

Macroscopic Analysis of Brisbane Urban Network for Traffic Monitoring

By

TSUBOTA, Takahiro
BHASKAR, Ashish
CHUNG, Edward

Smart Transport Research Centre, Queensland University of Technology

Abstract:

Macroscopic modelling of a network, termed Macroscopic Fundamental Diagram (MFD), gains more attention. The MFD represents the dynamics of area-wide traffic conditions as a relationship between area-average flow and density, and can be utilised for the traffic monitoring and control of large urban area. However, the key characteristics and derivation of the MFD have not been established well yet. Therefore, this research aims to fill this gap focusing on the case of the Brisbane network.

Firstly, the properties of the MFD under heterogeneous conditions were explored in a simulation environment. A grid-network analysis with explicit information provision into account revealed a significant impact of drivers' adaptation to traffic congestions on the shape of the MFD. The more drivers become adaptive, the more evenly they are distributed among the network, which increases the network throughput.

In order to apply the MFD to real world, a reliable variable estimation was then examined, particularly for traffic density. This research employed an input-output method, by fusing probe sample data, stop line detector and signal phase. The method was tested in a simulation network, and then was applied to real data set from the Brisbane urban network.

The derived MFD showed low scattered shape, confirming the existence of the MFD in the Brisbane network. By partitioning the network into several sub-regions, the MFD exhibited different shapes reflecting regional characteristics, confirming the importance of the network partitioning for appropriate representation of the network performance.

Finally, considering the radial structure of the Brisbane network, corridor-based traffic analyses were conducted for Brisbane major arterials. Two indices were introduced to identify traffic heterogeneity along a corridor, which determines the zone size for the corridor analysis in aggregated level. This macroscopic view of traffic helps comprehensive

monitoring of large urban area, and contributes to coordinated traffic controls.