

HIGHWAY TRAVEL TIME ESTIMATION WITH DATA FUSION

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ABSTRACT

Travel Time information is the key indicator of highway management performance and one of the most appreciated inputs for highway users. Despite this relevance, the interest of highway operators in providing approximate travel time information is quite recent. Besides, highway administrations have also recently begun to request such information as a means to measure the accessibility service provided by the road, in terms of quality and reliability.

In the last century, magnetic loop detectors played a role in providing traffic volume information and also, with less accuracy, information on average speed and vehicle length. New traffic monitoring technologies (intelligent cameras, GPS or cell phone tracking, Bluetooth identification, new MeMS detectors, etc.) have appeared in recent decades which permit considerable improvement in travel time data gathering. Some of the new technologies are cheap (Bluetooth), others are not (cameras); but in any case most of the main highways are still monitored by magnetic loop detectors. It makes sense to use their basic information and enrich it, when needed, with new data sources.

This thesis presents a new and simple approach for the short term prediction of toll highway travel times based on the fusion of inductive loop detector and toll ticket data. The methodology is generic and it is not technologically captive: it could be easily generalized to other equivalent types of data.

Bayesian analysis makes it possible to obtain fused estimates that are more reliable than the original inputs, overcoming some drawbacks of travel time estimations based on unique data sources. The developed methodology adds value and obtains the maximum (in terms of travel time estimation) of the available data, without falling in recurrent and costly request of additional data needs.

The application of the algorithms to empirical testing in AP-7 toll highway in Barcelona proves our thesis that it is possible to develop an accurate real-time travel time information system on closed toll highways with the existing surveillance equipment. Therefore, from now on highway operators can give this added value to their customers at almost no extra investment. Finally, research extensions are suggested, and some of the proposed lines are currently under development.