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Original Article

Dynamic Traffic Signals Timer Using Iot - A Survey

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Abstract – *Traffic light control systems are widely wont to monitor and control the flow of automobiles through the junction of the many roads. They aim to realize the smooth motion of cars in the transportation routes. However, the synchronization of multiple traffic light systems at adjacent intersections is a complicated problem, given the various parameters involved. Conventional systems do not handle variable flows approaching the junctions. In addition, the mutual interference between adjacent traffic light systems, the disparity of car flow with time, the accidents, the passage of emergency vehicles, and the pedestrian crossing are not implemented in the existing traffic system. This leads to traffic jams and congestion. We propose a system based on a PIC microcontroller that evaluates the traffic density using IR sensors and accomplishes dynamic timing slots with different levels. Moreover, a portable controller device is designed to solve the problem of emergency vehicles stuck in overcrowded roads.*

Keywords - *Sensors, IOT, Traffic.*

I. INTRODUCTION

Traffic lights, developed in 1912, is a device that passes a signal that is conceived to control the traffic flows at road intersections, pedestrian crossings, rail trains, and other locations. Traffic lights contain three types of universal coloured light: the green light allows traffic to proceed in the indicated direction, the yellow light warns vehicles to prepare for a shortstop, and the red signal restricts any traffic from proceeding.

II. INTELLIGENT TRAFFIC CONTROL SYSTEM

The design of a dynamic traffic control system that is based on traffic density is an active research topic. Researchers around the world are inventing newer approaches and innovative systems to solve these stressful and crowded area problems. Models are based on mathematical equations are applied to reduce the car waiting time at a traffic area, the number of vehicles in the waiting queue, the extension of the waiting vehicles along the lane, the minimum timing slots for green, yellow, and red lights that best fit and suit for the real and veritable situation and the efficient combination of routing. In fact, the mutual dependencies between nearby intersections lead to a complicated formulation. These parameters are accidental, hazardous, dependent, and the worse point is the variance of these parameters with time. With the ever day by day increasing number of vehicles on the street and the number of road users, the fewer resources provided by current infrastructure will lead to ever-increasing travelling times. Hence, intelligent control of traffic is an important issue to be considered. The Traffic Monitoring Authority (AMA) need to find new methods to overcome such type of problem like the construction of new roads, flyovers etc., and also the development of congested traffic monitoring and control systems. One way to improve the traffic flow and safety of the current transportation system is used for automation and intelligent control methods to roadside infrastructure and vehicles traffic lights are signal devices which are situated on the road with intersection points which are used to control the complete flows of traffic. In general, a traffic light contains a set of three lights. They are red, yellow and green. When the red light gets on, it indicates for vehicles facing the light to stop, and the yellow light indicates caution to prepare for a stop short of the intersection. The green light is used to proceed in the direction denoted. The traffic signal sequence may differ from others, and that they could also be special rules or set of lights for traffic delivering the actual direction.

A. Configuration of traffic light

In the proposed smart traffic light system, 2 things are presented: the primary arrangement allows the flow of

vehicles from the road first forwardly to road three also because the turning to the proper to follow road fourth, while the 2nd one permits the cars to manoeuvre from road 2 following road 4 or shift to the left to travel to the road 3. The disposition of cars transitions between the roads takes into consideration the crossing of individuals. Table 1 illustrates the states of the traffic lights labelled A, B, L, and R during the two configuration modes. The terminology we've adopted is made of three fields: traffic light-colour lights state. For instance, A- GreenON designates that the green light of the traffic signal A is illuminated. Phase 1 of the primary configuration corresponds to the activation of the green light of the traffic signal A and traffic R, where the cars parking at road 1 are crossing the intersection. The phase II clinical trial agrees with the warning for stop position where only the traffic signal of the traffic light A is popping on for 10s. During this configuration, the red light of the traffic signals B and L are ON. Within the second configuration, the lights working are briefly reversed.

B. IR sensors and density of traffic light

The main problem of the traditional traffic light systems is that the timing slots are fixed within our code. Recommended font sizes are shown in Table 1.

Table 1. Traffic light configurations during the two modes of operation

First configuration		**Second configuration**	
Phase I	***Phase II***	***Phase III***	***Phase IV***
A-G ON A-Y OFF A-R OFF	A-G OFF A-Y ON A-R OFF	A-G OFF A-Y OFF A-R ON	A-G OFF A-Y OFF A-R ON
B-G OFF B-Y OFF B-R ON	B-G OFF B-Y OFF B-R ON	B-G ON B-Y OFF B-R OFF	B-G OFF B-Y ON B-R OFF
R-G ON R-R OFF	R-G ON R-R OFF	R-G OFF R-R ON	R-G OFF R-R ON
L-G OFF L-R ON	L-G OFF L-R ON	L-G ON L-R OFF	L-G ON L-R OFF

C. Emergency vehicles

One of the best situations in the traffic light system includes the space for emergency vehicles as a first priority through the road. An emergency vehicle includes ambulances, fire brigade, police, and VIP persons that could get stuck in the traffic. This issue may cause several problems that depend on the injury of patient transported, personal accident, fire buildings, robbery, and many various critical situations. It is mandatory to implement a technique to solve this important problem.

Table 2. Timing Slots Acquired By Each configuration And Achieved For The Three Modes Of Traffic

Traffic Modes	**Configuration**	
	Phase I	***Phase II***
Normal traffic	30	5
Jam traffic	50	5
Soft traffic	15	5

In the traditional system, it had been unable to unravel this problem in order that they solved it and that we are considering it in future implementation. This state is usually detected in many cities where employees are driving within the morning for work and returning range in the evening. Additionally, when the flow of cars approaching the intersection roads increases during the working hours or decreases during the night, the green light activation was extended or reduced, respectively. Therefore, IR transceivers mounted on either side of roads are wont to detect the passage of cars through it. The IR transmitter generates continuously and frequently a 36 kHz square wave signal while the IR receiver connected to the traffic master controller receives the signal and remains inactivated. When an automobile traverses the road between the IR transceivers, the IR radiation bounces, and therefore the system is activated. This activation process is analysed by the traffic controller, where the density of the car counter is adjusted. Then the traffic controller, which is provided with a PIC microcontroller, responds to the collected data. Actually, three modes of lighting transition slots are suggested: the traditional model, the holdup, and, therefore, the light traffic mode. The shifting between these modes is completed in real-time, i.e. dynamically. So, the amount of counted cars during this phase 1 of a given configuration affects the green light period directly within the next phase 1 of the upcoming configuration. The timing slots of the varied modes are depicted in Table 2. the three-timing slots associated with the traditional, jam, and soft traffic are respectively 30, 60, and12 s. These different levels are assigned by the code and may be adjusted by the software. For the traditional mode, phase 1 of every configuration is adequate to 30s. However, if road 1 reveals jam traffic and road 2 shows soft traffic, then the amount of phase I clinical trials of the primary configuration are going to be the 60s. In contrast, the amount of phase I clinical trials of the second configuration is going to be 12s. It's noted that in the first configuration, the cars of the road first are moving to their destination while the cars of road second are stacked and

parked. Furthermore, when phase 2 of the primary configuration starts, the IR sensor of the road first epics the car counting from zero.

Fig. 1 Motion Sensor

The motion sensor is employed during this system for safety purposes. These sensors are going to be put at a maximum height of the traffic signal. This sensor is additionally executed at both traffic signals. This sensor is employed to sense the vehicles along the only lane. The sensor will sense the vehicles when both of the traffic lights are red. Albeit the numbers of vehicles are equal on both sides, there are still vehicles detected thereon single lane road, and the system won't let any of the traffic signals turn green. Figure 2 shows a summary of a motion sensor utilized in this technique.

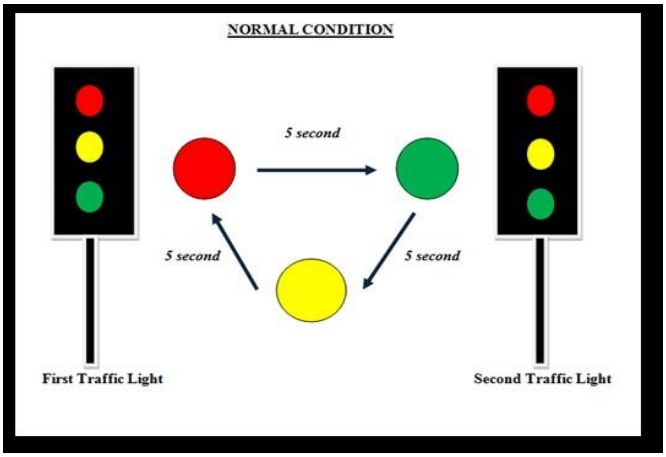

Fig. 2 Normal Condition

Figure 2 shows a summary of the traditional condition of the system. During this system, the time for every sequence of sunshine is set at 5 seconds. This condition is where the number of vehicles passed at both traffic lights is equal. When the first traffic signal is green and yellow, the number of vehicles passed through it'll be calculated using the infrared sensor. When it turns red, the microcontroller will stop calculating and send a sign to the2nd traffic signal to tell that the first traffic signal has turned red. Then it'll also send the 2nd signal to tell the amount of the vehicle calculated. At the 2nd traffic signal, before receiving the signal, it'll also count the amount of the vehicle skilled it. When it receives the primary signal, it'll await the 2nd signal. At an equivalent time, it'll still count the number of vehicles skilled it. Once received the number of vehicles from the1st traffic signal, it'll compare with the number of vehicles skilled. At an equivalent time, the motion sensor also will sense the vehicles on the only road. When the amount is equal, and no vehicles are using that single road, it'll automatically become green. This is often continuous for the first and2st traffic signal in sending the signal. Receiving signal also changes the state of sunshine colour. This also happens when there's no vehicle skilled in both traffic lights.

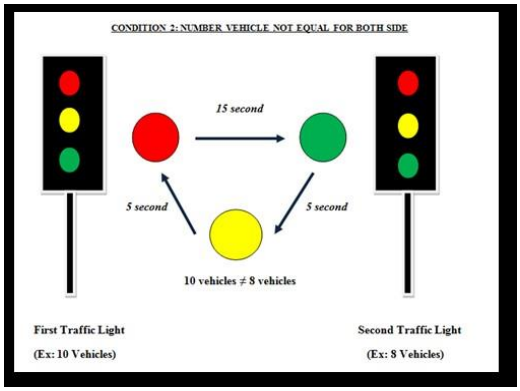

Fig. 3 Unequal Condition

Figure 3 shows the condition where the number of vehicles passed through both traffic lights is not equal. At this condition, there are still two types of signals that will be sent and received. For example, there are 10 vehicles passed through the first traffic light before it turns red. At the second traffic light, there are only 8 vehicles that passed through it until it received the second signal, which contains the number of vehicles at the first traffic light. In this situation, the 2ndtraffic light will not automatically turn into the green, but there will be delayed. In this system, the maximum delay is set to 4 seconds. After 4 seconds and there is no vehicle detection on that road, then only the 2ndtraffic light will turn green even the number of vehicles is not equal. This is for safety purposes.

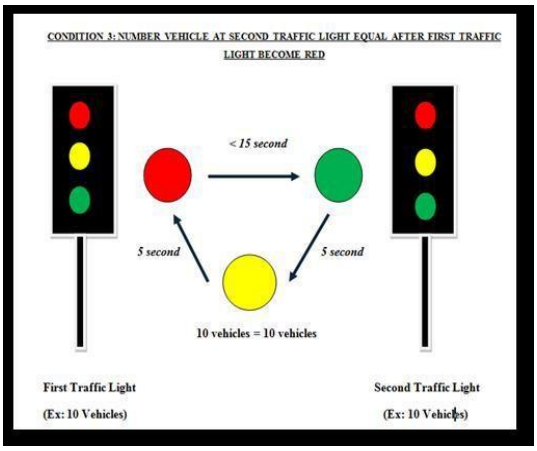

Fig. 4 Equal Condition

Figure 4 shows the condition where the numbers of vehicles passed at both traffic lights are equal after both traffic lights are turning into red. As mentioned before, the second traffic light will still be counting the number of vehicles passed through it even it received the second signal from the first traffic light. This is also vice versa. For

example, if there are 10 vehicles passed through the 1st traffic light before it turns red, the 1st traffic light will send the second signal with the number of vehicles that is 10 to the second traffic light. When the second traffic light receives the signal, it will then compare with the number of vehicles passed through it. If it is not equal, then it will wait for another 15 seconds and still count. In between 15 seconds, if the number of vehicles is equal and there is no vehicle detection on that road, then it will automatically turn green. The system of the second traffic light will not wait until the maximum delay.

III. CONCLUSION

The traffic light issue is obviously a critical problem that worries citizens and governments. The influence of a low efficient conventional traffic system affects the economic, health, financial, and environmental domains. The transportation system trouble and bad monitoring may cause car accidents, traffic jams, and road congestion that put heavy loads on businesses and works. The advancement of technologies and the miniature of control devices, appliances and sensors have given the capability to build sophisticated smart and intelligent embedded systems to solve human problems and facilitate the lifestyle. The advancement of technologies and the miniature of control devices, appliances and sensors have given the capability to build sophisticated smart and intelligent embedded systems to solve human problems and facilitate the lifestyle. Our smart traffic light control system endeavours to contribute to the scientific society to ameliorate the existing traffic light systems and manage the flow of automobiles at the intersections by implementing innovative hardware and software design systems.

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