Modelling Traffic Flows on a Single Link System

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Recent developments in the area of transportation have given birth to Advanced Traveller Information Systems (ATIS) that provide historical, real time and predictive information to support travel decisions. Travellers seeking to travel from their current locations to specified destinations require best routings that minimize the travel times. The best route for any trip relies to a great extent on the accurate prediction of trip travel times.

Prediction of accurate travel time plays an essential role in determining the best route for any trip. The varying input flows arriving at the entrances of the system combined with the capacity constraints of the links lead to continuously changing system states and therefore dynamic travel times on the network. To study the network dynamics under piecewise constant flows, we begin with a single link system and study the evolution of stepwise constant flows inside the single link. We propose the main relations that characterize the dynamics of this single lane system and show how the travelling time of a car is affected by the history of the system. The two parameters used to describe the history of the system are the initial system state of the link and the piecewise constant input flows arriving at the entrance of the link The analysis of the behaviour of the system is done to derive the travel time from the characteristics of the link, the input flow and the constraints on the output flow.