# Microsimulation-based Analysis of Road Closure Scenarios


## Master‘s Thesis of Ekaterina Vaskina

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### Background

Numerous studies have been devoted to modelling flow changes on highways due to the road closures, while the behaviour and the response of the spatiotemporal flow to construction projects within the urban networks are not well understood yet. The study addresses a critical gap in analysis of the long-term closure within the urban network which has not yet been sufficiently explored by using simulation tool. Understanding this area is essential for traffic management and control strategies.

### Objectives

- create an appropriate representation of traffic flow redistribution caused by multi-day road closures using the microsimulation model in SUMO
- examine the performance and recovery patterns of the network

### Methodology

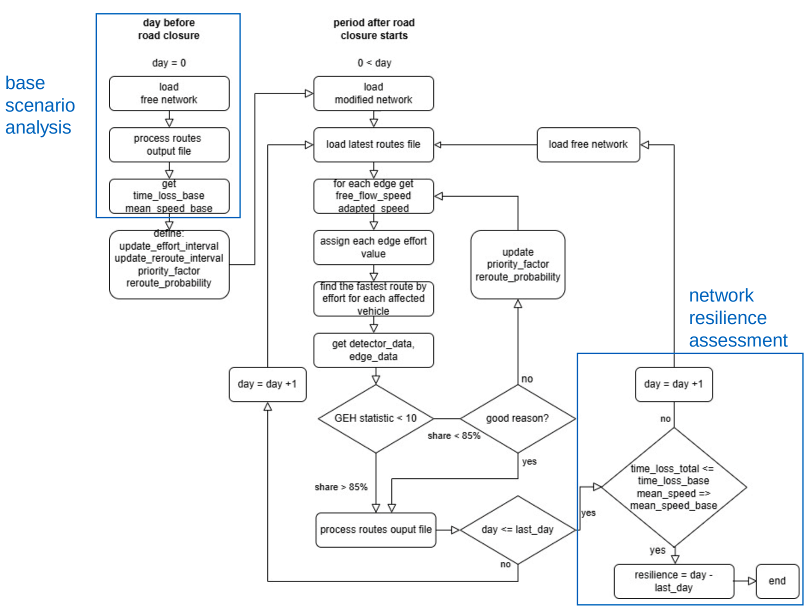


*Figure 1: Rerouting algorithm*

The study uses dynamic traffic assignment day-to-day algorithm to represent the traffic flow distribution in the network (Figure 1) and analyses the impact of the disruptions by naïve and rerouting approaches for the case scenarios (Figure 2).

The naïve approach assumes that road users are not aware of the disruption at the beginning of the trip, and the rerouting approach allows the users to possess the pre-trip and on-route information.

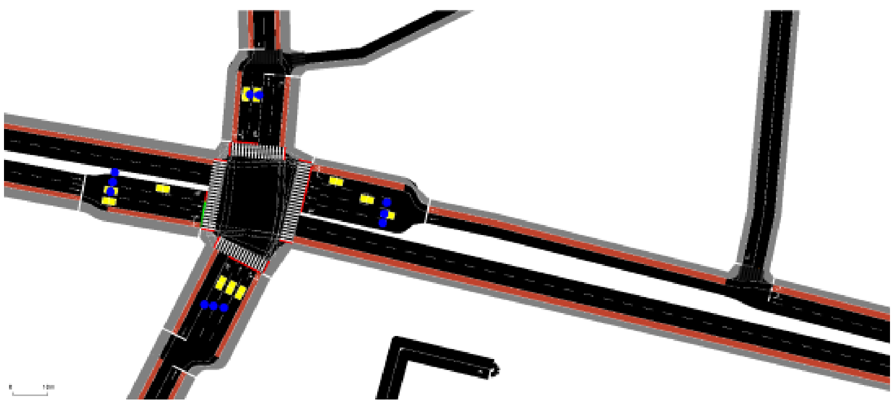

*Figure 2: Representation of the inner study area for Scenario #2 in SUMO*

### Results

Rerouting strategies chosen for the analysis were defined through the set of simulations by changing the parameters: routing type, rerouting probability of the affected vehicles, weights priority factor:

*for* ***all vehicles*** *– routing by travel time and edge priority (weights.priority-factor = 1.0, rerouting.probability = 0.2)*

*for the* ***affected vehicles*** *– routing by effort (effort as a current speed ratio to the free flow speed, initial reroute_share = 20%)*

Clear tendency in the changes in time losses and mean speed (Figure 3) represents a fading out nature of any disruption effects. Apparently, the road closures tend to lead to overreactions in the travel behavior and result in the oscillation of the traffic among alternative routes.

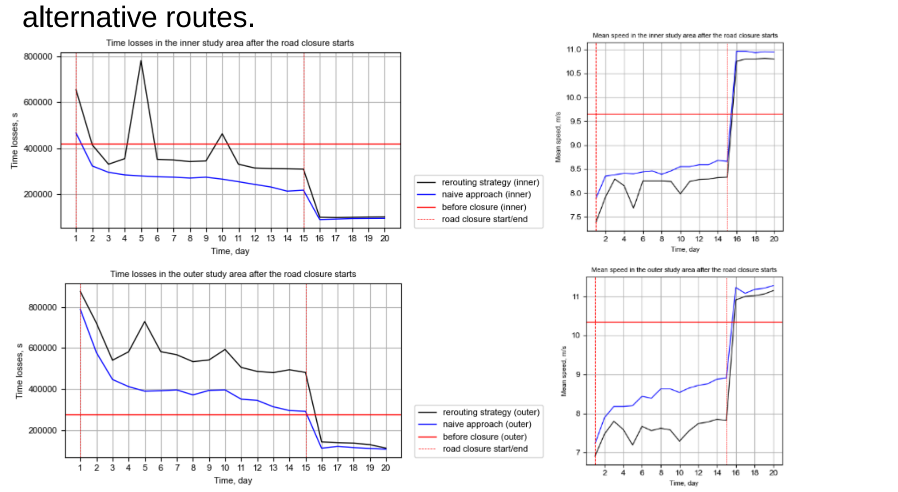


*Figure 3: Time losses and mean speed in Scenario #2*

The RMSPE values for the inner study area within the first two weeks are analogous to the outer study area (Figure 4), indicating that the errors occur due to the general assumption and do not specify a misconception of the rerouting strategy.

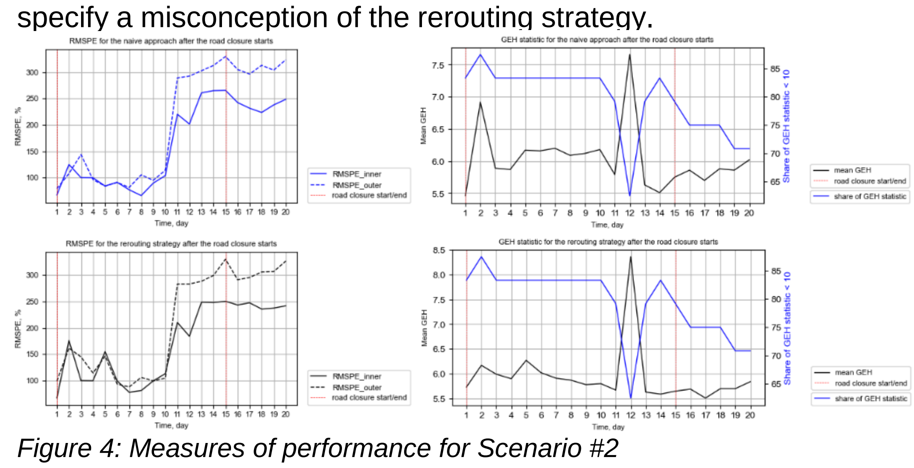

*Figure 4: Measures of performance for Scenario #2*

Confirming by GEH-statistic data, the rerouting approach is relatively accurate at the beginning of the closures. The following redistribution of the traffic within the network, though, is more complex than assumed by the implemented strategy.

### Conclusion

The developed rerouting strategy is applicable for traffic impact analysis of road closures lasting less than **ten working days** and the network resilience assessment. The future research includes applying different routing strategies for different road users within the day, developing the rerouting strategy for the period after the closure ends, analyzing simultaneous road closures impact.