Data Collection and Modelling for APTS and ATIS under Indian Conditions

Lelitha Vanajakshi
Department of Civil Engineering,
Indian Institute of Technology, Madras, India

The main challenges for the implementation of a full scale Intelligent Transportation System (ITS) in India are the lack of automated traffic data collection systems and lack of theoretical models suitable for the Indian traffic conditions. Thus, automated real time traffic data collection and development of models to characterize the heterogeneous and less lane disciplined traffic conditions are the immediate requirements for ITS implementations under Indian scenario. This talk will elaborate on these two challenges and will discuss some of the initiatives taken to tackle these problems with specific emphasis on the Advanced Public Transportation Systems (APTS) and Advanced Traveller Information Systems (ATIS) applications. APTS and ATIS are two main functional areas of ITS which are popularly deployed in countries where ITS solutions are widely employed for traffic management. APTS mainly deal with improving public transport facilities, where as ATIS concentrate on traveller information systems for the entire traffic stream.

The existing traffic data collection sensors can be classified mainly into two groups as location based (fixed at a location) and spatial based (moving in the stream) sensors. Location based sensors which provide traffic data at a location such as flow, time mean speed and occupancy are still the prevalent source of traffic data, especially for applications such as ATIS. Inductive Loop Detectors (ILD) are the most popularly adopted data source used for these applications. However, the available inductive loop detectors cannot be used in the present form in Indian conditions because they are developed for the lane disciplined traffic and also cannot classify the wide range of vehicles that are using the Indian roadway. The first part of the presentation discusses a novel inductive loop sensor development, which can detect vehicles under a heterogeneous and less-lane disciplined traffic. To accomplish this, a multiple loop system with a new inductive loop sensor structure is developed. It senses and segregates the vehicle type from bicycle to truck based on their unique signature, enabling accurate measurement of classified flow, speed and

occupancy even when there is parallel movement of vehicles within the same lane. Also, some of the successful and widely employed location based sensors such as video sensors, radar sensors, infrared detectors, virtual loop based detectors and image processing are being evaluated for their performance under Indian traffic conditions and will be discussed briefly. Using the flow, speed and occupancy data collected from location based sensors an ATIS application for informing the travellers on the level of congestion based on density is developed. The study was based on a model based approach for the estimation of traffic density under Indian traffic condition using a non-continuum approach.

Spatial sensors are preferred mainly for applications such as APTS where individual public transit vehicles need to be tracked. The other advantages include relatively less infrastructure requirement since they mainly rely on the communication infrastructure which has penetrated almost all around the world. The commonly used spatial sensors include Automatic Vehicle Identification (AVI), ground-based radio navigation, Global Positioning System (GPS) and cellular phone tracking. Among them, GPS is more popular due to low operating cost per unit of data, coverage in any part of the world and affordability of the GPS instruments at lower price due to competitive market, thus making the initial and operating costs lower. The only disadvantage with the GPS systems is the privacy issues with the private vehicle owners. However, it is a good source of data from commercial vehicles and public transit buses. Most of the cities all over the world have their public transit equipped with GPS mainly for real time tracking of the fleets and bus arrival information systems. However, many of them have the advantage of a good database available since the system is in place for many years. Many of the Indian cities are starting to equip their buses with GPS and hence a historic data based bus arrival prediction system cannot be implemented. Due to the limited sample size of bus probes as well as lack of historic data base, data driven techniques like neural network may not be a good option under Indian conditions. A model based approach using the Kalman filtering technique was explored using the data from previous vehicles alone to predict the bus arrival time.