REVIEW PAPER ON TRAFFIC SIGNAL ANALYSIS AND METHODS

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ABSTRACT: -

Road accidents, traffic jams, confrontations, and bottlenecks are all made worse by the growing number of vehicles using our crossings. These issues can only be resolved right now by providing effective traffic control at intersections, which can be accomplished by installing automated volume-based traffic signal systems there to allow for continuous and efficient passage of vehicles. For failing cross-junctions, other researchers' suggestions for redesigning and building roundabouts, grade separated intersections, or continuous flow intersections were advised for better performance of the intersections. For effective operation of cross-intersections, it was also advised to adopt annotated pavement markings to direct drivers for improved lane discipline as well as strict enforcement procedures to check on-street parking at intersections for improved lane capacity. The traffic volume is surveyed using a manual approach, in which the cars are manually tallied according to their various vehicle classifications, such as passenger, commercial, and agricultural, etc. The other component is the design of traffic lights, which is carried out using the IRC technique by adopting the maximum PCU on the intersection in each direction. The design of traffic lights at these crossroads will facilitate the safe and easy movement of the increasing volume of traffic while also assisting in lowering the number of accidents that occur there as a result of traffic jams and vehicle collisions.

Key Words: - Level of Service, Webster's Models, degree of saturation, phase cycle duration, and signal-controlled traffic system (LOS).

Introduction:-

The issue of urban traffic is a significant aspect that influences the growth and limits the economic development of cities. To deal with the numerous traffic issues in cities, it was important to optimize traffic control signals since the system is complicated in a random fashion. Incorrect timing of the signal. Plans have the potential to inconvenience drivers (add additional delay), raise pollutants, and increase fuel consumption. Investigating the use of signal optimization approach is crucial to ensuring that freshly created timing plans will enhance system performance. Cross intersections play a significant role in the metropolitan traffic network. The main strategy for raising intersection quality is signal timing optimization.The urban road system is crucial because of intersections. The low is relatively simple to produce efficiency of a vehicle's operation when it frequently merges, diverges, or intersects ata grade crossing. This situation will result in a reduction in traffic capacity, an increase in vehicle delays, and an increase in noise pollution and exhaust emissions. On the other hand, ifthe intersection is closed, it will affect not only the nearby roads but also the routes that are distant from it. Therefore, for traffic moving through the intersection, organizational optimization is required. Techniques for traffic simulation are being more often utilized to improve junction conditions. In order to investigate and address the traffic issue, it becomes acrucial instrument. Through the use of cutting-edge computer technology, traffic simulation studies the characteristics of a practical traffic system that could resurface in order to find the best solution to a real-world traffic issue. Through the repetition of the traffic flow arrangement, traffic simulation correctly and directly illustrates complex traffic properties. Atthe moment, traffic models may be broken down into micro-models, mesa-models, and macro-models depending on the amount of information. Among these, a micro-simulation model mayexplain the whole system and its internal relationships in great detail. When there is heavy traffic, research on individual behavior the individual features of the vehicle are frequently taken into account in analyses of traffic congestion to calculate rush hour flow. Additionally, by ascertaining the nature and the quantity, researchers can perform analyses and calculationsfor the rush-hour traffic characteristic, the remaining capacity, and the saturation. They can then look into the vehicle correlation, non-vehicle correlation, and mixing problem by watchingthe video recording and conducting surveys. Collection, analysis of the issue, improvement ofthe programmer and programmer assessment. Signal timing is a specialty of the synchrony system. The three indices of time delay, stops, and queue length are specified as the aim functions, and the maximum period, minimum period, and phase minimum green light durationare taken into consideration as the limitations. Synchrony is a simple and fantastic An effectiveand simple signal timing optimization tool is Synchrony which eliminates the hassle of manualcomputations. James Melinda and other researchers conducted comparative experiments usingdifferent simulation software under identical geometry and traffic conditions, and they found that in many simulation software's, VISSIM-based genetic algorithm-based signal timing optimization and Synchrony programmers produce extremely similar results and produce signal timing of the highest quality.

Literature Review :-

In order to address the many traffic issues, several articles and studies have been produced in the topic of traffic control. Following are explanations of a few of these papers Litana U. & Jem Sugal 2009 For an intelligent traffic signal simulator, a suitable algorithm and its simulation were created and built. The created system can detect the presence or absence of cars within a specific range by adjusting the duration for the traffic lights to respond appropriately.

Mahmoud Taghizadeh et al.2010 Proposed a generic framework for the integration of a simulator and a vehicle traffic simulator for quick design and assessment of vehicular communication protocols-based dedicated short-range communication applications. The performance of the collision avoidance apps is investigated using the resultant integrated simulator.

Khalid A. S. Al-Khateeb et al. 2011 Discussed the creation of a genetic algorithm-based intelligent traffic light control. Based on this technology, an isolated junction condition is simulated using the proposed algorithm. The performance of the traditional fixed time controller and the genetic algorithm controller were then contrasted.

Shwe Yi Aye 2013 demonstrated LAN networking-based vehicle traffic control system. The acquired findings demonstrated a decrease in routine recurrence, a considerable improvement in operational tools for managing traffic incidents, a reduction in pollution and faster reaction times, an improvement in public transportation, and a decrease in emergency response times.

Visit Hirankitti et al.2016 suggested a multi-agent strategy that includes agents and their environment for intelligent traffic signal control (cars, networks, traffic lights ...etc). Each of these agents uses an observe-think-act cycle to manage all the traffic signals at a single road intersection. This method demonstrated how a rule-based multi agent strategy may elegantly resolve a challenging problem of traffic light control on a vast road network.

Lawrence Y. Deng et al. 2019 To accomplish the development trend in the intelligent transportation system, the video surveillance and self-adaptive urban traffic signal control systems were upgraded. The suggested solution used vision-based techniques to accurately determine real-time measurements in metropolitan roads.

Danko A. Roozemond et al. 2020 concentrated on how autonomous intelligent agents may be deployed in urban traffic light control systems. Intelligent agent technology is used to create adaptive traffic control units that respond to real-time traffic (short and long term) fluctuations. During operation, this system may give a balanced, coordinated, and ideal arrangement of the signal control scheme.

Problem Definition:-

Due to the complicated flow patterns of vehicle traffic, the existence of mixed traffic, and the presence of pedestrians, the problem of congestion and accident is especially acute in highwaytransportation. Traffic accidents can result in casualties, property damage, or even personal injury. Creating safe traffic flow is one of traffic engineering's key goals. The city of Nagpur is being built. Due to the combination of complicated flow patterns and the fast rise in industrialization, urbanization, and tourism, transportation activities have expanded, leading tosevere traffic difficulties, particularly near junctions.

Methodology:-

The design of a traffic signal primarily uses four strategies. They include:
1. Trail Cycle Method
2. Approximate Method Based on Pedestrian Crossing Requirement
3. Webster's Method
4. IRC Method

It is an analytical approach of determining the optimum signal cycle time C corresponding to minimum delay to all the vehicles at the approach roads of the intersection. The field work consists of determining the following set of values on each approach road near the intersection:

The normal flow q on each approach during the design hour an The saturation flow ,S per unit time The normal flow values q1 and q2 on road 1 and road 2 are determined from field studies conducted during the Design hours or the traffic during peak 15 minute's period. The saturation flow of vehicles is determined from careful field studies by noting the number of vehicles in the stream of compactflow during the green phases and the corresponding intervals precisely. In the absence of datathe approximate value of saturation flow is estimated assuming 160 PCU per 0.3 m width of approach road. Based on the selected values of normal flow, the ratio y1=q1/S1 and y2=q2/S2are determined on the approach roads1 and 2.In the case of mixed traffic, it is necessary to convert the different vehicle classes in terms of suitable of PCU values at signalized intersection; in case these are not available the may be determined separately.

The normal flow of the traffic on the approach roads may also be determined by conducting field's studies during off-peak hours to design different sets of signal timings during other periods of the day also, as required so as to provide different signal settings

Discussion on Paper:-

The primary accident cause, according to our analysis of the city's traffic, is vehicle collisionsat crossings. Rear-shunt crashes on approaches to intersections, right-angled collisions, fundamental right-turn collisions, and pedestrian collisions are all possible. The major goal ofthe dissertation is to deliver improved and safe traffic flow through signal design at the junctionsince these collisions may be prevented if correct signal design is done. The signal is created in accordance with IRC recommendations so that it can support the appropriate flow of traffic.

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