Patna

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Patna is a medium-size city in eastern India. As in other developing nations, traffic conditions are heterogeneous, composed of: a large number of bikes (37 %, including 4 % cycle rickshaws) and motorbikes (14 %). When this scenario was composed, public transport accounted for 18 % and walk for 29 %; only 2 % of all trips were made by car. Therefore, the MATSim queue simulation was modified to simulate travel demand under mixed traffic conditions (Agarwal et al., 2015b).

A detailed Patna scenario description can be found in Agarwal et al. (2013). The scenario was created using household survey data from a comprehensive Patna mobility plan (TRIPP et al., 2009), using the area within the Patna Municipal Corporation. The scenario consisted of 72 zones, with a population of about 1.57 million (year 2008). MATSim demand was generated using trip diaries, with car, motorbike and bike used as main congested modes (Figure 77.1). PCU (Passenger Car Unit) factors for different vehicle types were derived using effective area occupied by vehicles. The effective area occupied by a vehicle is calculated, and the ratio of area occupied by this vehicle to the area occupied by a passenger car is taken as PCU factor for the respective vehicle. To allow overtaking of slower vehicles (bike), by faster vehicles (car and motorbike), pre-existing, state-of-the-art FIFO queue simulation was overridden, using earliest link exit time as shown in Figure 77.2. Traffic behavior in modified queue simulation was then analyzed by plotting fundamental diagrams and space time trajectories for car, motorbike and bike (Agarwal et al., 2015b).

To address some special factors of Patna's travel time distributions, MATSim utility function was calibrated so that a mode share from real world data was replicated in the model, performed by allowing agents to switch modes. The model was validated using traffic count data and modal travel time distributions. The model's main shortcoming seemed to be overly short average travel times for motorbikes. Although no specific experiment was performed to analyze computational performance, no noticeable loss of performance was found during simulations. Thus, the model seems to be useful for many areas where mixed traffic conditions predominate.
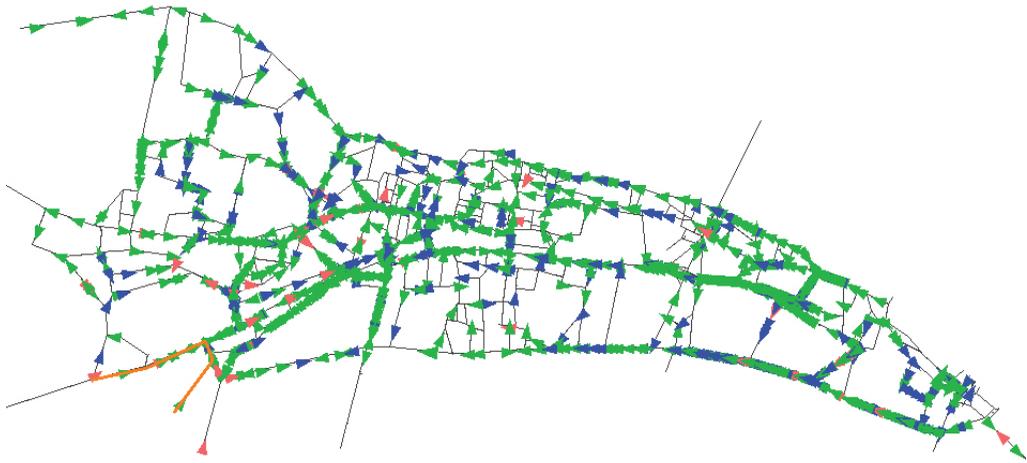
Figure 77.1: Patna: Various vehicles on network, car in red, motorbike in blue and bike in green.
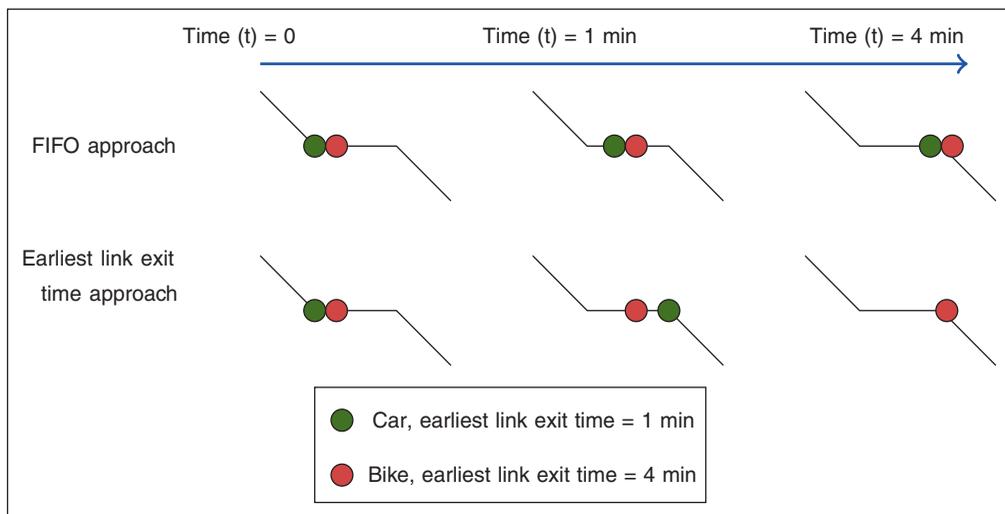
Figure 77.2: Patna: FIFO approach and passing of bicycle by car on a link (not to scale).