

Towards the improvement of traffic control at signalized intersection for mixed traffic

Utsunomiya University Student M. Md. Mohsin J. Sarker
Fellow Hiroataka Koike
Member Akinori Morimoto

Introduction

From a few decades ago, world has been running under rapid motorization, as motor vehicle is one of the most convenient transport modes. But rapid and growing motorization has resulted in some bad effects also, such as, air pollution, high energy consumption, severe traffic congestion, global warming, urban sprawl and the unemployment and immobility of low income people. From the view of bad effects of motorization and also from the view of traffic demand management (TDM), the city planners, engineers and policy makers are now encouraging the use of non-motorized vehicles (NMVs) instead of motorized vehicles (MVs).

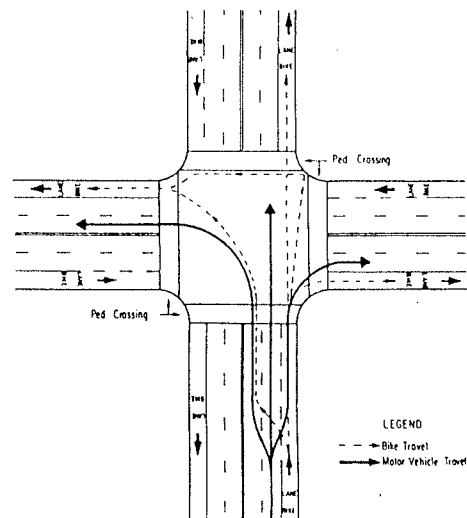
But people often blame NMVs for impeding the flow of MVs and also for traffic congestion at intersection. When the NMVs, such as bicycles, are of small number, they can use the footpath with pedestrians and cross-walk at intersection due to their small sizes. But when NMVs are of greater number and when their sizes are bigger than bicycle, such as, tricycle or rickshaw, they can not make use of footpath and cross-walk at intersection. Hence, they share the same right-of-way with other motorized transport, severely impeding the flow of MVs at straight road section between intersections as well as at intersection.

To solve this problem, we can make exclusive road for NMV, can separate the grade of roads, and can channelize lanes for NMVs and MVs in the same road. But at intersection, the problem is quite difficult to solve. In this paper, in view of above mentioned problems, a new approach has been proposed regarding how NMVs will cross the intersection with other MVs.

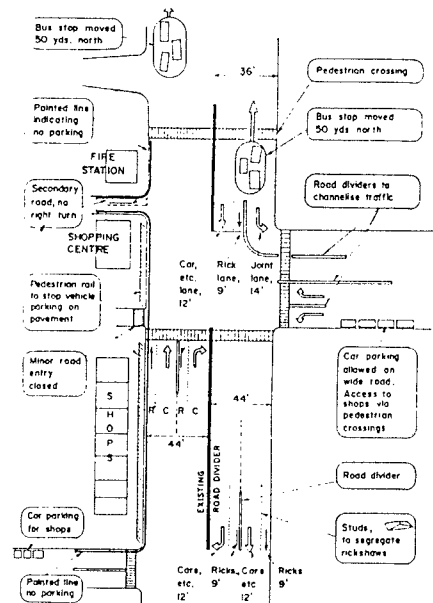
Previous proposed approaches :

In California, the department of transportation suggested typical bicycle

movement at intersection⁽¹⁾ as shown in following figure :



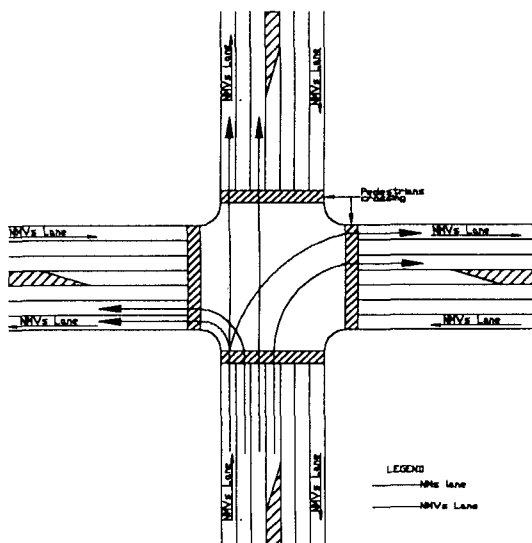
Rob Gallagher, one of the former teacher of BUET (Bangladesh University of Engineering and Technology) also suggested a crossing strategy for tricycles or rickshaws with MVs at intersection⁽²⁾ as shown in the following figure :



In the previous two proposed approaches, right turning or left turning NMVs and MVs are going to the right-turning lane or left-turning lane respectively from their exclusive lanes. For this reason, during the lane switching or merging, NMVs and MVs are impeding flow to each other and it is not safe.

New approach :

In order to get rid of the above mentioned problems of the two approaches, the following new approach has been suggested as shown in the following figure.



In this new approach, exclusive one way lane has been suggested for NMVs at straight road section between intersections and in intersection with lane marking. The NMVs and MVs may cross the intersection together during the same traffic signal phase (left, right or through) or during the different signal phase. In other word for example, during right turning phase, NMVs and MVs are taking right turn together or there may be two different phase for NMVs and for MVs. Obviously it depends on road width, traffic volume, etc.

Advantage :

In this new approach,

- As NMVs and MVs are using different exclusive lanes and are not changing or merging lanes for right or left turning, they are not impeding flow to each other;
- This problem is quite applicable in the countries where the percentage of NMVs is high. This will help to reduce startup

lost time at intersection, intersection crossing time, queue length, etc.;

- As NMVs are not using the footpath, pedestrians can be able to use footpath conveniently and safely;
- This approach is safe for both NMVs and MVs;
- Its application will encourage people to use NMVs in greater number. And thereby it will help to reduce the bad effects of motorization.

Disadvantage :

- Adequate road width is required for exclusive NMVs lane.
- Adequate intersection crossing width is required.
- In case of narrow road two different phase may be needed for right turning traffic and its oncoming right turning traffic.
- Right turning and through moving traffic signal phase may not be applied together.

Scope of application :

Where the number of NMVs such as bicycle is of lower percentage, present approach pattern can be used. But where NMVs are of greater number, we face several problems at intersection as well as at straight road section between intersections. Thereby in that situation this new approach pattern is quite applicable. Moreover, in the countries like Bangladesh, India where the NMVs such as rickshaw is of bigger size than bicycle and are of greater percentage, this new approach pattern will be helpful to improve the present integration problem of mixed traffic system. The main problem is that people are not familiar with this new type of approaches as it is a new intersection crossing pattern. So for field application, it needs educational programs to make people familiar with this type of new intersection crossing and controlling approach and also it is needed to solve the regulation or jurisdictional problems.

Reference :

1. Traffic Engineering Handbook, *Institute of Transportation Engineers*, 4th edition.
2. The Rickshaws of Bangladesh, *Rob Gallagher*, The university press ltd., 1992, BUET, Dhaka, Bangladesh.