

Solar and Smart Energy Based Traffic Management System: A Review

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Abstract:

It is a well-known fact that as population is increasing the number of vehicles on the road is also increasing. Due to which, heavy traffic is generated on the road that is creating a big problem for the citizens and traffic policeman. As it is widely used to control the flow of vehicle therefore there should be a technology which helps the traffic to run smoothly. In this paper a review of the previously proposed system is presented. Also, with the help of solar energy, a solution to the big problem of traffic congestion is suggested. In this project, a system is suggested which reacts to the traffic density in real time and automatically adjust the timing based on the intensity of the vehicle on the road. One PIC Microcontroller is used in this project which represents the brain of the system. A prototype of smart traffic control system has been proposed in this project. Results and the proposed system are also presented here.

Introduction

Quick mobility is the basic need in today's modern society. Therefore, use of different transportation services like using automotive vehicles, making subways, and using bicycles have become popular ways among people. However, among all these transportation facilities, due to comfort and practicality automotive vehicles are the most adopted version of these transportation modes [1]. Therefore, if continuous population growth is assumed, there is equivalent increase in the numbers of vehicles is also expected. But it is much quicker than transport infrastructure development; subsequently, traffic bottleneck will become a pressing matter. Due to this situation, negative apprehensions for atmosphere and humanity such as growing in number of road traffic misfortunes, economic influences, and high levels of conservatory emissions have been aroused [2]-[3]. There may be three key sources of traffic congestion as mentioned below [4]:

- Traffic persuading events like instances, working sectors, and bad weather conditions.
- Traffic mandate due to variations in normal traffic and unusual events.
- Transportation infrastructure including traffic regulator devices and physical bottlenecks.

As there is a huge energy crisis and global warming in today's world the dependency on the conventional source of energy may not be a good solution. Renewable sources of energy which are the alternate source of energy are the best way to handle the problems due to energy calamity.

Sustainable assets are favored on the grounds that it is energized naturally at an a lot quicker pace than it very well may be expended. Non-inexhaustible assets like coal, fuel and so on can't be energized

commonly in certainty it hurts the nature from multiple points of view. Sun oriented power changes over the sun powered vitality into power. It is saddled in two different ways: Directly utilizing Photovoltaic and in a roundabout way utilizing concentrated sunlight based power. The most dynamic route is to change over the sunlight based vitality into power straightforwardly utilizing photovoltaic cells. Semiconductor materials are used for this purpose [5]. Only 9% of the energy sources are comprised of the renewable sources of energy. Since we are much dependent on fossil fuels, it harms the climate and generates pollution. That is why there is a need of 100% use of renewable source of energy. So, there is a need to build a smart control system which helps to control the traffic without any manual operator. The control system used in the proposed system uses sensors on the road to detect the number of vehicles and wherever the congestion is more it will automatically prioritize the flow of traffic. and Smart energy system is a combination This work is completely programmed and it keeps away from wastage of time because of the traffic. It has low power utilization and it gives a simple access in the rush hour traffic light. The work proposed by [6] Solar of customary traffic lights with a variety of sensors and artificial intelligence to keenly route vehicles and pedestrian traffic. Next section reviews some of the literatures presented earlier on the traffic management system and proposed solutions.

Literature Survey

This work is a functioning examination point among the scientists in this field all around the globe. More up to date draws near and inventive frameworks are being investigated to take care of the traffic issues. The following is the writing review for some arrangement over the most recent couple of years.

In the reference [7] P. Sinhmar proposed a traffic signal system that is the combination of two technologies i.e. solar and smart energy system. Author has considered the enhancement of traffic light controller in one of the city utilizing microcontroller and proposed numerous traffic light control and observing framework. They have attempted to decrease conceivable outcomes of automobile overloads, caused because of traffic lights, somewhat. The 89V51RD2 micro-controller have been used in the system which is based on MCS-51 family. The system comprises of IR transmitter and receivers. The proposed system in this paper, records the number of vehicle at predefined recording break on real time basis, which is used to analyze traffic condition at respective traffic lights associated to the system.

K. Vidhya, A. Bazila Banu [8] designed and developed a concentration based active traffic signal structure. Signal timing made to change automatically on identifying the traffic concentration at the intersection. Conventional traffic light system use fixed time concept which cannot be varied as per traffic concentration variations. The captured image is processed then transformed into grayscale image. After getting the image its threshold value is measured based on which authors have drawn a contour. It is used to analyze number of vehicles existing in image. After calculating the same, high density side is known. So, based on the values, signals will be prearranged for a particular side. Authors have used Raspberry pi as microcontroller in reported work, which provides signal effectiveness based on traffic concentration. Image processing is used as open tool software by displaying various conversion of

image on screen. With the help of this, number of vehicle is calculated and displayed on the screen. MATLAB tool is used to calculate the density of the vehicle by relating the four side of image which is given as input but it can't be used in real time applications due to slow speed therefore open software is used as it is easily install [8].

G.Kavya, B.Saranya in [9] reported a PIC Microcontroller based traffic control system. By using this system, the traffic could be handled easily. There is a fixed time slot for no. of vehicles and this time slot is given by counting number of vehicles on road. The microcontroller decides the traffic light delays for next recording interval. As this information is recorded, one can easily download it on the computer. [9]

SachinJaiswal et. al. [10] reported a four-way lane crossing. In this paper, three problems have been identified and addressed. RFID concept is utilized to mark Ambulance path green and provides free way to Ambulance. Then the problems faced by Priority vehicles, IR transmitter and receiver are used so that the lane in which the priority vehicle is present is green. Then there comes traffic concentration control where IR transmitter and receiver is being used so that wherever the traffic is more the period of the green light of that particular lane will increase. [10]. Two more references have been studied presented as [11] and [12]. In these papers intelligent traffic light control system (ITLCS) and Smart Traffic Light Controller based on Microcontroller have been presented. Studying these references, we came up with an all new solution to the traffic problem regarding traffic congestion and unwanted long time delay.

Proposed System

The aim of this work is to reduce traffic congestion and unwanted long time delay. It is designed to be implemented in the places where huge traffic congestion is generated. The present traffic control system indicates when to proceed and when to stop. This project is to control a two-way traffic. When, there will be a red light on one side of the road then automatically there will be the green light on the other side. There is also a yellow light which helps the drivers to know that the signal is about to open. The two-way traffic light described in this project is a small prototype which can be seen in our daily life on street. With the help of this project, two-way traffic can be controlled very easily as traffic lights are widely used to control the rush on the road.

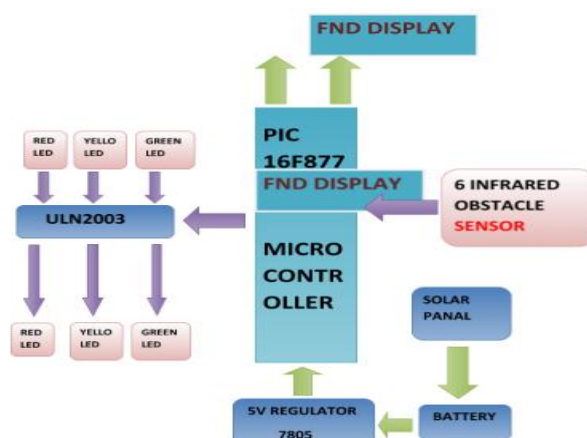


Figure-1 Proposed model

The proposed system as shown in the Figure-1 consists of microcontroller, FND display, PIC 16f877, Infrared obstacle sensor, ULN2003, SV Regulator, Solar panel and battery.

Microcontroller controls all processes in the system and sensors determine level of gridlock in roads. The main problem in the existing traffic system is that the time slot is fixed. The IR sensor in this project acts as a comparator. The comparator is used to compare the analog voltages of potentiometer and the voltage generated by the photodiode. The proposed system is better than the other system as it will automatically adjust its timing on the basis of density on the road. If on one road there are 20 cars and on the other road there are 5 cars it will prioritize its time on the road having 20 cars and will display green signal for a long period of time. This system is cost effective and can be installed in the present traffic signal very easily.

Conclusion:

In this paper, a brief review of some reported work has been presented. Literatures based on traffic management, traffic congestion control, priority control etc. have been studies and complied. Finally, a microcontroller based cost effective traffic management system is proposed. Microcontroller is used for density based traffic signal. The proposed system definitely works successfully to solve problematic traffic congestion. In present traffic system, suppose there is a huge traffic congestion area where a large number of vehicles like personal transport, public transport and emergency vehicles have to wait for extended hours to change the traffic signals at juncture points. This leads to excess time requirement especially for emergency conditions. Therefore, the proposed system presents a meaningful solution for such kind of traffic by using IR sensors, which monitors the strength of vehicles on the road. The IR sensors give the information to the microcontroller to follow the program with the time as desired. Therefore, the proposed solution is useful for the society at large.

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