described by Daganzo (2005) to improve urban mobility and mitigate congestion on a uniformly distributed space. Interaction between *traffic control center* and vehicles with build in or drivers' mobile device Navigation system makes the urban area meet the implementation requirements. This paper integrates the approach to congestion control for large-scale networks with traffic data from Vehicle Plate Recognition System (VPRS) of Nanjing (China). The computing ability of HANA ensures the demand of real-time control.

Fig.1 photo of one station

Fig.2 Overview of the stations position

As an industrial base of the internet of things, besides the similar Vehicle Plate Recognition Station with other urban cities in China, the station are equipped with the RFID antennas to capture the reflected signal from the RFID card which is stuck on the front windshield of local registered vehicles.

Nearly 500 stations are positioned on arterial links about 100 m downstream of most major intersections in the urban area upload the information of passing though vehicles in real-time.

Real-time information of traffic situation from the VPRS is sent to the drivers' mobile devices and vehicle build-in navigation system. The routing apps guides the vehicle bypass the congestion. This interaction procedure makes

the urban area meet the conditional of control strategy execution which will relieve the congestion and then save the drivers' trip time.

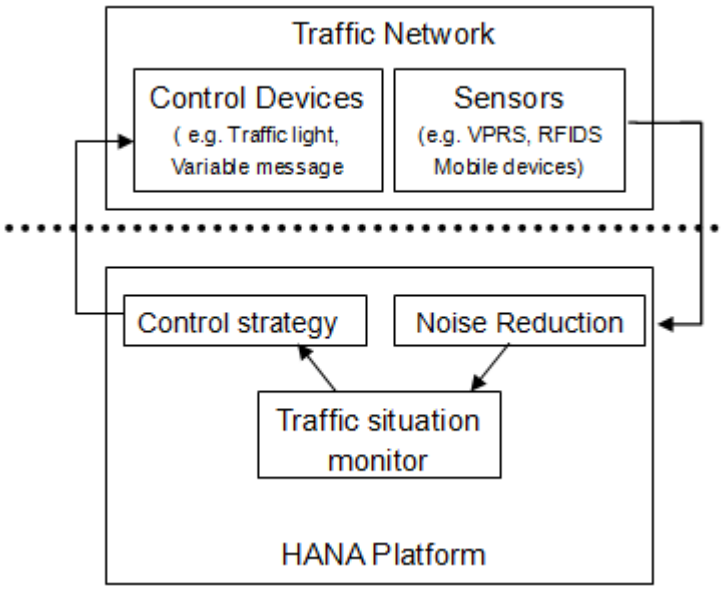

Fig. 3 The control loop

Fig. 3 illustrates the main elements of the traffic congestion control loop. After the noise reduction process, the traffic data from various sources are integrated to the situation monitor. The control commands based on the predefined strategy are sent to the traffic control devices to relieve the congestion by the urban *traffic control center*.

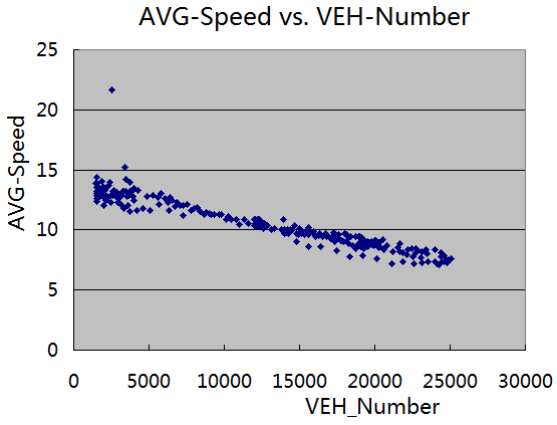

Fig. 4 Aggregated scatter plot: Vehicles Number vs. space – mean average speed

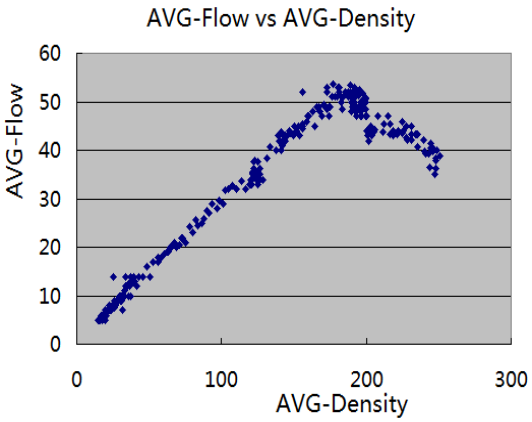

Fig. 5 Aggregated scatter plot: average density vs. average flow

The aggregated scatter plot of vehicle number vs. average speed in 5 minutes slices for a week day in Fig.3 shows the pattern proved that an MFD exists in the cities.

Fig.4 is a scatter plot of average density vs. average flow indicates the real-time control regulator for the urban area.

The road traffic status information provided by *traffic control center* through the interaction to the drivers' vehicle build-in or handy mobile devices make the urban area vehicles uniformly distributed in space. Based on the real-time data and the computing ability of HANA, we can relieve the traffic congestion for a large scale urban area.