Introduction to
transportation systems (2024-2025)

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Assignment and congestion pricing — April 16, 2025

Question 1: Congestion pricing

Consider the small network represented in Figure 1, that represents an origin-destination pair connected with two links: one representing a highway, and one representing urban streets. There are 1.5 units of flow that travel from node A to node B during the peak hour. The performance functions are

$$t_{\text{highway}} = 3 + \frac{1}{2}x_1,$$
$$t_{\text{urban}} = 1 + x_2,$$

where the travel time is expressed in minutes. At user equilibrium, everybody uses the urban streets.

The public authorities would like to impose a congestion toll in order to minimize the total travel time. Traffic engineers have identified that this can be achieved if a flow of $1/3$ decided to use the highway. What pricing strategy should they operate, knowing that the value of time of commuters driving a car is 30 CHF/hour?

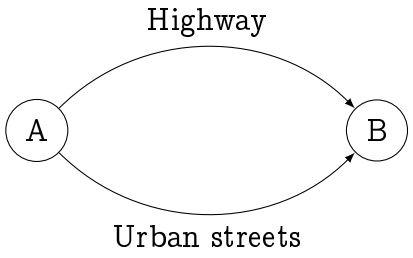

Figure 1: Small network