Defining the State-of-the-Practice and Identifying Gaps: A Synthesis of Bicycle-Specific Traffic Signal Applications

Abstract

The American Community Survey, an annual survey conducted by the US Census Bureau, has recorded a significant increase (145%) over ten years in residents of Portland, Oregon choosing the bicycle as their primary means for commuting to work. Despite this increase in activity, recent surveys have found that more than half of Portland residents limit their bicycling due to traffic safety concerns. From an engineering perspective, safety can be improved by either 1) creating separate facilities for bicycles and cars or 2) improving the road environment that cars and bicycles share. In many urban areas, one application that is receiving more attention is bicycle-specific traffic signals and signal control. These signals can either be stand-alone (such as a bicycle path intersection with a road) or integrated with motor vehicle signals. There is a vast literature and extensive experience in relation to motorized vehicles and pedestrian signal control and bicycle usage and cyclists' preferences but the literature and engineering experience for bicycle signal control and design is scarce. As such, there is a real need to begin developing engineering guidance for bicycle-specific signals. This research proposes to take the useful steps to define the state-of-the-practice and identify gaps in knowledge.

Motivation for Proposal

The American Community Survey, an annual survey conducted by the US Census Bureau, has recorded a significant increase (145%) over ten years in residents of Portland, Oregon choosing the bicycle as their primary means for commuting to work (*US Census, 2006*). Despite this increase in bicycling activity, recent surveys have found that more than half of Portland residents limit their bicycling due to traffic safety concerns (*PDOT, 2004*). From an engineering perspective, safety can be improved by either 1) creating separate facilities for bicycles and cars or 2) improving the road environment that cars and bicycles share (*Taylor and Mahmassani, 1998*). Cost and right-of-way restrictions make 1) infeasible in most Oregon cities (since infrastructure is nearly all built out), but 2) is readily achievable.

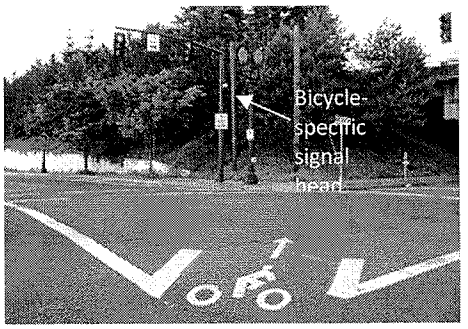

Figure 1: Example bicycle-specific signal

In their review of cycling in the Netherlands and Germany, Pucher and Dijkstra (*2003*) provide examples of infrastructure improvements that have resulted in both improved safety and increased cycling. Examples given include cycle tracks, bike boxes (advanced stop lines), and signalized traffic control specific for bicycles (bicycle-specific signals, dedicated signal phases, and coordination). In many urban areas, this last tool (bicycle-specific signal control) is receiving more attention, especially as bicycle volumes increase. These signals can either be stand-alone (such as a bicycle path intersection with a road) or integrated with motor vehicle signals. In essence, bicycles are treated as a separate movement at an intersection. In fact, cities such as Portland, Oregon, Denver, Colorado, and San Francisco, California have recently deployed bicycle-specific signals (see figure). Indications are that there will be continued and growing interest in this treatment. For example, expansion of the bike boulevard system in Portland, Oregon is likely to require the use of special signalization for bicycles and pedestrians.