Level of Service of Traffic Signal Coordination in Urban Networks

Master Thesis of Muhammad Azhar Nawaz

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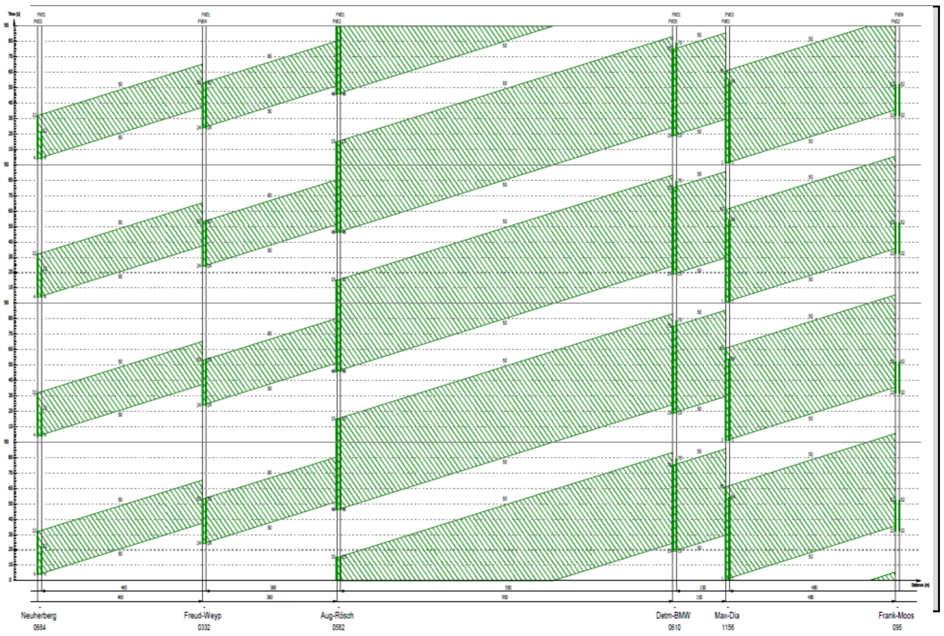
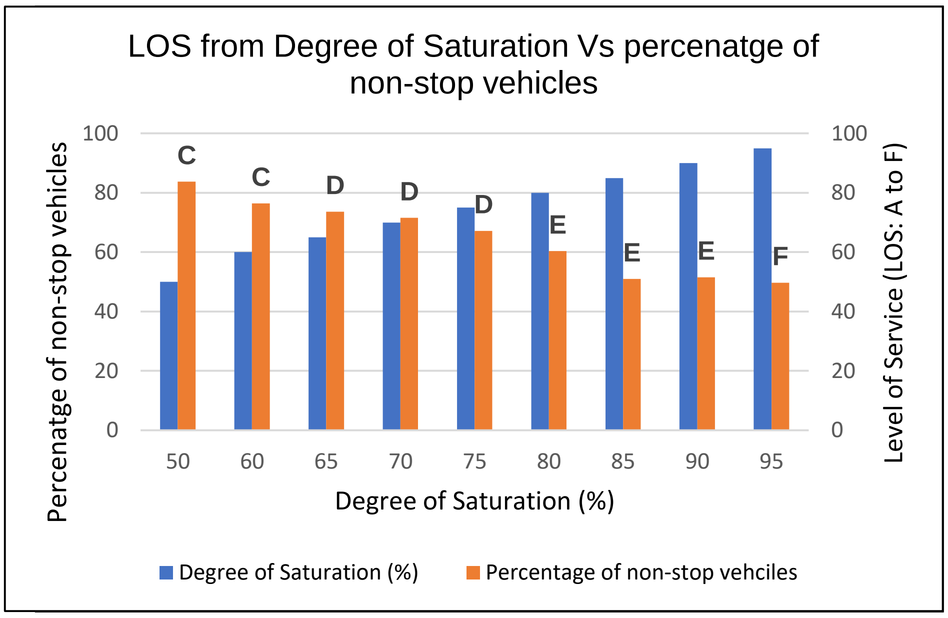


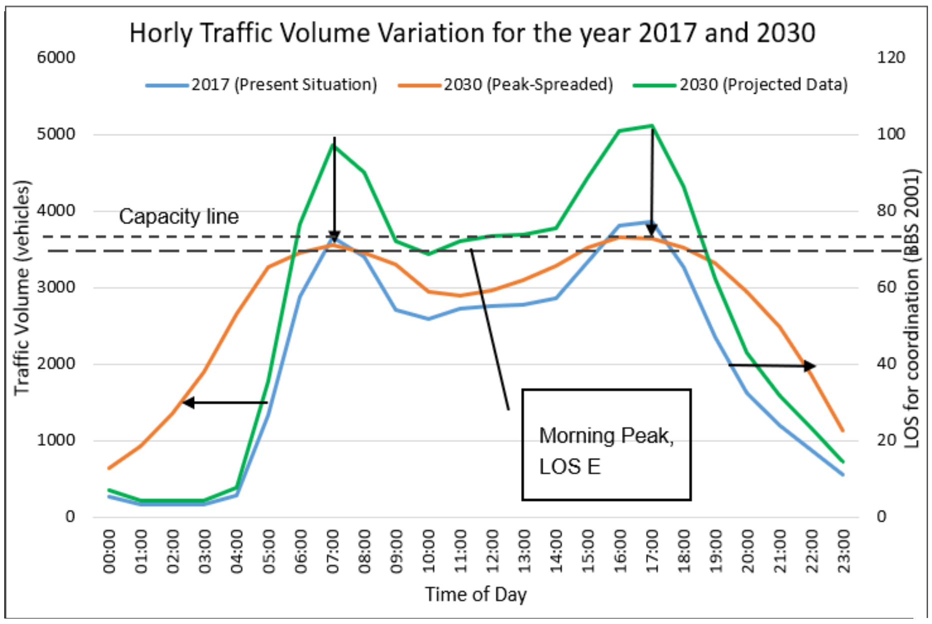
The traffic signal coordination has been employed on several urban streets in order to minimize waiting times at signalized intersections. However, due to increasing trends of traffic volumes in the peak hours, the coordination starts to collapse, and the vehicles start to fall out of the coordination. The purpose of this thesis research is to quantify the limitations of saturated traffic volumes, at which the coordination starts failing. Moreover, an effort has been made to establish a proper method to evaluate the traffic signal coordination using microsimulation models.

A stretch of a major urban street with six signalized intersections has been chosen in Munich as a case study area. Firstly the coordination is evaluated using LISA+ and then the signal offsets are optimized using Time-Distance diagram (diagram on the left). The optimized signal timings are then imported in VISSIM model. The simulations are performed on different traffic inflows obtained at different saturation levels. The final results obtained with the VISSIM simulations have been mentioned in bar chart below.

The main goal of this was to define the traffic saturation limits at which the coordination starts failing. At higher traffic volumes, the longer queues of vehicle have been observed in the simulation models. The queues were taking extra time to dissolve, resulting in overall collapse of the coordination. After the analysis, the level of service (LOS) of coordination obtained at various traffic saturation levels have been listed in bar chart on right.



It can be concluded from the results, that coordination started to collapse around 80% of traffic saturation levels. However, the coordination fails completely at 95% (LOS: F) of traffic saturation level. According to generally accepted limitations, the coordination starts failing beyond 85% of the traffic saturation levels. It means the results obtained from this case study are pretty close to the accepted limitation of traffic volumes. However, another research area could be evaluated for the coordination using the procedure described in this report. The simulation methods used in this study could be cross checked and validated.



For achieving the peak-spreading behaviour in Munich City for the year 2030 during the peak-hours, the peak volumes spread to the shoulders to maintain the same Level of Service for coordination as for the current scenario. Keeping in view of the significant increase in traffic volumes, however it would be impossible to match the traffic volume peak in year 2030 to the current peak hour volumes. Nevertheless, the trips could be distributed to the shoulders to make the peak less sharp. For overall generation of traffic from North to South on Schleißhamer Straße, the maximum traffic has been found out to be during 7:00 to 8:00 am, while the evening has been found out to be from 16:00 to 17:00. The results obtained after peak spreading for the traffic volumes in year 2030 have been listed in the line graph on the left.