

Increasing the Capacity of Signalized Intersections with Separate Left Turn Phases

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Abstract

A separate turn phase is often used on the approach leg to an intersection with heavy left turns. This wastes capacity on the approach because some of its lanes cannot discharge during its green phases. The paper shows that the problem can be eliminated by reorganizing traffic on all the lanes upstream of an intersection using a mid-block pre-signal. If drivers behave deterministically, the capacity that can be achieved is the same as if there were no left turns. However, if the reorganization is too drastic, it may be counterintuitive to drivers. This can be remedied by reorganizing traffic on just some of the available lanes. It is shown that such partial reorganization still increases capacity significantly, even if drivers behave randomly and only one lane is reorganized. The paper shows how to optimize the design of a pre-signal system for a generic intersection. It also identifies both, the potential benefits of the proposed system for a broad class of intersections, and the domain of application where the benefits are most significant.

Keywords: Traffic signal capacity, Pre-signals, Left turn phases