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Enhancing Traffic Discipline

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ABSTRACT: The project aim is at designing a density based dynamic traffic signal system where the timing of signal will change automatically on sensing the traffic density at any junction with ambulance clearance. Traffic congestion is a severe problem in most cities across the world and therefore it is time to shift more manual mode or fixed timer mode to an automated system with decision making capabilities. Present day traffic signaling system is fixed time based which may render inefficient if one lane is operational than the others. To optimize this problem, we have made a framework for an intelligent traffic control system. Sometimes higher traffic density at one side of the junction demands longer green time as compared to standard allotted time. We, therefore propose here a mechanism in which the time period of green light and red light is assigned on the basis of the density of the traffic present at that time. The density-based traffic light system with ambulance clearance presented in this project offers an innovative solution to address urban traffic congestion and emergency vehicle clearance challenges. The system utilizes 8 IR sensors to detect vehicle presence and determine traffic density. A PIC micro-controller processes sensor data and controls 12 LED's representing traffic lights. Based on the traffic density, the system dynamically adjusts traffic light signals to optimize traffic flow. Additionally, the system includes an ambulance clearance mode enabled by RF communication. When an ambulance approaches, it sends a signal to the system, prompting the micro-controller to override traffic light settings and grant clearance for the ambulance to pass through safely. Once the ambulance has cleared the area, the system resumes normal traffic light operation based on the prevailing traffic density

KEYWORDS: Traffic signal system, Density, Timing, Ambulance clearance, Automated

I. INTRODUCTION

One of such over-stretched infrastructure is the road, a circumstance which has resulted to increase in traffic. In spite of the fact that traffic lights have dependably been utilized for controlling the movement of traffic (pedestrian or automobile), traffic management in many real urban areas around the globe has kept on being a subject of concern. A traffic light is a signaling device which controls a traffic flow at road intersections. It consists of three basic lights which include red, yellow and green. Red signal is used to halt traffic from proceeding; yellow signal alerts vehicles for brief stop, while green signal alerts vehicles for procession in the indicated directions. Traffic congestion is a situation that happens on road networks in which vehicles travel slower than usual due to the increased physical use of vehicles (traffic) on the road at that moment. Also known as traffic jam, traffic congestion's may result from roads being blocked, bad roads, accidents on the road, lack of proper traffic light system to control vehicles, inappropriate driving by road users etc. This would make the journey longer due to the slow movement of the traffic and increased queuing of vehicles. Urban communities started to make traffic tenets to minimize crashes, while traffic flags and cops were utilized to coordinate option to proceed at major urban convergences. Traffic control development in urban streets has aided easy movement and use of automobile in mega cities. Most of the major roads have effective traffic control system, which has facilitated easy flow of vehicles in urban regions. Railroads were invented serving as a temporary solution to the developing issue of street traffic control. However, this creates congestion at terminals inside urban communities.

II. PROBLEM STATEMENT

One of the various problems we manage in modern life is the nature of traffic congestion. The primary causes of the growing traffic obstacles are supposedly the large number of vehicles, the poor infrastructure, and the illogical allocation of development. The main factor causing traffic congestion is the large number of vehicles, which is a result of population growth and economic expansion. On road networks, traffic congestion is a phenomenon that arises with

increased use and is typified by slower travel times, longer trip times, and longer lines of vehicles. The most prevalent example is how cars actually use the roadways. Extreme traffic congestion occurs when there is so much traffic that the movement of vehicles on a route (or at its intersections) slows down. A traffic jam, also referred to as a traffic snarl-up, occurs when cars are completely halted for extended periods of time. Road rage can result from drivers being upset by traffic congestion. In an effort to prevent traffic congestion, Traffic Sign Recognizing (TSR) is used in traffic situations to control traffic signs, alert drivers, and mandate or forbid specific activities. A rapidly, solid, and real-time automation detection of traffic signs and recognition system may substantially improve driving comfort and safety by assisting and relieving the driver. Traffic jams are an ongoing issue that has become a nightmare for the inhabitants of most cities in the world. It is brought on by signal delays, improper traffic light timing, etc. Traffic light delays are hard coded and independent of flow of traffic. Thus, there is a growing need for systematic quick automatic systems to optimize traffic control. The traditional traffic light system is based on a manual mode and a fixed time concept that is assigned to each side of the intersection and is not adjusted based on the volume of traffic at certain intersections. As a result, fuel is consumed and time is wasted needlessly. Moreover, it causes unwanted traffic congestion. It's time to switch from a fixed timer or more manual mode to an automated system that can make decisions. Intelligent vision-based traffic light controllers are needed to reduce traffic delays and travel times due to the massive growth in urbanization and traffic congestion, especially in developing countries where sensor-based traffic light controllers are unreliable and the current automatic time-based control is not realistic. These days, one of the main issues facing metropolitan areas is traffic congestion. The existing poor state of road infrastructure and the expanding number of transportation options will inevitably lead to a far wider increase in traffic difficulties. Furthermore, a number of studies and statistics produced in emerging nations suggested that the majority of traffic accidents are caused by extremely narrow roads and the detrimental expansion of transportation options. Many academics have been drawn to this field of study by the thought of effectively controlling traffic lights in real time. Their aim is to develop an automatic tool that can predict traffic congestion and forecast the traffic sign time interval depending on this variable.

III. PROJECT OVERVIEW

In an embedded system, software and hardware combine their efforts to finish a task. Some of the main devices used in embedded products are Microprocessors and Micro-controllers. Microprocessors are commonly referred to as general purpose processors as they simply accept the inputs, process it and give the output. In contrast, a micro-controller not only accepts the data as inputs but also manipulates it, interfaces the data with various devices, controls the data and thus finally gives the result. The exclusive project "ENHANCE TRAFFIC DISPALNE" combines a PIC16F877A micro-controller to monitor and control traffic lights according to ambulance direction using radio frequencies and traffic density using infrared technology.

IV. LITERATURE SURVEY

Udoakah1 Y. N. and Okure I. G. (2017)[1] Traffic congestion especially at road intersections is becoming an issue for which road traffic users contend with daily. The conventional traffic light applies a fixed logic of allocating equal "GO" time to lanes of traffic at road intersections irrespective of the density of traffic on each lane. Using the PIC18F4550 microcontroller interfaced with infrared sensors, a new traffic light control system was developed to ease the flow of traffic at a particular troubled spot in Uyo Metropolis (Abak Road, Udo Eduok, Udo Obio streets intersection) in Akwa Ibom State, Nigeria. Simulation of the proposed design was performed using the Proteus Software while implementation was carried out on a prototype. Performance evaluation of the prototype implemented showed that the 4 arrays (IR Transmitter and Receiver) of infrared sensors interfaced with the microcontroller using AND gates and strategically positioned to read the density of traffic on each lane at the intersection triggered when a vehicle comes between the transmitter and the receiver. Obtaining inputs from these sensors together with the logic from the microcontroller, a new traffic light control system was developed capable of controlling traffic based on the density of each lane of traffic.

Kham N and New (2014) [2] There are many problems of congestion with traffic light in many cities. This problem of congestion can be caused by long time delays of traffic light's Red light. When there are emergency case at traffic light intersection which are always busy with many vehicles, this problem can also be caused. The possibilities of traffic jams caused by traffic light can reduce by using the Programmable Integrated Circuit (PIC) 16F877A microcontroller. The intended system is to change the sequence back to the normal sequence after triggering for the emergency modes by using the controller. Many accidents which often happen at the traffic light intersections will be reduced because of using this system. The system that provides the traffic control of six way and four junction of modern traffic light has

been implemented with arrowed signal for each direction. The arrowed signal of red, yellow and green light are displayed with LEDs. There are two modes of traffic light sequence in this system. One is the normal sequence and the other is the emergency sequence. The phases of red, yellow and green are determined by computer programming based on the patterns of traffic light congestion.

Traffic Control Systems Handbook (2005). [3] It serves as a basic reference in planning, designing and implementing traffic control systems. Specific chapters include introduction, summary of available and emerging traffic control system technology, control concepts for urban and suburban streets (traffic control parameters, descriptions of traffic control concepts and their application), a brief summary of control and management concepts for freeways, traffic detectors, local controller operation, traffic control system architectures, a brief summary of traffic control system communications, traveler information systems, the processes required for selection of a system, design and implementation, and systems management. The Handbook concludes with a discussion of intelligent transportation systems (ITS) plans and programs. The "Traffic Control Systems Handbook" references other FHWA handbooks for more detailed information on freeway management, communications, and traffic detectors.

Kell J. H. and Fullerton I. J (1998) [4] This Traffic Signal Timing Manual (TSTM) is intended to be a comprehensive guide to the traffic signal timing engineer and technician on traffic signal logic principles, practices, and procedures. The TSTM represents a synthesis of traffic signal timing concepts, analytical procedures, and applications based on North American practice into a single publication. The manual also presents a framework for evaluating traffic signal timing applications related to maintenance and operations.

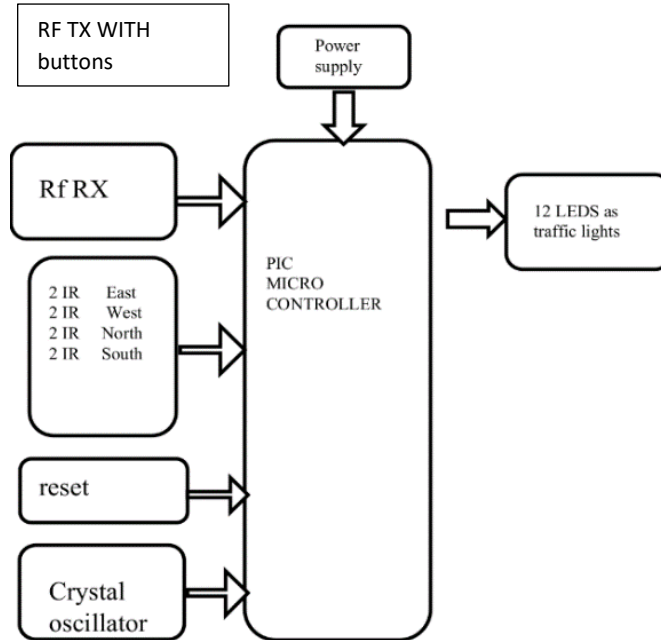
Sinhmar P (2012) [5] Red Light Running (RLR) has been associated with road traffic collisions in many jurisdictions across the world. The study aimed at evaluating the factors related to red light running (RLR) in Trinidad and Tobago that could be incorporated into policies that would aim to reduce this tendency and its related costs. Using data collected from the Traffic Unit of Trinidad and Tobago and three major intersections in the country, analysis was done on the impact of time of the day, age of the driver, ethnicity, gender, type of the vehicle, location and day of the week which are related to RLR. The results showed that the highest number of RLR occurs during rush hours in the morning and also in the evenings. Also, Indo-Trinidadian and male drivers display a higher tendency towards RLR. It was also established that some junctions have higher RLR rates than others and that Fridays have more RLR cases than all the other days of the week. These findings are very similar to those made in other countries such as the USA. The study has resulted in specific findings that can be used to improve traffic safety policies in the country.

Nwoye C. D., Usikalu M. R., Babarimisa I. O, Achuka J. A and Ayara W. A. (2017) [6] off light and other appliances wherever it is not needed is a concern. In Covenant University, the issue led to various rules that try to limit the way light is being used in the halls of residence, classrooms and other buildings. The main aim of this project is to conserve energy. This project presents the construction of a power control system which can detect the approach of a person, and then turn the power of a room on. The project involves four stages: the power supply stage, the sensor stage, the arduino stage and the switching mechanism stage. The power supply stage involves the supply of power to the arduino and the sensor. The sensor stage consist the passive infrared sensor which is the core part of the project. It detects the radiated heat energy from a person and converts the energy to an electrical signal which is sent to the arduino for processing. The arduino then processes the signal and sends a specific voltage to the relay that actuates the power switch to on. When nobody is detected the power is turned off. Conclusively, the constructed energy control system prevents energy wastage in the lecture halls, classrooms and other buildings.

V. OBJECTIVE

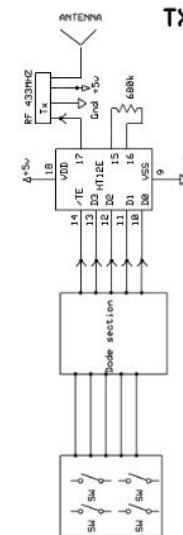
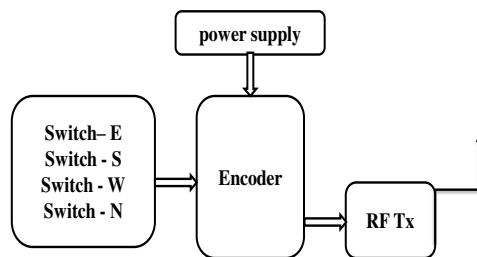
The objective of this research project was that intent of coordinating traffic signals is to provide smooth flow of traffic along streets and highways. A well-timed, coordinated system permits continuous movement along an arterial or throughout a network of major streets. Automatic traffic lights control. Clearance of Emergency vehicles. Traffic density can be known by using IR sensors. Three levels to indicate Traffic density. Using RF technology and selection switch to indicate the direction of ambulance. Using PIC Micro-controller to achieve this task.

VI. CIRCUIT DIAGRAMS



Block Diagram

density based traffic signal with ambulance clearance
1. Ambulance Section



schematic diagram of ambulance section

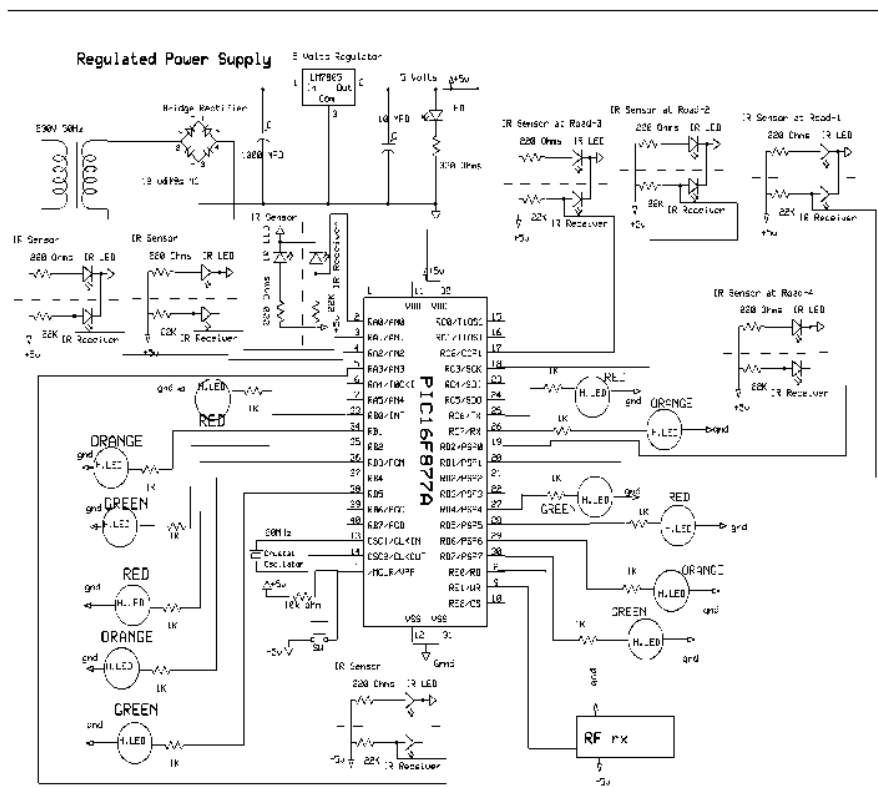
VII. METHODOLOGY

In the design and construction of this system all components work simultaneously. the density based traffic light controlling system along with ambulance clearance. So here we are using RF transmitter section to identify the ambulance. which is RF module which we are going to provide this with the ambulance drivers and whenever the emergency is required to provide the access for the traffic lights, then the person has to enable the direction using this RF remote. and the same data will be received by this rf receiver module and microcontroller will provide the green

light or traffic signal for the respective direction for the ambulance. At the same time, whenever the normal without any ambulance condition, the system will check the density by using this IR modules. So we are using total eight IR modules which we place each side of two sensors. There we are going to detect the high, medium, And if there is no input from the IR sensor then it is considered as a low density. So we provided the traffic green light timings 3 seconds, 6 seconds for the medium, 9 seconds for the high traffic density. So based on this the PIC microcontroller will control the traffic lights timings

VIII. WORKING ALGORITHM

The working of the project is divided into four steps. If there is traffic at all the signals, then the system will work normally by controlling the signals one by one. If there is high traffic near a signal, then the system will gives green signal and will give more time. For example, if there is high density at signal 2, then will gives green signal up to 9 seconds. Check other signals densities. If there is low traffic near a signals, system will gives green signal with less time. For example, if there is high density at signal 2, then will gives green signal up to 6seconds. Check other signals densities. If there will not detect any sensor from any signal ,then gives very less time like 3 seconds. If an ambulance is detected in a particular lane then the preference will be given to that particular lane only, and that control will be given the traffic police.



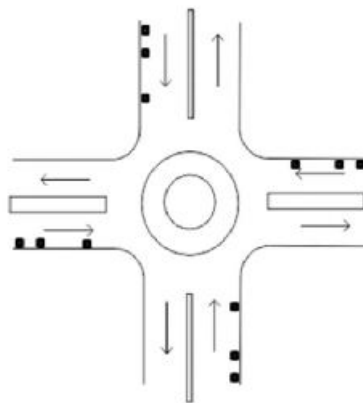
IX. DESIGN OF THE PROJECT

The construction of the system is divided into four stages as stated: power supply stage, sensor switching stage RF stage, and Micro controller connection stage. The power supply form 230V 50HZ.It 230V step down to 12V with step down transformer and it will converted AC to DC 12V with bridge rectifier. It has a nominal capacitor act as regulator to convert 12V to 5V , a discharge resistance of 330 Ω s and a cut off voltage of 5.4 V. According to the power needed for the components of the thickness based traffic light control framework, supply of +5 V regarding GND is created. The total hardware worked with PIC(Peripheral Interface Controller) rationale dimension of 0 V to 5V. Power applied to the VDD pin is stepped down to 5 V by the on-board regulator on the Microcontroller. The minimum voltage is about 6.2 V because of the regulator dropout (that is, the regulator needs at least 1.2 V above its 5 V output in order to operate) 9 -12 V is recommended. Applying a higher voltage to the system will not provide any more power to the

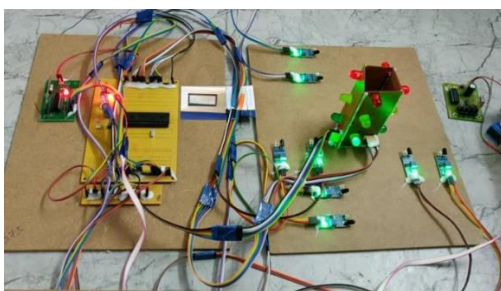
Microcontroller and its peripherals/shields. Instead, the excess power is dissipated in the regulator as heat. and we have interfaced the RF module HFI E0, E1, E2 pins and each RF module takes 3V to 6V. 8 IR sensors at A0, A1, A2, A3 and C0, C1, C2, C3 pins and each IR sensor takes 1.2V to 3.4V. the total 12 LEDs interface at pin numbers of C6, C7, D4, D5, D6, D7 and B0 to B5 and each LED take 1.8V to 3.3V. So these are the main input and output pin connections of our microcontroller.

X. RESULT

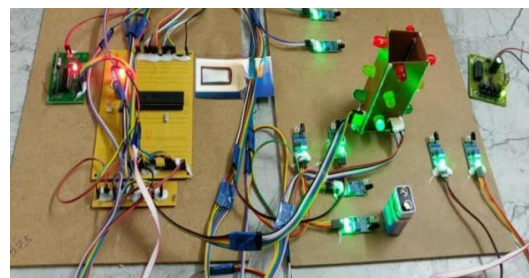
The result of the density-based traffic light system with ambulance clearance project is a smart and efficient traffic management system that improves traffic flow and safety in urban areas. By dynamically adjusting traffic light signals based on real-time traffic density, the system reduces congestion and improves the overall flow of traffic. The system provides timely clearance for emergency vehicles, such as ambulances, ensuring their safe passage through intersections. Using energy-efficient LEDs for traffic lights reduces electricity consumption and operating costs. The system offers a cost-effective solution for managing traffic flow and providing emergency vehicle clearance, potentially reducing the need for expensive infrastructure upgrades. The system provides real-time monitoring of traffic density and emergency vehicle clearance, allowing for better traffic management and response to changing conditions.



Schematic Diagram of Proposed Road Layout for Implementation



Normal mode



After detection mode

XI. CONCLUSION

Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced IC's with the help of growing technology, the project has been successfully implemented. Thus the project has been successfully designed and tested.

The proposed integrated solar-powered WIFI surveillance system for speed monitoring presents a comprehensive solution that leverages advanced technology and renewable energy sources. By utilizing WIFI technology, the system ensures reliable communication over a wider range compared to Bluetooth, facilitating seamless data transmission.



between speed monitoring devices, surveillance cameras, and the central monitoring system. Powered by solar energy, the system reduces dependence on grid electricity, promoting environmental sustainability and cost-effectiveness. High-resolution surveillance cameras are strategically deployed to capture speeding violations, enhancing enforcement capabilities. Through continuous monitoring, data analysis, and prompt enforcement actions, the system contributes to improved road safety by deterring speeding behavior and minimizing accident risks. Overall, this integrated approach represents a forward-thinking solution that combines innovation with eco-friendly operations to address speed enforcement challenges effectively.

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