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Proposed Alternative System to Existing Traffic Signal System

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***Abstract*—**Alone with fast urbanization in world, traffic control became a big issue in urban construction. Having an efficient and reliable traffic control system is crucial to macro-traffic control. Traffic signal is used to manage conflicting requirement by allocating different sets of mutually compatible traffic movement during distinct time interval. Many approaches have been made proposed to solve this discrete stochastic problem. Recognizing the need to minimize right-of-way impacts while efficiently handling the anticipated high traffic volumes, the proposed alternative system gives effective design. This model allows for increased traffic capacity and reduces delays by eliminating a step in maneuvering through the freeway interchange. The concept proposed in this paper involves construction of bridges and ramps at intersection of four roads to control the vehicular congestion and to prevent traffic breakdown.

***Keywords*—**Bridges, junctions, ramps, urban traffic control.

I. Introduction

TRANSPORTATION since its birth, had a huge development and now it's almost at its peak. Whenever we speak or think about transportation, the first picture that flashes in our minds is ROADS. Roads are the basic mode of transportation for all the people alike unlike Railways, Seaways or Airways. Road transport is easily feasible by common man.

The increase in number of vehicles in all developing and developed countries results in traffic jams. Traffic jam is one of the major problems, the world is facing today. Traffic control operation is a difficult task. Many believe that installing a traffic signal, raising or lowering the speed limit or adding more signs can solve traffic problem.

Today however engineering projects face challenges that extend beyond designing traffic control devices such as traffic signals, signs and pavement markings. Controlling the traffic light intersection requires a prior knowledge of that intersection and the traffic load to be ABLE set the proper parameters for the control algorithm.

II. Related Work

Congestion of traffic is a solemn experience faced by the users who travel on urban roads. Due to traffic congestion, traffic commuters spoil valuable time, fuel and money. Design of an uninterrupted traffic flow system at the traffic junctions without have to wait for others will lead to minimize severe traffic congestion [1].

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As cities grew, civil engineers became involved in developing, building, and operating transit facilities, including street railways and elevated and underground systems. Main topics include transportation engineering practice, airport and highway pavements and materials, design and safety, planning and operations, pipelines, technology, and education [2].

The folded interchange combines some of the elements of the diverging diamond and continues flow interchange elements to optimize operational efficiency while maintaining the basic foot print of the existing cloverleaf interchange to minimize costs and impacts. This paper represents the folded interchange design and discusses appropriate applications so that it may be added into the transportation engineer toolbox of ideas [3].

With the ever increasing vehicles on the road and the number of road users, the limited resources provided by current infrastructure lead to ever increasing travelling times. Therefore there is a need for the dynamic control of traffic during rush hours. The proposed system tries to minimize the possibilities of traffic jams, caused by the traffic lights, to some extent b clearing the road with higher density of vehicles and also provides the clearance for emergency vehicles if any [4].

The significant evolution in interchange forms such as evolution of interchange forms from the cloverleaf to the double crossover diamond (diverging diamond). Evolution of interchange geometric design criteria from 1930's to the present. The interchange forms includes 17 diamond interchange forms, 10 partial cloverleaf forms and 16 system interchange forms with their design and operational characteristics [5].

Detailed design of the 2nd stage of south bridge over River Daugava in Riga was developed with a target to build a high-speed access road to South Bridge and the necessary multilevel crossings of city's main traffic arteries. Approximately 3400m of reinforced concrete flyovers and two 200m long overpasses across the railway of composite concrete and steel have been built without stopping the city traffic [6].

The role of public transportation is ever more important in decreasing the number of cars a subsequently emissions of greenhouse gases. Transport plays a major role in modern economies. Simultaneously it also creates problems. The paper deals with the issues of Park and Ride – a tool to decrease the amount of private cars in favor of public transport in order to improve the modal split [7].

Traffic models are represented by minimization of congestions, accidents, pollution and the maximization of

safety. The paper deals with a mathematical model for fluid dynamic flows on road networks which is based on the conservation of cars. The paper focuses on traffic circle, which is a finite number of roads that meet at some junctions [8].

III. Existing Traffic Signal System

The area shared by two or more roads is known as junction. Traffic jam mostly occurs at junctions. Junctions are classified into different types, Three Road Junction ("T" Junction or "Y" Junction), Four Road Junction, Five Road Junction and Six Road Junction. The Five Road Junction or Six Road Junctions exist rarely. With the help of these junctions any vehicle can take a 'U' turn in different directions to reach their required destinations (according to Traffic Rules). The main function of this system is to guide vehicles. Many accidents will occur due to error in Traffic control at Junctions. Therefore this paper has been concerned with Four Road Junction.

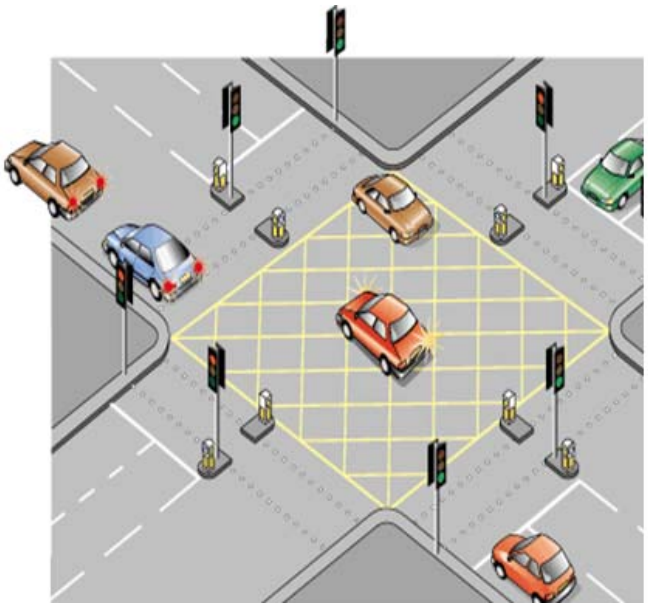

Fig. 1 The Junction of Four Roads

Basically most of the traffic signals intersections have four directions queues, North (N), South (S), East (E) and West (W). The queue possibilities are moving from west towards North, East, South (W⟶N, W⟶E, W ⟶S), from North towards East, South, West (N⟶E, N⟶S, N ⟶W), from East towards South, West, North (E⟶S, E ⟶W, E⟶N), from South towards West, North, East (S ⟶W, S⟶N, S⟶E) as shown in Figs. 2-5.

The queues such as W⟶N, N⟶E, E⟶S, S⟶ W is free left as they can flow all the time. The model simply shows that one direction can open at the same time, for example W⟶E and W⟶S direction will move then other direction queues such as N⟶S, N⟶W, S⟶N, S⟶E,E⟶W, E⟶S has to wait, then the control algorithm will be more complicated and more sensing elements are required. So, the main goal is to provide a controlling mechanism to minimize the waiting time for vehicles waiting in the red signal and maximize the service time for vehicles passing through intersection.

Here in this system we are considering six lane roads with two way traffic. The lanes moving from North direction are indicated by 1, 2, 3, from East direction by 4, 5, 6, from South direction by 7, 8, 9 and West direction by 10, 11, 12.

The lanes such as 3, 6, 7, 10 shows green colour in all cases as they indicates free flow of vehicles.

As in Fig. 2 there is a green signal for West direction i.e., 10, 11, 12 are indicated by green colour and the rest of lanes such as 1, 2, 4, 5, 8, 9 are indicated by red colour.

As in Fig. 3 there is a green signal for North direction i.e., 1, 2, 3 are indicated by green colour and the rest of lanes such as 4, 5, 8, 9, 11, 12 are indicated by red colour.

As in Fig. 4 there is a green signal for East direction i.e., 4, 5, 6 are indicated by green colour and the rest of lanes such as 1, 2, 8, 9, 11,12 are indicated by red colour.

As in Fig. 5 there is a green signal for South direction i.e., 7, 8, 9 are indicated by green colour and the rest of lanes such as 1, 2, 4, 5, 11,12 are indicated by red colour.

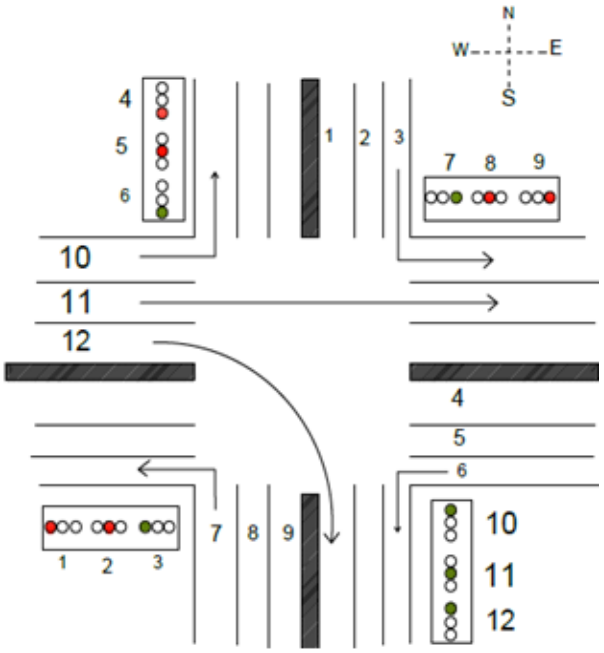

Fig. 2 Turning Lane for W S and Straight lane for W⟶ E directions

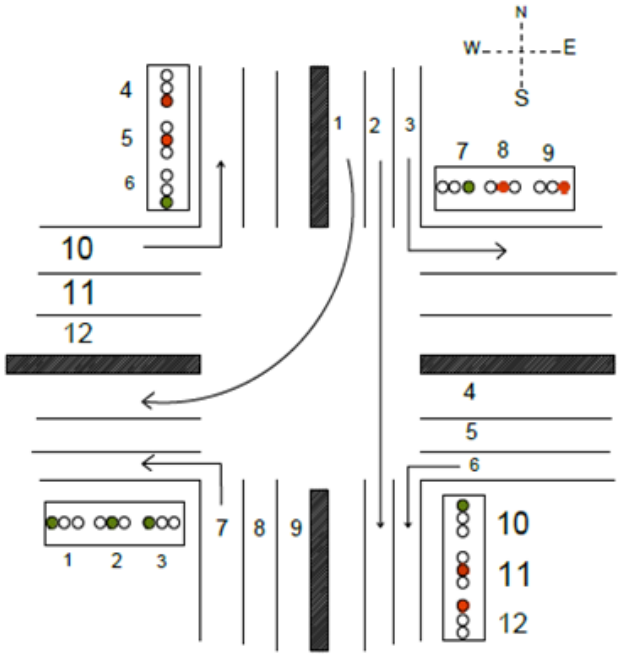

Fig. 3 Turning Lane for N ⟶ W and Straight lane for N ⟶ S directions

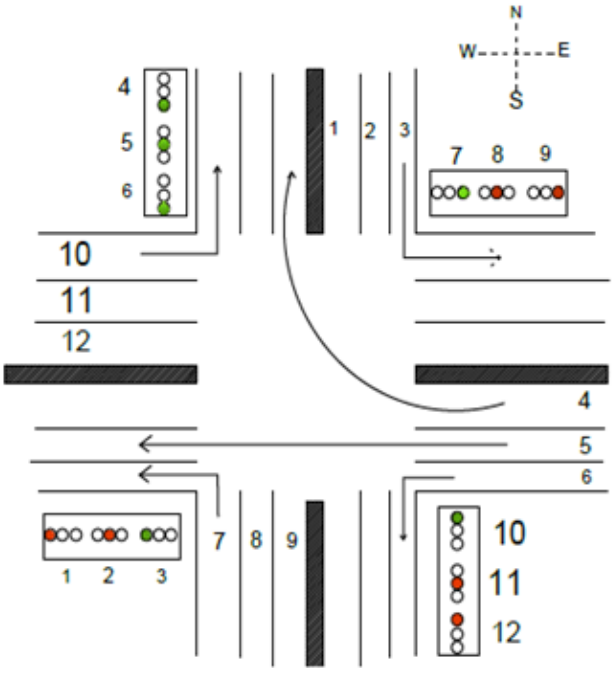

Fig. 4 Turning Lane for E ⟶ N and Straight lane for E ⟶ W directions

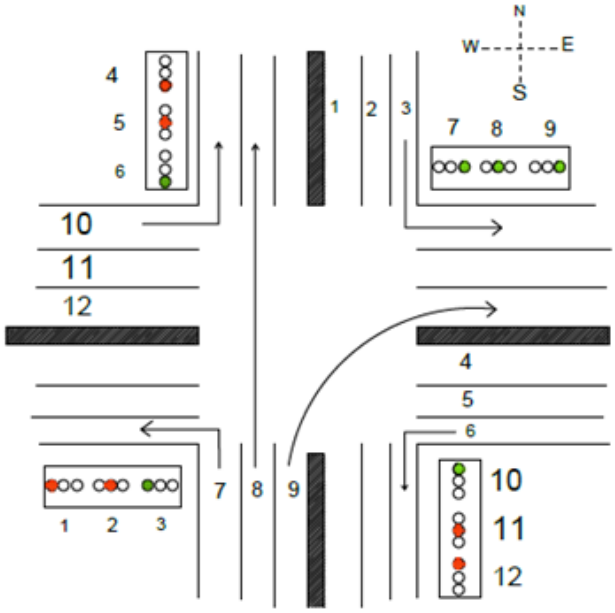

Fig. 5 Turning Lane for S E and Straight lane for S N directions

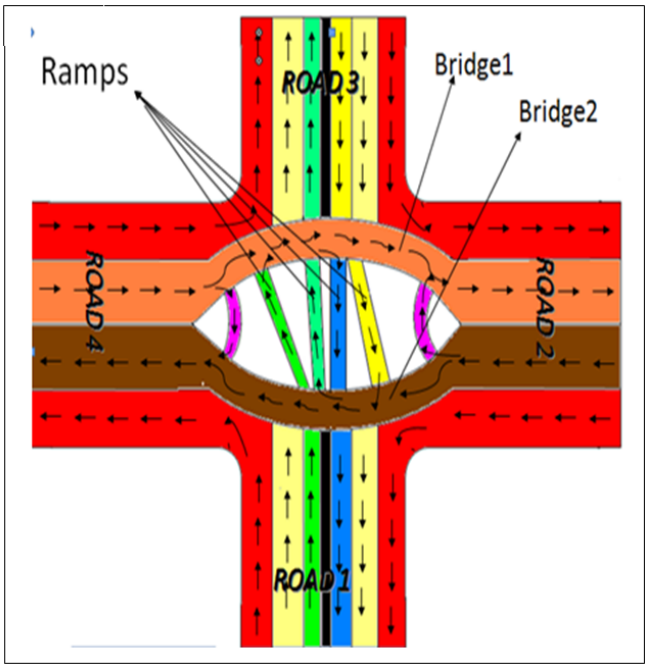

Fig. 6 Alternative Model Developed to Avoid Traffic Signal System at Junctions of Four Cross Roads

IV. Proposed Alternative System

Fig. 6 exhibits an alternative method for passing of vehicles at junctions by avoiding installation of traffic signal system. This model has intersection of four roads i.e., road 1 (South), road 2 (East), road 3 (North) and road 4 (West).

Road 4 and road 2 are connected by two bridges, bridge 1 and bridge 2. There are four ramps connecting bridge 1 and bridge 2 as shown in Fig. 6. Passing of vehicles from road 4 and road 2 is done by connecting bridge 1 and bridge 2 (as indicated by orange and brown colour).

Similarly passing of vehicles from road 1 and road 3 is done under the bridge (as indicated by cream colour) Road 3 is connected to bridge 2 by ramp (as indicated by yellow colour) to pass to road 4. Road 1 is connected to bridge 1 by ramp (as indicated by light green colour) to pass to road 2. Road 4 is connected to bridge 1 by ramp (as indicated by blue colour) to pass to road 1.

Road 2 is connected to bridge 2 by ramp (as indicated by greenish shade colour) to pass to road 3.The other possibility of roads are shown in red colour i.e., from road 1 to road 4, road 2 to road 1, road 3 to road 2 and road 4 to road 3.

V. Conclusion

The method for achieving proposed alternative system is applicable for free flow of vehicles at junctions without stopping. However, the method has few limitations too. As it is applicable to wide roads with sufficient space the exercise such as dimensions of the bridge and ramps are yet to be worked out. The advantages of the discussed model are no traffic light system at junctions. This facility leads to avoidance of crossings at same level. This model saves motorists and commuter's time. Moreover, the system has lesser chances of delay. Through this model plenty of time is saved avoiding traffic congestion. It also contributes a lot to the aesthetics of the city. It is hoped that use of this method will help in control of urban traffic congestion.

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