A control method for the coordination of urban bicycle highways and public transport prioritization at signalized intersections

Master‘s Thesis of Özen Deniz

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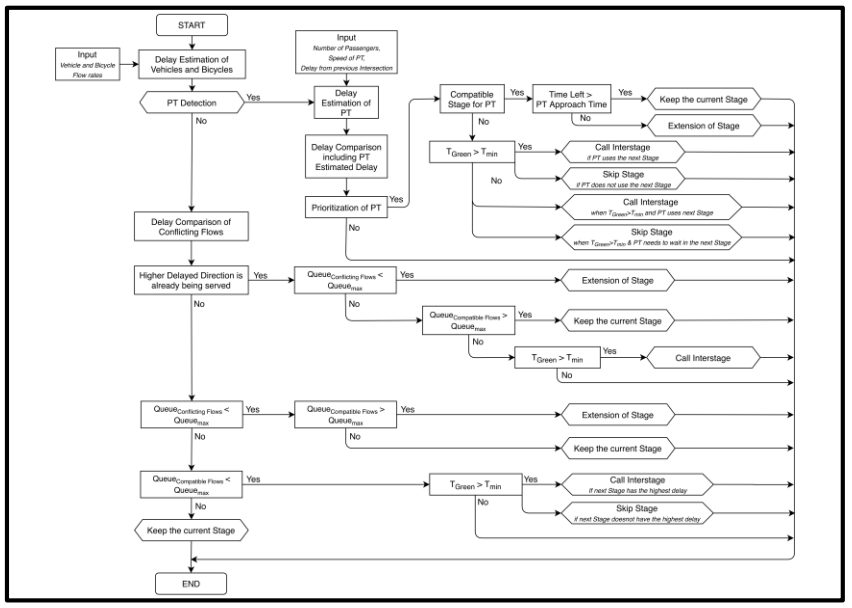


Congestion and its negative impacts have become a part of our lives for a long time, especially at urban signalized intersections. The increasing share of cycling and public transit needs to be treated positively in this regard. Thus, cyclists should also be an integral part of the urban traffic control systems for further developments in this area, such as cycling highway introductions.

This thesis aimed to provide an alternative control strategy that considers the motorized vehicles, cyclists and public transit vehicles and prioritizes them in accordance with the estimated delay time of each user group. For this reason, a logic was created and then tested with the simulation tool SUMO, which was also calibrated and validated.

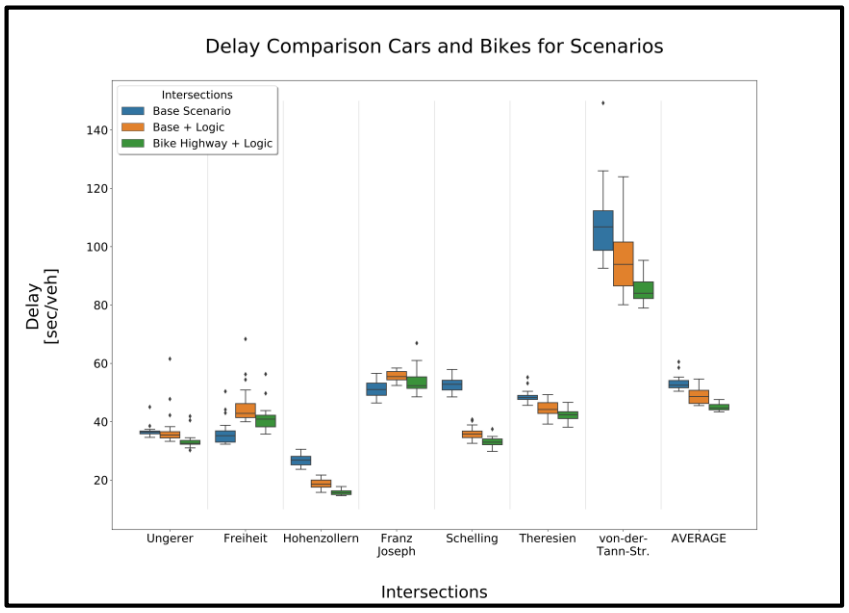
The proposed logic was tested on the existing network and on one of the planned cycle highway corridors that the city of Munich may accommodate in the near future.

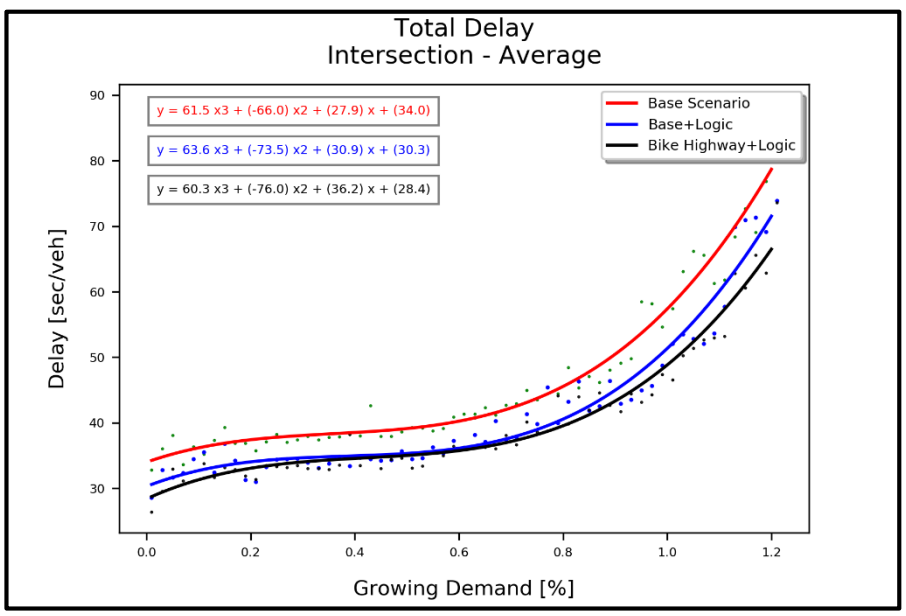
The results of the delay, the number of stops and the travel time are compared between the ‘Bike Highway+Logic’, ‘Base+Logic’ and the ‘Base Scenario’. Additionally, the travel time savings per passenger are also compared for each public transit (PT) line.

The number of passengers in PT vehicles played a role in the estimation of the bus delay predictions to compare the delay times per user at each intersection.

The delay of the cyclists and the vehicles on the main direction with higher volume showed 9,3% reduction in delay time on the existing network and 18,2% in the future scenario. The decrease in the lateral flow on average is 3,4% and 5,6% for these scenarios respectively.

The number of stops for cyclists decreased to 95,3% of the beginning value on the existing network with the proposed logic and to 89,9% on the future network with cycle highways.





The total travel time of all PT lines can be reduced by 2,9%, that corresponds to 2,3sec travel time saving for each passenger and by 3,7%, that corresponds to 3,5sec decrease in the future network.

The proposed control method is also tested under incremental demand to represent the different demand conditions. The strategy provided parallel results under varying demand conditions on the existing network. However, the delay time decrease became more explicit when the intersections reached the capacity flows for future scenario.

Therefore, it can be said that the proposed control algorithm, that considers cyclists, cars and PT vehicles at signalized intersections has proved to be beneficial for all the users, as well as it served the varying demand conditions with flexibility.