Integration of Traffic Camera Network & User Generated Content for Traffic Load Balancing System

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Abstract—The ability to generate a meaningful big-data through social media opens many possibilities that never existed before. In traffic management system, there are systems that use user generated contents to brings information about real-time traffic condition, such as Waze (www.waze.com). However, those applications do not utilize the available traffic camera network. Second, they do not also utilize all that information to predict the future traffic condition through simulation and use it to gives user traffic suggestions that potentially balances the traffic load. The paper describes the project to develop the integration of traffic camera network & user proximity device’s generated content to bring more robust traffic information. Furthermore, by using those information to calibrate traffic microsimulation in real-time, the system has prediction capability to generate better suggestion for the user and even optimally balance the traffic load.

Keywords—microsimulation, big-data, user generated content, traffic management system, model calibration

I. INTRODUCTION

Simulation is become more and more important concept in many applications. The ability to model complex phenomena and gives predictions are become the important and necessary foundation of more advanced features especially in transportation system.

However, there are gap between the application of macro-simulation model that usually is used on planning and demand forecasting on one hand and the need of operational model on the other.

Planning or demand forecasting model that are used in predicting future traffic volumes are based on land use patterns and socio-economic factors such as income levels, vehicle ownership and other household information. It is suitable for a view at large, big picture, but unable to provide operational information that is often required in smaller scale such as daily traffic management, or traffic suggestion to individual users.

On the other hand, the operational models that are more concerned on the smaller scale issues such as arterial analysis and capacity analysis at intersections at a specific time, are usually deficient in capturing wide effects of a localized improvement because of their simulation scope.

The widely available GPS-based on-board navigation computer is one of the example of the available operational model that suffers such problem. It has the capability to gives route suggestion to the user without concerning to any actual traffic condition.

A better solution is to augment the navigation computer with real traffic condition so that the user can make a traffic related decision using the information of the actual traffic condition. Waze (www.waze.com) has done exactly that by utilizing the actual traffic information from the user, user generated traffic data.

The application on user proximity devices, smartphone or car unit, interprete user’s movement data from GPS-equipped smartphone into traffic information, and send the information to central data server. All user of Waze now can see the interpretation of data for the whole traffic network and act accordingly.

Despite the success drawing many users, the above approach still faces many issues i.e. (1) since user only know the actual traffic information, the user decision can lead to suboptimal trafic since the one user decision is mutually exclusive to the other; (2) there are no prediction available on the future traffic condition which also leads to suboptimal decision making by the user.

This paper describes the Bandung Smart Transportation System Project (BSTS) at the School of Electrical Engineering & Informatics, Institut Teknologi Bandung. It is the next enhancement to the above system by making the simulation of the traffic as the back-bone of the system.

Similar to Waze system, there are information from user proximity devices sent to the central server. The information is used for simulation calibration. However, since not all traffic actors are the collaborative member of the BSTS service, then additional information is needed to refine the realism of the simulation further. The BSTS used the available traffic camera network for additional calibration information.

The next section describes the traffic microsimulation model. BSTS is design to be a service for Bandung City area, hence the Bandung map & Bandung street map is used. Next, the section will illustrate on how the information from the user and camera is used for calibration of the simulation.

Several open problems for the future works are presented on the last section of the paper.