

Coordination of Signalized Crosswalk with Adjacent Intersections

横断歩道および隣接する交差点の系統信号制御

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BACKGROUND AND OBJECTIVES

A midblock crosswalk installed on roads with high pedestrian demand provides a safe passage for pedestrians. However, it may decrease vehicle flow performance on arterials with dense signalized intersections in an urban area. Therefore, adjacent traffic signals should be considered when installing a crosswalk. This study explores the impact of the installation of signalized single-stage and two-stage crosswalks on coordinated links and compares their relative effectiveness.



<http://www.udcsrts.com/midblock-crossings.html>

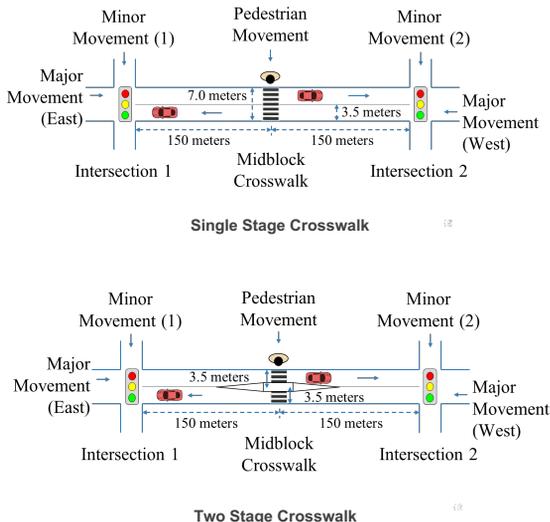
MEASURE OF EFFECTIVENESS

Delay is an important measure of effectiveness and is also important for safety. Hence, cycle length, green splits and offsets are determined simultaneously to minimize the expected average user delay.

Average user delay consists of vehicle delay as well as pedestrian delay with equal weightage for both.

METHODOLOGY

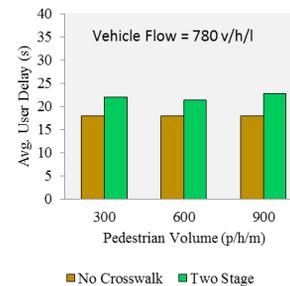
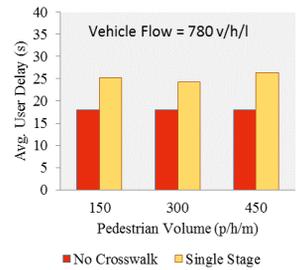
Single stage and two stage midblock crosswalks were coordinated with adjacent intersections. Layout of the corridor for both single stage and two stage crosswalk is shown below



An existing methodology based on variational theory (VT) of kinematic waves was utilized to optimize coordination between signalized intersections. Unlike the existing optimization models and simulation packages, the method properly considers physical queues and demand fluctuations (random arrivals). It also optimizes signal coordination parameters simultaneously. As it is a macroscopic approach therefore it requires less parameters.

RESULTS AND DISCUSSION

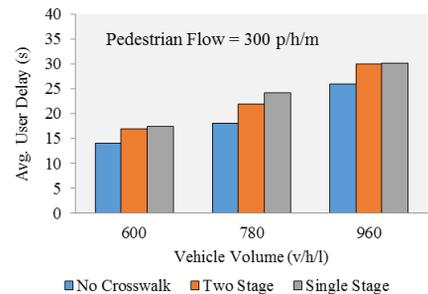
➤ User delay includes pedestrian delay, therefore, higher delay is expected in case of a single stage crosswalk when compared with no crosswalk case.



Average user delay: no crosswalk vs single-stage

➤ Two-stage crosswalks caused pretty low user delays at lower pedestrian demand levels.
➤ Average user delays for the no-crosswalk and the two-stage crosswalk cases were almost the same at lower vehicle volumes

Average user delay: no crosswalk vs two-stage crosswalk



Average user delay: no crosswalk vs single-stage crosswalk vs two-stage crosswalk

- Two-stage crosswalks perform better for all three vehicle demand levels.
- Though avg. user delay is almost the same at higher demand levels, but common cycle length is shorter for two-stage crosswalks
- Hence, coordination of two-stage crosswalk with adjacent intersections yields lower delays and shorter cycle lengths.

FUTURE WORKS

Further study that includes varying link lengths will provide more insight into the impact of signalized crosswalk installation on coordinated links.

Further study should also include time consumed while traversing the refuge island and pedestrian interaction.