

Road Segment Identification from Cellular Network Information
Using Hidden Markov Model

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Abstract

This thesis proposes an economical method for road segment identification and travel time estimation for each road segment in the entire Bangkok expressway network using Cell ID (CID) and Cell Dwell Time (CDT) data collected from mobile phones. CDT is the duration that a mobile phone remains associated to a base station. As travel time is an essential traffic condition indicator for commuters, its availability allow them to choose appropriate routes and as a consequence reduces congestion to an already congested area. Travel time information reporting to commuters should be accurate, timely, and useful. In order to achieve these objectives, two majors steps are required: expressway segment identification and travel time estimation. In the first step, the aim is to identify the road segment where the mobile phone is located using CID. A Hidden Markov Model (HMM) is built from the the training sequences of CIDs with their corresponding known true segments. The true segments are collected using data from a GPS device. In the second step, the aim is to estimate the travel time using the linear regression technique. The relationship is computed from the true travel time collected from GPS and the summation of CDT values collected from mobile phones on each road segment. The results show that the HMM model is able to give 89.86% accuracy when identifying the segments on the expressway network and the linear regression technique is able to estimate the travel time of each expressway segment with 20% absolute error or 20 seconds absolute error depending on the duration of the trip.