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INTERCONNECTION OF AUTOMATIC TRAFFIC CONTROL MECHANISM IN CITIES

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ABSTRACT

Nowadays, in cities more traffic is occurred because of those cities are not preplanned before construction. So the traffic may not be controlled as we want by using any traffic control mechanism. Signals offer maximum control at intersections and relay messages of both what to do and what not to do. The primary function of any traffic signal is to assign right-of-way to conflicting movements of traffic at an intersection. But if we are going to construct a preplanned city we may choose appropriate traffic control mechanism to control the traffic. In this paper an Interconnection of Automatic Traffic Control Mechanism is used to control the vehicles. This mechanism is used only in the cities where the distances between the signals are same. We may instruct the vehicles to go such an average speed. So it can pass the signals with in a small/limited time seconds. We have added a set of new performance in traffic control which is better than old mechanisms.

Keywords: *Round robin scheduling, Signals, Paths, Interconnection.*

1. INTRODUCTION

Traffic light control is a challenging problem in modern societies. This is due to the huge number of vehicles and the high dynamics of the traffic system. Poor traffic management [1] causes a high rate of accidents, time losses, and negative impact on the economy as well as the environment. For the safety purpose, traffic signal must be used. According to the city planning we should choose a suitable Traffic control mechanism from a lot of Traffic control mechanisms.

In the 1st century BC Julius Caesar banned wheeled traffic from Rome during the daytime, a measure gradually extended to cities in the provinces. Late in the 1st century AD the emperor Hadrian [2] was forced to limit the total number of carts entering Rome.

On 10 December 1868, the first traffic lights were installed outside the British Houses of Parliament in London to control the traffic in Bridge Street, Great George Street and Parliament Street. Although it was said to be successful at controlling traffic, its operational life was brief. It exploded on 2 January 1869, as a result of a leak in one of the gas lines underneath the pavement With doubts about its safety, the concept was abandoned until electric signals became available.

The first electric traffic light [3, 4] was developed in 1912 by Lester Wire, an American policeman, who also used red-green lights. On 5 August 1914, the American Traffic Signal Company installed a traffic signal system in Cleveland, Ohio. The first interconnected traffic signal system was installed in Salt Lake City in 1917.

Traffic control signals that are properly designed, located, operated, and maintained will have one or more of the following advantages: [5] they provide for the orderly movement of traffic. They increase the traffic-handling capacity of the intersection if: Proper physical layouts and control measures are used, and the signal operational parameters are reviewed and updated (in needed) on a regular to maximize the ability of the traffic control signal to satisfy current traffic demands.

They reduce the frequency and severity of certain types of crashes, especially right-angle collisions. They are coordinated to provide for continuous or nearly continuous movement of traffic at a definite speed along a given route under favorable conditions. They are used to interrupt heavy traffic at intervals to permit other traffic, vehicular or pedestrian, to cross. This paper presents the automatic traffic control mechanism in cities developed in java [12-14]. The normal traffic signals movement in current traffic scenario is depicted in Fig.1.

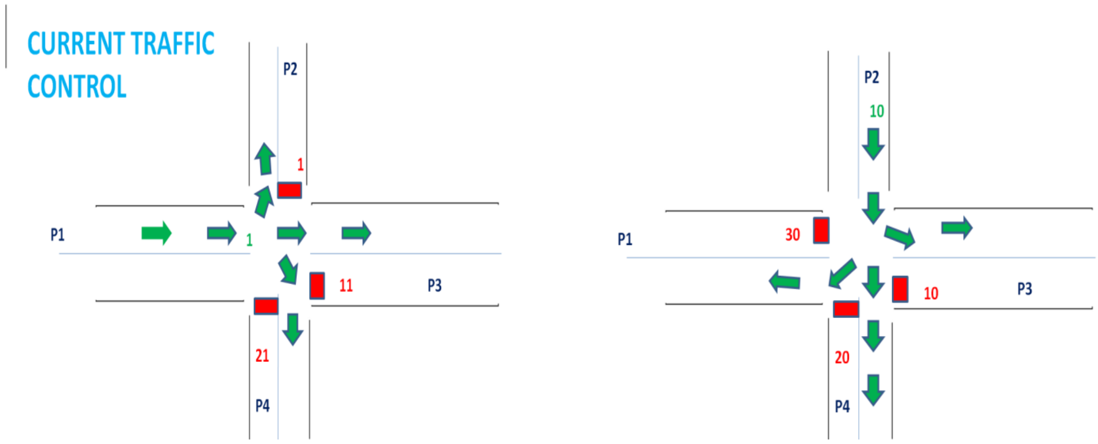

Fig.1 Traffic signal movement

2. REVIEW OF LITERATURE

A lot of Traffic control based works have been reported for the past decades [9] related concepts approach for traffic signal design [16], Solar traffic signal [17], Passenger–Bus–Traffic Interactions [18].

Kurt Dresner and Peter Stone conducted a study on “Multiagent Traffic Management [6] A Reservation – Based Intersection Control”. This paper proposes a reservation based system for alleviating traffic congestion, specifically at intersections, and under the assumption that the cars are controlled by agents. First, the authors describe a custom simulator that they have created to measure the different delays associated with conducting traffic through an intersection. Second, authors specify a precise metric for evaluating the quality of traffic control at an intersection. Using this simulator and this metric, authors show that their reservation-based system can perform two to three hundred times better than traffic lights. As a result, it can smoothly handle much heavier traffic conditions. Authors show that their system very closely approximates an overpass, which is the optimal solution for the problem with which they are dealing.

One problem authors discovered occurs whenever cars traveling in the inside lanes, but in opposite directions are competing for the same tiles. This happens usually when the granularity is an odd number. If one car has to slow down because it cannot obtain a reservation, when it finally does get a reservation it will occupy those tiles for a longer period of time. This makes it more likely that the next car coming in the opposite direction will have to slow down even more. This process eventually slows the cars down more and more. For small to average amounts of traffic, this causes larger delays. For very heavy traffic, it will eventually deadlock the intersection.

B.G. Heydecker (2004) conducted a study [7] on "Objectives, Stimulus and Feedback in Signal Control of Road Traffic". This article identifies the prospective role of a range of intelligent transport systems technologies for the signal control of road traffic. Author discuss signal control within the context of traffic management and control in urban road networks and then present a control-theoretic formulation for it that distinguishes the various roles of detector data, objectives of optimization, and control feedback. By reference to this, author discuss the importance of different kinds of variability in traffic flows and review the state of knowledge in respect of control in the presence of different combinations of them. In light of this formulation and review, author identify a range of important possibilities for contributions to traffic management and control through traffic measurement and detection technology, and contemporary flexible optimization techniques that use various kinds of automated learning.

Somayeh Nassiria, Alireza Bayata & Peter Kilburnb (2013) conducted a study [8] on "Traffic inputs for mechanistic-empirical pavement design guide using weigh-in-motion systems in Alberta". Mechanistic-empirical pavement design guide (MEPDG) uses axle load spectra and the number of axle applications to characterize traffic loads for pavement design.

Alberta Transportation installed weigh-in-motion (WIM) systems at six highway locations to characterize traffic loads in Alberta for MEPDG design. Seasonal and regional trends in traffic characteristics of the six WIM sites were investigated and compared with the default values in the MEPDG for the years 2009 and 2010. Truck traffic classification (TTC) and axle load distribution factor (ALDF) for the WIM sites showed deviations from the MEPDG defaults. Seasonal variations were also evident in the distribution of different classes of truck throughout the year. Differences are attributed to cold climate conditions and special truck traffic in Alberta because of local industries. Influence of the differences between site-specific traffic characteristics and the MEPDG defaults on the performance of both flexible and rigid pavements for Alberta conditions was investigated through a sensitivity analysis. It was found that the flexible pavement performance is sensitive to TTC and ALDF, and the rigid pavement performance is most sensitive to ALDF.

3. METHODOLOGY

3.1 Objectives

To reduce the traffic in the cities, allot time for moving the vehicles. To prevent accidents [15] mainly write angle accidents, reduce this by the signals. In this paper if the vehicle goes straightly, it will wait for the signal two after two manner, which means if the vehicle waits for the green signal and get it, that vehicle need not wait for the upcoming straight signal; it also be green, if the vehicle passes the signal in a particular time. The success of this technique is based on the distance between each signal should be same as in Coimbatore city. The vehicle's average speed between the signals must be determined previously.

3.2 Round Robin

Basically Round Robin [10] concept was implemented. The scheduler assigns a fixed time unit per process, and cycles through them. Round Robin scheduling involves extensive overhead, especially with a small time unit. A small unit of time, called a time quantum or time slice, is defined.

Particular time slice is goes to each signal. In this paper the time slice allotted to each signal is 3 seconds. Each 3 seconds the process of green moves to other path in the signal.

3.3 Signals

It specifies an action, movement or sound [11] which gives information, a message, a warning or an order. This work implemented two categories of signals; three path signals and four path signals. Totally, there are 10 signals are considered in which, seven of them are three path signals and 3 are four path signals. The three path signals consist of two types; type1 and type2. Type1 includes signal1, 3, 5, and 7 and type2 includes 2, 4 and 6.

The flowchart of three path signals with 50 time delay is shown in Fig.2. Like the three path signals, the four path signals consist of type3 and type4. Type3 includes 8 and 10 and type4 includes 9.

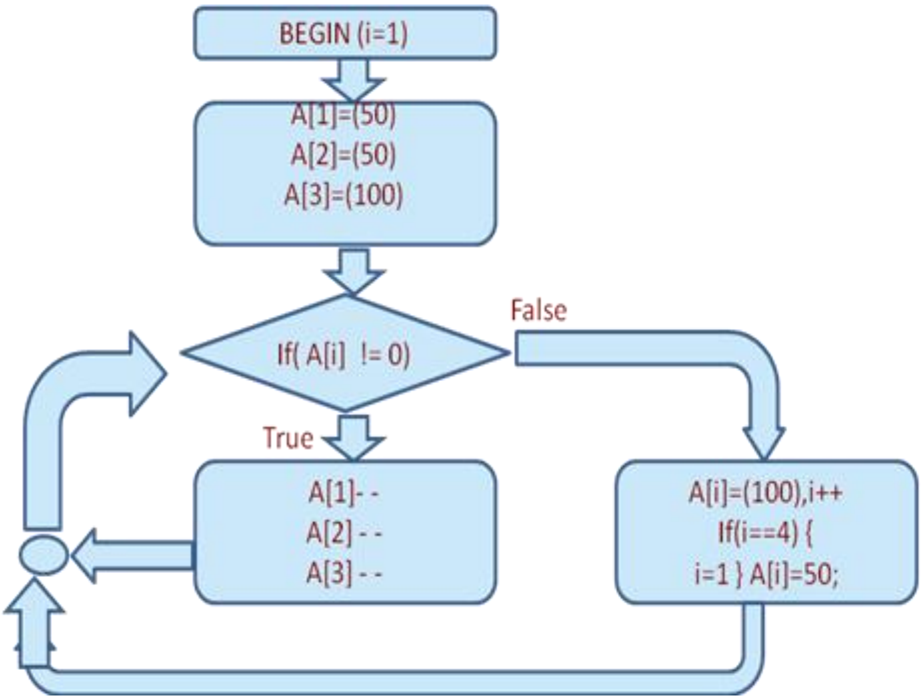

Fig. 2 Three path signal (Time limit = 50 sec.)

The flowchart of four path signals with equal time delay (50 sec) is represented in Figure 3.

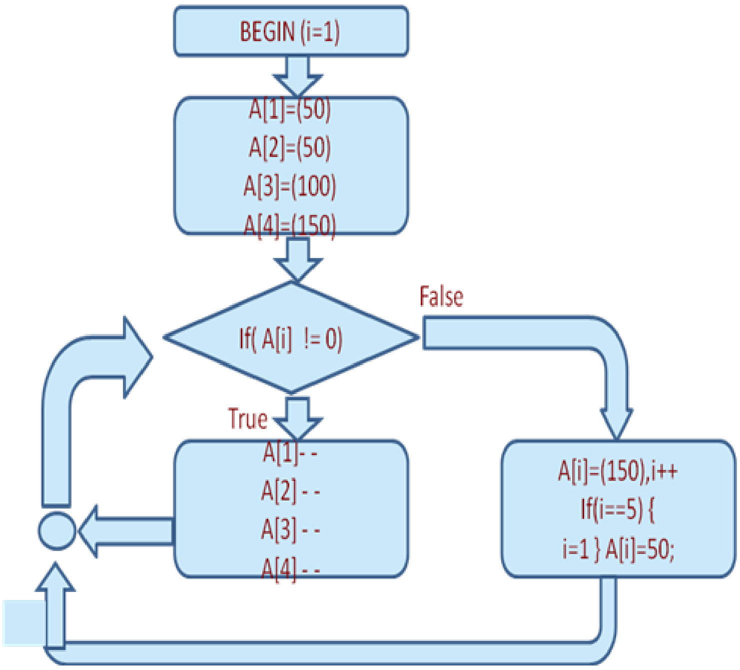

Fig 3. Four Path Signal (Time limit = 50sec.).

All the signals are met with in a particular distance. This paper deals with traffic control of that type of city planning.

3.4 Paths

It defines a route or track between one place and another, or the direction in which something is moving. This work consists of 33 paths in which 21 paths are belongs to category1 signal in which 12 is for type1 and 9 is for type2. Other 12 paths are belongs to category 2.

3.5 Interconnection

It tells something is connected with one another. It may be an object or event. Here all the signals are connected with one another. Thus provides an efficient traffic control mechanism.

4 RESULTS AND DISCUSSION

This work consists of two classes namely roadmap and traffic signals. Roadmap class gets some inputs from user and sends that by calling the method control in the upper class traffic signals. The class traffic signals contain seven methods. They are control, type1, type2, control1, type3, and type4, green. All the methods have some parameters. Here at the beginning of control method we make some initialization and decreasing the seconds of red and green signals for all the 33 paths in ten signals.

Control and control1 methods are interconnected with one another and call one another continuously. As like this type1 and type2 methods are interconnected with one another and which are belongs to control method. Type1 method is for providing the seconds for paths in signals 1, 3, 5, 7. Type2 method is for providing seconds for paths in signals 2, 4, 6. Basically control method is used for Three Path Signals. Type3 and type4 methods are belonging to control1. They are interconnected with one another. Type3 provides seconds for paths in signals 8 and 10. Type4 is for signal 9.

It controls the execution by a control variable. Finally green method checks and provides which are the paths belongs to green and red signals at the current time.

In this Automatic Traffic Control Mechanism, with in cities any changes in a signal will affect other signals. So there is a need for interconnection. Every Signal should act according to others too. Anyway according to the structure of the streets in the cities, we should develop a unique traffic control mechanism. The streets in all the cities are not same. It will vary by the length, distance, breath, etc. Thus it is not possible to provide a common traffic control mechanism. Whatever sensors we use, it may not be possible.

The next important thing is every signal is depends on the other signals, so that only we can reduce the traffic in the area. Before making the signal we should calculate what kind of mechanism is needed for the particular place and find out the exact one. Whatever we develop the methods should have the capable of flexibility and reusability.

According to the traffic we may change the path1 signal to path3 and vice versa. This could be an acceptable one to the efficient mechanism. Usually at the normal time if the traffic is minimum the signal time is less such as 30 sec or less. If it is a higher traffic time, the signal time should increase to 50 sec or more. So it must be a possible one to change the time whenever we need.

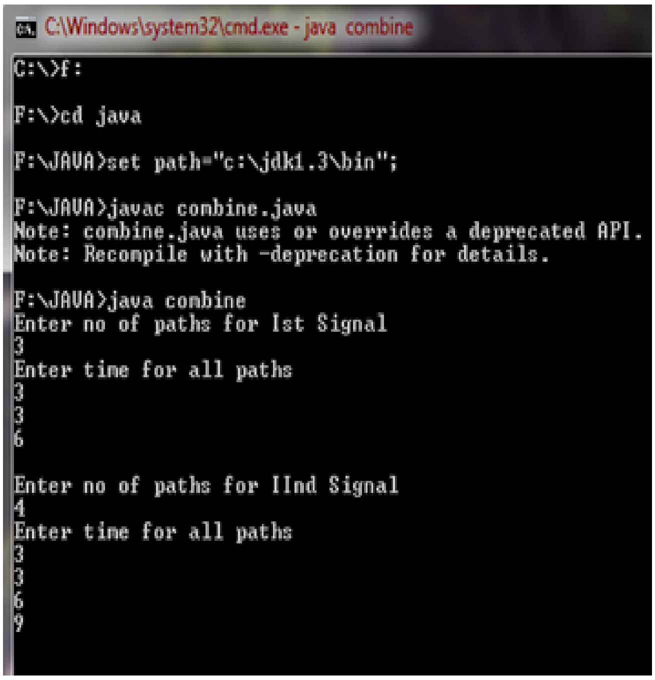

Fig. 4 Screen shot of Traffic signal inputs

The Fig.4 shows the input screen in which users gets inputs related to number of signals, number of paths, time delays of all paths in signals. The input to the 1st signal as three path signal and its execution seconds as green 3 seconds, red 3 and red 6 for the paths1, 2 and 3 respectively. As like this, 2nd type signal is a four path signal and its running time for 4 paths as shown in Fig.4.

The Fig 5 shows the output at runtime which gives clear picture of all 10 signals, paths and about delay status of particular signal in a path at particular time.

The final result of interconnection of automatic traffic control mechanism as shown in Fig.5 is visualized for better understanding using java applet as shown in Fig.6.

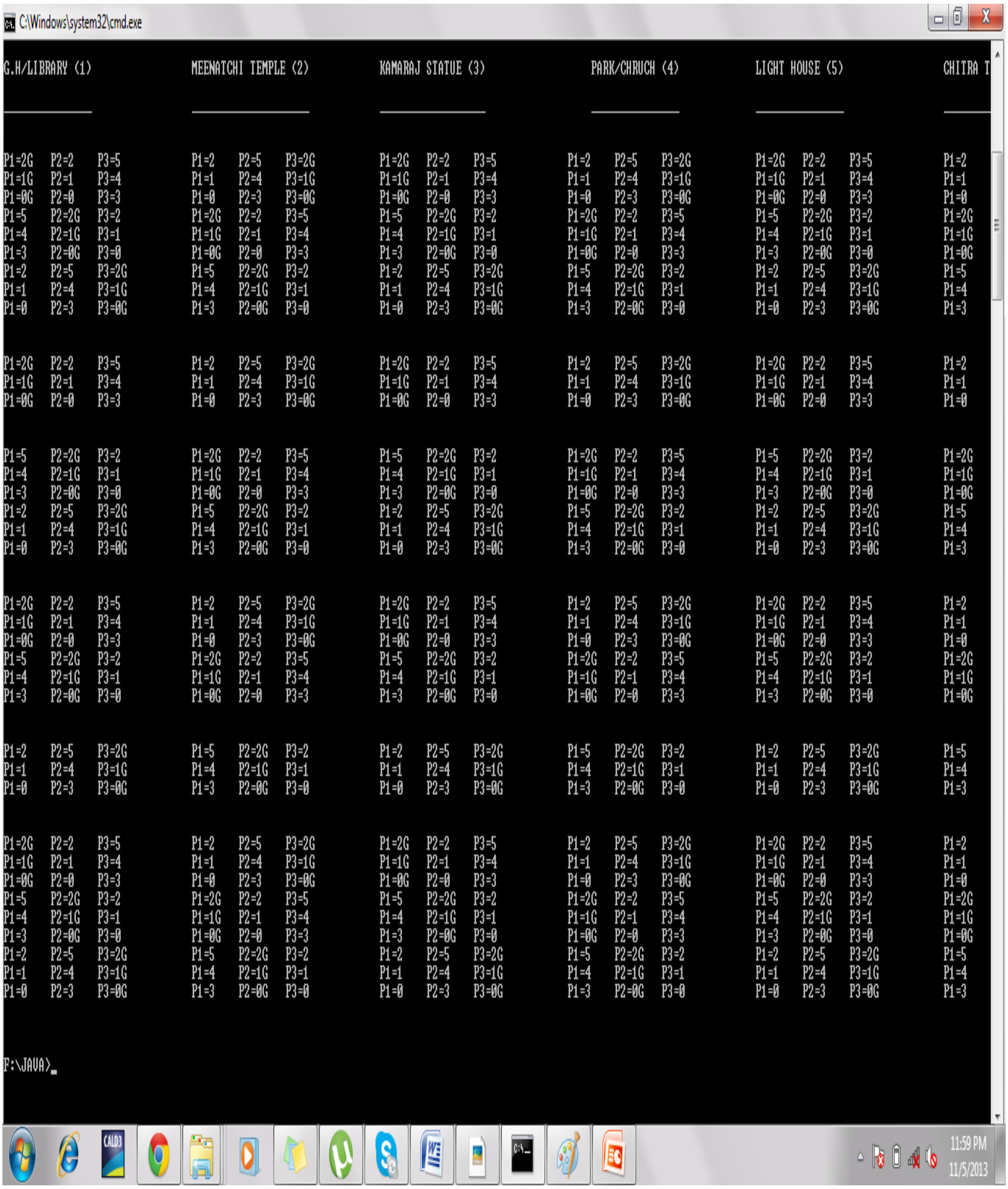

Fig. 5 Screen shot of Traffic signal output

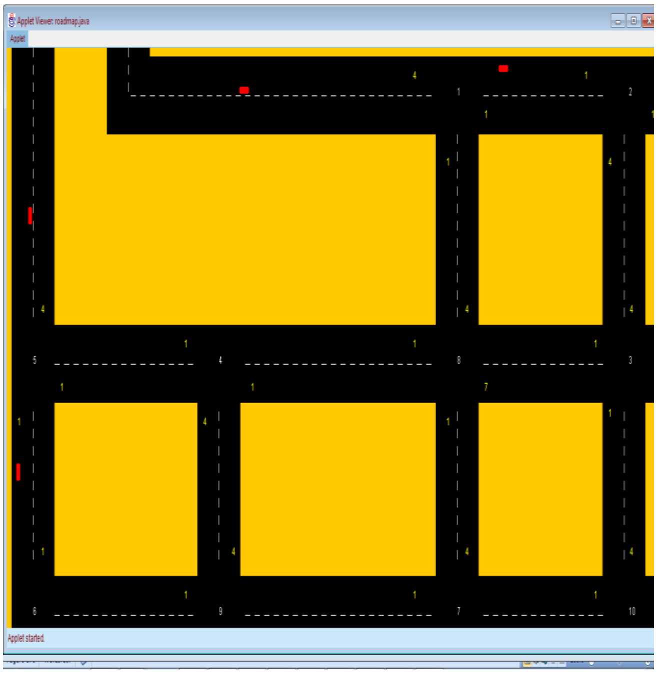

Fig: 6 Graphical representations of city traffic signals

5 CONCLUSION AND FUTURE ENHANCEMENT

Integrated Traffic Control Mechanism has consists of several main concepts. Control pass, seconds implementation, deciding the red & green signal, and so on. All the above concepts are directly applied and traffic mechanism gives all possible results. This mechanism could be used to the cities like Coimbatore and other Indian cities which have the same distance between signals. We studied almost all road traffic control mechanism and identified all their merits and demerits.

In consideration with this in mind the Interconnection of Automatic Traffic Control Mechanism has proposed by accumulating the essential features represented in all specified Traffic controllers and further to be used with some sensors and various type of signals in other cities. We can further modify this mechanism to other kind of signals in the cities in India by applying some other suitable scheduling mechanism and other communication technologies, such as RFID and Sensors networks. In order to handle traffics in a better and efficient way.

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