iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 12 **Issue:** IV **Month of publication:** April 2024

DOI: https://doi.org/10.22214/ijraset.2024.59622

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 12 Issue IV Apr 2024- Available at www.ijraset.com

Traffic Signal Controller System and Vehicle Count-Based Road Congestion Detection

Pallam Venkatapathi[1], Kondu Vinay[2], Kummathi Harshavardhan Reddy[3], Mulli Karthik[4], Dr Sudhakar Alluri[5]
[1, 2, 3, 4, 5]*ECE Department, CMR Institute of Technology, Hyderabad, Telangana*

Abstract: ***Traffic congestion is one of the major modern-day crisis in every big city in the world. Recent study of World Bank has shown that average vehicle speed has been reduced from 21 km to 7 km per hour in the last 10 years in Dhaka. Inter metropolitan area studies suggest that traffic congestion reduces regional competitiveness and redistributes economic activity by slowing growth in county gross output or slowing metropolitan area employment growth. As more and more vehicles are commissioning in an already congested traffic system, there is an urgent need for a whole new traffic control system using advanced technologies to utilize the already existent infrastructures to its full extent. Since building new roads, flyovers, elevated expressway etc. needs extensive planning, huge capital and lots of time; focus should be directed upon availing existing infrastructures more efficiently and diligently. Previously different techniques had been proposed, such as infra-red light sensor, induction loop etc. to acquire traffic date which had their fair share of demerits. In recent years, image processing has shown promising outcomes in acquiring real time traffic information using CCTV footage installed along the traffic light. Different approaches have been proposed to glean traffic data. Some of them count total number of pixels , some of the work calculate number of vehicles .These methods have shown promising results in collecting traffic data.***

Keywords: Color cast, Color image enhancement, Degraded image, Dusty weather, Fuzzy Intensification(FI) operators, Dark channel prior (DCP)

I. INTRODUCTION

INDIA is the second most populous Country in the World and is a fast growing economy. It is seeing terrible road congestion problems in its cities. Infrastructure growth is slow as compared to the growth in number of vehicles, due to space and cost constraints [1]. Also, Indian traffic is non lane based and chaotic. It needs a traffic control solutions, which are different from the developed Countries. Intelligent management of traffic flows can reduce the negative impact of congestion. In recent years, wireless networks are widely used in the road transport as they provide more cost effective options [2]. Technologies like ZigBee, RFID and GSM can be used in traffic control to provide cost effective solutions. RFID is a wireless technology that uses radio frequency electromagnetic energy to carry information between the RFID tag and RFID reader. Some RFID systems will only work within the range inches or centimeters, while others may work for 100 meters (300 feet) or more.

II. LITERATURE REVIEW

1) Siddique, A. (2017). WB: Dhaka's average traffic speed 7kmph. [online] Dhaka Tribune.

In "Violation detection method for vehicular ad hoc networking," Every hour, nearly 40 people under the age of 25 die in road accidents around the world. According to the World Health Organization, this is the second most important cause of death for 5- to 29-year-olds. In India, drunk driving and inefficient law enforcements are major contributing factors. The current system of visual identification of traffic violation, conducted by the traffic authorities, cannot work everywhere and every time. There is a great demand for simple and cost-effective solutions to traffic safety problem. In this paper, we propose a traffic violation detection technique for vehicular ad hoc networks to detect crossing speed limits and analyzing the behavior of driver. In this work, we used a sensor device, a digital map and GPS-based system for area of 1000 m × 1000 m. We analyzed the behavior of each vehicle in the network. Here, we have divided a network into a number of clusters, and each cluster has an infrastructure node (base station); the infrastructure node will be the point of contact for all the vehicles in that area. All infrastructure nodes communicate with a control center (master control room). If the driver violates traffic rule(s), then the infrastructure node will send an alert message to the control center. We have simulated our proposed model on a graphics package, and the simulation result suggests that drunken drivers can no longer escape from the law enforcers, which is the foundation for traffic safety.

2) M. Sweet, "Traffic Congestion's Economic Impacts: Evidence from US Metropolitan Regions," Urban Studies, vol. 51, no. 10, pp. 2088–2110, Oct. 2013.

In "Traffic light control in non-stationary environments based on multi agent Q-learning," In many urban areas where traffic congestion does not have the peak pattern, conventional traffic signal timing methods does not result in an efficient control. One alternative is to let traffic signal controllers learn how to adjust the lights based on the traffic situation. However this creates a classical non-stationary environment since each controller is adapting to the changes caused by other controllers. In multi-agent learning this is likely to be inefficient and computationally challenging, i.e., the efficiency decreases with the increase in the number of agents (controllers).

In this paper, we model a relatively large traffic network as a multi-agent system and use techniques from multi-agent reinforcement learning. In particular, Q-learning is employed, where the average queue length in approaching links is used to estimate states.

3) Md. Munir Hasan, Gobinda Saha, Aminul Hoque and Md. Badruddoja Majumder, "Smart Traffic Control System with Application of Image Processing Techniques,"in 3rd International Conference on Informatics, Electronics & Vision, Dhaka, May 2014.

In "A novel approach to implement green wave system and detection of stolen vehicles" In today's world, traffic jams during rush hours is one of the major concerns. During rush hours, emergency vehicles like Ambulances, Police cars and Fire Brigade trucks get stuck in jams. Due to this, these emergency vehicles are not able to reach their destinations in time, resulting into a loss of human lives.

We have developed a system which is used to provide clearance to any emergency vehicle by turning all the red lights to green on the path of the emergency vehicle, hence providing a complete green wave to the desired vehicle. A `green wave' is the synchronization of the green phase of traffic signals.

With a `green wave' setup, a vehicle passing through a green signal will continue to receive green signals as it travels down the road. Around the world, green waves are used to great effect. Often criminal or terrorist vehicles have to be identified. In addition to the green wave path, the system will track a stolen vehicle when it passes through a traffic light. In contrast to any traditional vehicle tracking system, in which the Global Positioning System (GPS) module requires battery power, our tracking system, installed inside the vehicle, does not require any power. The information regarding the vehicle has to be updated in the system database.

4) Lei Yang, Dewei Zhao and Xiaoyu Wu, "An improved Prewitt algorithm for edge detection based on noised image,"in 4th International Congress on Image and Signal Processing, Shanghai, China, October 2011.

In "Traffic light priority control for emergency vehicle using RFID," The proposed RFID traffic control avoids problems that usually arise with standard traffic control systems, especially those related to image processing and beam interruption techniques. This RFID technique deals with a multi vehicle, multi lane, multi road junction area. It provides an efficient time management scheme, in which a dynamic time schedule is worked out in real time for the passage of each traffic column. The real time operation of the system emulates the judgment of a traffic policeman on duty. The number of vehicles in each column and the routing are proprieties, upon which the calculations and the judgments are based. Keywords-EV (Emergency vehicle),PIC (Priority Intersection Control),RFID TAGS, VTL (Virtual traffic light).

III. EXISTING SYSTEM

Traffic congestion is one of the major modern-day crisis in every big city in the world. Recent study of World Bank has shown that average vehicle speed has been reduced from 21 km to 7 km per hour in the last 10 years in Dhaka. Intermetropolitan area studies suggest that traffic congestion reduces regional competitiveness and redistributes economic activity by slowing growth in county gross output or slowing metropolitan area employment growth .As more and more vehicles are commissioning in an already congested traffic system, there is an urgent need for a whole new traffic control system using advanced technologies to utilize the already existent infrastructures to its full extent.

Since building new roads, flyovers, elevated expressway etc. needs extensive planning, huge capital and lots of time; focus should be directed upon availing existing infrastructures more efficiently and diligently. Previously different techniques had been proposed, such as infra-red light sensor, induction loop etc. to acquire traffic date which had their fair share of demerits. In recent years, image processing has shown promising outcomes in acquiring real time traffic information using CCTV footage installed along the traffic light.

Fig 1:The human eye is able to classify both.

IV. PROPOSED SYSTEM

Edge detection technique is imperative to extract the required traffic information from the CCTV footage.It can be used to isolate the required information from rest of the image. There are several edge detection techniques available.They have distinct characteristics in terms of noise reduction, detection sensitivity, accuracy etc. It has been observed that the Canny edge detector depicts higher accuracy in detection of object with higher entropy, PSNR(Peak Signal to Noise Ratio), MSE(Mean Square Error) and execution time compared with Sobel, Roberts, Prewitt, Zero crossing and LOG.Here is a comparison between distinct edge detection techniques. In this paper, a system in which density of traffic is measured by comparing captured image with real time traffic information against the image of the empty road as reference image is proposed.

V. SYSTEM REPRESENTATION

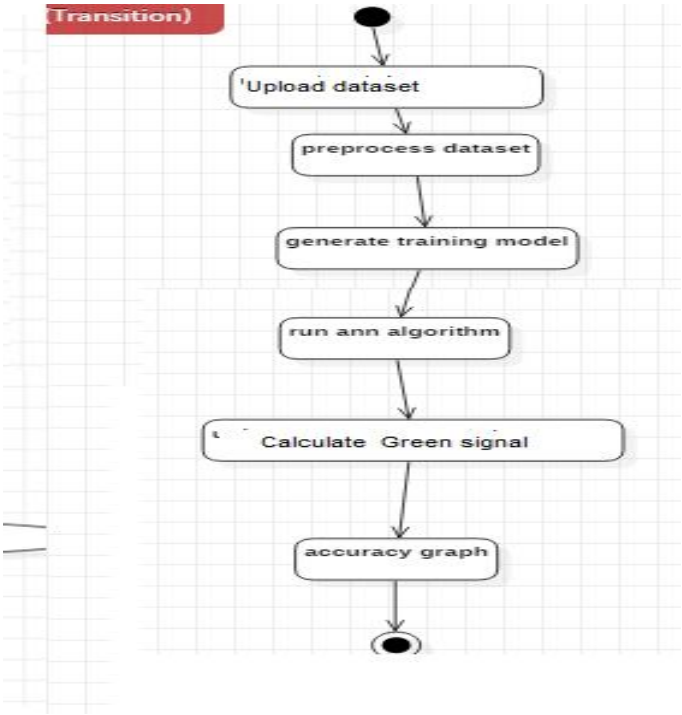


Fig 2: State Chart Diagram

The hardware and software that make up the entire system are its key components. Whereas hardware part consist of two sections i.e. transmitter and receiver, in which transmitter developed by four sensors, Master and Slave type combination. In master circuit four input sensors viz., Eye-blink sensor,Since building new roads, flyovers, elevated expressway etc. needs extensive planning, huge capital and lots of time; focus should be directed upon availing existing infrastructures more efficiently and diligently. Previously different techniques had been proposed, such as infra-red light sensor, induction loop etc. to acquire traffic date which had their fair share of demerits. In recent years, image processing has shown promising outcomes in acquiring real time traffic information using CCTV footage installed along the traffic light.

A. Block Diagram

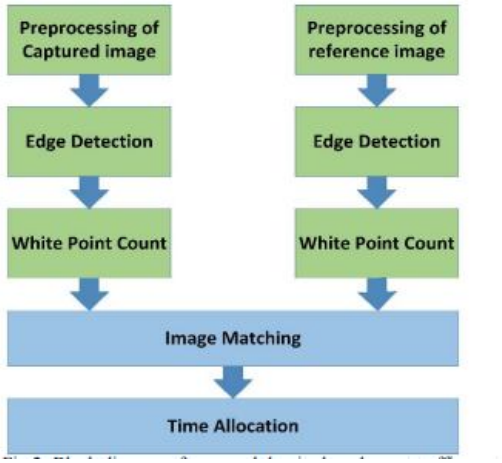


Fig 3: Main Block diagram

CANNY EDGE DETECTION:

When it comes to image classification, the human eye has the incredible ability to process an image in a couple of milliseconds, and to determine what it is about (label). It is so amazing that it can do it whether it is a drawing or a picture. The **Canny edge detector** is an edge detection operator that uses a multi-stage algorithm to detect a wide range of edges in images. It was developed by John F. Canny in 1986. Canny also produced a computational theory of edge detection explaining why the technique works. (Wikipedia)

VI. RESULTS AND APPLICATIONS.

This section shows the result of our project.

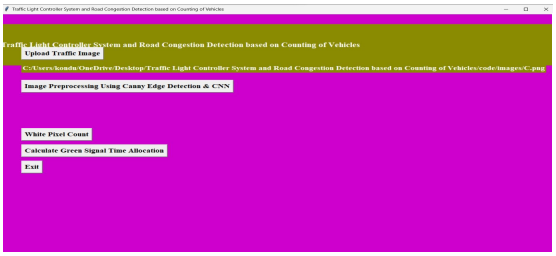


Fig 4. Project interface

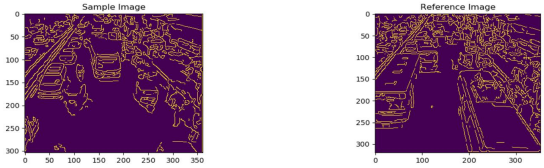


Fig.5 Using candy edge detection

The screen shots that appear on our close eye contact.

Fig6.White pixel count

Fig7. Green signal allocation

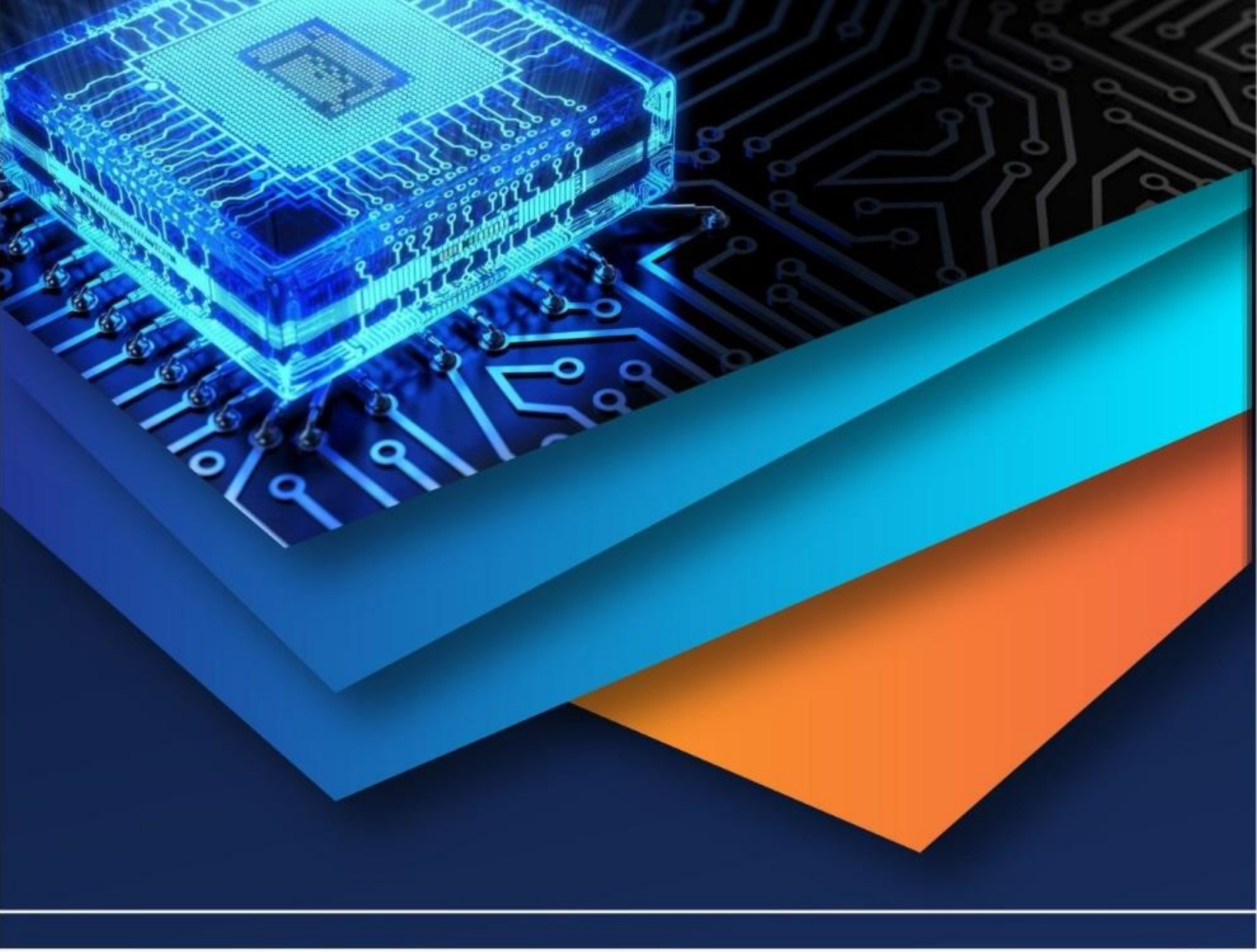
VII. CONCLUSION

In this paper, a smart traffic control system availing image processing as an instrument for measuring the density has been proposed. Besides explaining the limitations of current near obsolete traffic control system, the advantages of proposed traffic control system have been demonstrated. For this purpose, four sample images of different traffic scenario have been attained. Upon completion of edge detection, the similarity between sample images with the reference image has been calculated. Using this similarity, time allocation has been carried out for each individual image in accordance with the time allocation algorithm. In addition, similarity in percentage and time allocation have been illustrated for each of the four sample images using Python programming language. Besides presenting the schematics for the proposed smart traffic control system, all the necessary results have been verified by hardware implementation

REFERENCES

[1] Siddique, A. (2017). WB: Dhaka's average traffic speed 7kmph. [online] Dhaka Tribune. Available at: http://www.dhakatribune.com/bangladesh/dhaka/2017/07/19/dhakaaverage-traffic-speed-7-kmph/ [Accessed 25 Jul. 2017].
[2] M. Sweet, "Traffic Congestion's Economic Impacts: Evidence from US Metropolitan Regions," Urban Studies, vol. 51, no. 10, pp. 2088–2110, Oct. 2013.
[3] Md. Munir Hasan, Gobinda Saha, Aminul Hoque and Md. Badruddoja Majumder, "Smart Traffic Control System with Application of Image Processing Techniques,"in 3rd International Conference on Informatics, Electronics & Vision, Dhaka, May 2014.
[4] Pallavi Choudekar, Sayanti Banerjee and M. K. Muju, "Implementation of image processing in real time traffic light control," in3rd International Conference on Electronics Computer Technology, April, 2011.
[5] A. A. Shafie, Hazrat MD. ALI, Fadhlan Hafiz, Roslizar M. ALI, Smart Video Surveillance System for Vehicle DetectionJournal of Engineering Science and Technology 2011.6 (4), 469 480.
[6] Hazrat MD.ALI, A.A.Shafie Fadhlan Hafiz Roslizar, M. Ali. Advance Video Analysis System and its Applications. European Journal of Scientific Research 2010. 41 (1), 72-83.
[7] Fadhlan Hafiz, A.A. Shafie,Hazrat MD. ALI, Othman Khalifa. Event-Handling Based Smart Video Surveillance System. International Journal of Image Processing 2010. 4(1), 24-34.
[8] Vismay Pandit, Jinesh Doshi, Dhruv Mehta, Ashay Mhatre and Abhilash Janardhan, "Smart Traffic Control System Using Image Processing,"International Journal of Emerging Trends & Technology in Computer Science (IJETTCS), Vol. 3, Issue 1, January – February 2014.
[9] Zhang W, Fang X.Z, Yang X. Moving vehicles segmentation based on Bayesian framework for Gaussian motion model.Pattern Recognition Letters 2006. 27(1), 956-967.
[10] Li X, Liu Z.Q, Leung K.M. Detection of vehicles from traffic scenes using fuzzy integrals. Pattern Recognition 2002. 35(4),967- 980.
[11] Fadhlan Hafiz, A.A. Shafie,Hazrat MD. ALI, Othman Khalifa. Event-Handling Based Smart Video Surveillance System.International Journal of Image Processing 2010. 4(1), 24-34.
[12] Pallam Venkatapathi, Kondu Vinay, Kummathi Harshavardhan Reddy, Mulli Karthik, Dr. Sudhakar Alluri "Real Time Driver Gaze Tracking and Eyes off the Road Detection System" International Journal for Research in Applied Science & Engineering Technology (IJRASET) ISSN: 2321-9653; Volume 11 Issue X Oct 2023
[13] Angelica Pearl Francis, P. Venkatapathi, M. Shiva Kumar, Dr. M. Sreedhar Reddy "Embedded System Application on Shipping Surveillance and Control" International Journal for Research in Applied Science & Engineering Technology ISSN: 2321-9653; Volume 9 Issue IV Apr 2021
[14] P. Tejaswi, P. Venkatapathi "IOT based Smart Home with Load Control" International Journal for Research in Applied Science & Engineering Technology ISSN: 2321-9653; Volume 8 Issue XI Nov 2020
[15] M. Santosh, P.Venkatapathi " Vehicle position of Self-Recognition using Ultra High Frequency Passive RFID Tags" International Journal of Scientific Engineering and Technology Research(IJSETR), Volume 03, Issue 32, Oct 2014,ISSN: 2319-8885,pp.6294-6300.
[16] Venkatapathi Pallam, P.Bheerendra kumar," Computer Controlled Intrusion-Detector and Automatic Firing-Unit for Border Security" International Journal of Advanced Technology and Innovative Research (IJATIR), Volume 06, Issue 09, Oct 2014, ISSN:2348-2370,pp955-960.
[17] Viitaniemi V, Laaksonen J. Techniques for still image scene classification and object detection. ICANN 2006, Lecture Notes in Computer Science 2006. 4132, 35-44.
[18] Hampapur A, Brown L, Connell J, Ekin A, Haas N, Lu M, Merkl H, Pankanti SSmart video surveillance: exploring the concept of multiscale spatiotemporal tracking. IEEE Signal Processing Magazine 2005. 22(2), 38-51.
[19] Pochana Ashok Kumar, P. Venkatapathi, M. Shiva Kumar, Dr. M. Sreedhar Reddy "High Overhead Flip-Flop Alert Dependent on Time Slack Control Charge Sharing" International Journal for Research in Applied Science & Engineering Technology ISSN: 2321-9653; Volume 9 Issue III March 2021
[20] Haripal Reddy Kota, Barre Nikhitha, Karedla Akshitha, Pudota Praveen Naidu, Pallam Venkatapathi "IOT E-Circular Notification for Students Using a WIFI-Based LED Advertising Board" International Journal for Research in Applied Science & Engineering Technology (IJRASET) ISSN: 2321-9653; Volume 11 Issue XI Nov 2023

.



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY