QUANTIFYING CROSS-WEAVE IMPACT ON CAPACITY REDUCTION FOR FREEWAY FACILITIES WITH MANAGED LANES

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ABSTRACT

With the increasing concerns towards environmental impacts and sustainability of roadway capacity expansion, transportation agencies are seeking alternative solutions for congestion mitigation. Managed Lanes (MLs) promote person throughput on freeways and manage congestion through improving efficiency. The ML concept therefore has been gaining popularity in the past decades. However, the lack of guidance on performance evaluation of ML facility poses real challenges for agencies wanting to design and implement the strategy in an effective manner. Many MLs are designed to be left-lane concurrent, where vehicles entering the freeway from General Purpose (GP) lanes on-ramps, need to *cross weave* over multiple GP lanes to access the ML. These weaving vehicles will have a negative impact on the operating performance of the parallel GP lanes. This paper investigates this cross-weaving effect as a function of different roadway geometric configurations as well as traffic conditions. A microscopic simulation model is built and calibrated on the basis of video data collected along IH 635 in Dallas, Texas. Multiple scenarios are tested to explore the effect of number of GP lanes, cross-weave demand, and cross-weaving length. A set of Capacity Adjustment Factors (CAF) are determined to account for this effect as a function of the above parameters. This study discovers that the capacity reducing effect is higher with a reduction in cross weaving length, an increase in number of GP lanes, or a rise in cross-weave demand volumes. The results are valuable in evaluating the operational performance of freeway segments in the presence of concurrent GP and ML in a Highway Capacity Manual context.

KEYWORDS: Managed Lanes, Simulation, Cross-Weave, Microscopic Traffic Flow, Access Point