DENSITY BASED AUTOMATIC TRAFFIC CONTROLLER SYSTEM

Priyasagi.N
Department of Computer Science and Engineering
Panimalar Engineering College, Chennai

Sindhuja.K
Department of Computer Science and Engineering
Panimalar Engineering College, Chennai

Dr.K. Valarmathi, ME., Ph.D., Professor
Department of Computer Science and Engineering
Panimalar Engineering College, Chennai

Abstract - The project is aimed 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. 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. IR trans receivers count the obstructions and provide an idea about the traffic density on a particular lane and feed this response to a controller unit which will make the necessary decisions as and when required.

Keywords - Microcontroller, Traffic signals, Proximity Infrared Sensor.

I.INTRODUCTION

In today's high-speed life, traffic congestion becomes a serious issue in our day-to-day activities. It brings down the productivity of individual and thereby the society as lots of work hour is wasted in the signals. High volume of vehicles, the inadequate infrastructure and the irrational distribution of the signaling system are main reasons for these chaotic congestions. It indirectly also adds to the increase in pollution level as engines remain on in most cases, a huge volume of natural resources in forms of petrol and diesel is consumed without any fruitful outcome. Therefore, in order to get rid of these problems or at least reduce them to significant level, newer schemes need to be implemented by bringing in sensor-based automation technique in this field of traffic signaling system. Under present scenario, traffic control is achieved by the use of a system of hand signs by traffic police personnel, traffic signals, and markings. Under current circumstances, traffic lights are set on in the different directions with fixed time delay, following a particular cycle while switching from one signal to other creating unwanted and wasteful congestion on one lane while the other lanes remain vacant. The system we propose identify the density of traffic on

individual lanes and thereby regulate the timing of the signals' timing. IR trans receivers count the obstructions and provide an idea about the traffic density on a particular lane and feed this response to a controller unit which will make the necessary decisions as and when required.

An embedded system is a microprocessor-based computer hardware system with software that is designed to perform a dedicated function, either as an independent system or as a part of a large system. At the core is an integrated circuit designed to carry out computation for real-time operations. Complexities range from a single microcontroller to a suite of processors with connected peripherals and networks; from no user interface to complex graphical user interfaces. The complexity of an embedded system varies significantly depending on the task for which it is designed. Embedded system applications range from digital watches and microwaves to hybrid vehicles and avionics. As much as 98 percent of all microprocessors manufactured are used in embedded systems. An embedded system is a microprocessor-based computer hardware system with software that is designed to perform a dedicated function, either as an independent system or as a part of a large system. At the core is an integrated circuit designed to carry out computation for real-time operations. Complexities range from a single microcontroller to a suite of processors with connected peripherals and networks; from no user interface to complex graphical user interfaces. The complexity of an embedded system varies significantly depending on the task for which it is designed. Embedded system applications range from digital watches and microwaves to hybrid vehicles and avionics. As much as 98 percent of all microprocessors manufactured are used in embedded systems.

II. LITERATURE SURVEY

This paper present by Sk Mahammad Sorif, Dipanjan Saha, Pallav Dutta on a streetlamp control system based on the Bolt IoT platform. Using LDR with LED lights the intensity can be controlled. IR sensors utilized on roadside send signals for the LEDs to get glowing for the next specific section of the road after sensing the density of vehicles. During daytime the LDR keeps the streetlamp off until the light level is low or the light frequency is low and the LDR resistance is high.[1]

This model is structured by Imran Kabir, Shihab Uddin Ahamad, Mohammad Naim Uddin, Shah Mohazzem Hossain, Faija Farjana, Partha Protim Datta, Md. Raduanul Alam Riad and Mohammed Hossam-E-Haider using the GSM-GPRS shield. The whole model has the superiority to be controlled in full-automated, semi-automated and manual method. The GPRS part has the access to internet which can use the sunset and sunrise timing to allow the system to operate in full-automated method. The entire process is controlled by ATmega-328p microcontroller.[2]

In this paper Automatic Street Light Controller by Shreyas M. Paralikar, Sayali V. Mahajan, Nihal G. Kolage, Prof. Sulakshana B. Mane, illigent street lighting, also known as adaptive street lighting, slows down when no activity is detected, but flashes when movement is detected. The IR sensors Sense a movement on the road and sends signal to Arduino and thus respective LEDs are turned on. Each sensor has sequence of 3 LED's. When 1st sensor senses the vehicle the first 3 led and turned on.[3]

The paper by Dr. Jayalakshmi B, Anjali V, Nithin Raj R, Nakul Nair, Rahul T M on IoT Based Energy Efficient Automatic Streetlight explains the external brightness of the environment is sensed by the LDR and it is given to the Arduino as input and the LEDs brightness is adjusted correspondingly as the output.[4]

This paper presents an Internet of Things (IoT)-based solar powered street lighting system with antivandalisation Mechanism by Archibong, Ekaette Ifiok, Ozuomba, Simeon, Ekott, Etinamabasiyaka where the system is a

stand-alone solar PV system which is self-powered. It automatically switches the street light ON and OFF utilizing the light dependent resistor (LDR) and saves power by utilizing infrared sensor (IR) together with the microcontroller to dim and brighten up the LED as at when required thereby increasing the life span of the lighting module.[5]

In this paper Arduino UNO Based Visitors Counting System for Vaccination Rooms by Sakshi Gupta, Sreenitya Mandava, B. Chandrakanth Reddy, Arduino is interfaced with an ESP32 Wi-Fi modem to connect with an internet router and access the cloud server. sensors. The Arduino passes the count of the visitors in the room to the cloud.[6]

This paper Intelligent Traffic Light System Using Computer Vision with Android Monitoring and Control by Jess Tyron G. Nodado, Hans Christian P. Morales, Ma Angelica P. Abugan, Jerick L. Olisea, Angelo C. Aralar, Pocholo James M. Loresco discussed an approach in developing traffic signaling system capable of prioritizing congested lanes based on real-time traffic density data using cctv photages and integrated with an automated and manual control ported in a mobile android-based application.[7]

This paper A Hierarchical Framework for Intelligent Traffic Management in Smart Cities explained by Zhiyi Li, Reida Al Hassan, Mohammad Shahidehpour, Shay Bahramirad, and Amin Khodaei outcomes traffic efficiency improvements can be achieved by the utilization of a closed-loop management system. Interactive simulations are conducted in this paper to examine the performance of the proposed framework in a real-world transportation system.[8]

This paper a hybrid Particle Swarm Optimization and Tabu Search Algorithm for adaptive traffic signal timing optimization is proposed by Maryam Alami Chentoufi and Rachid Ellaia. A novel algorithm that uses the information of the particle best neighbor in updating velocity and position, a new way of moving for each particle depending on her position. Second, we prove the effectiveness of the proposed algorithm for solving the real time traffic at isolated intersections.[9]

In the study on the paper A Cyber-Physical System for Freeway Ramp Meter Signal Control Using Deep Reinforcement Learning in a Connected Environment by Yi Hou, Xiangyu Zhang, Peter Graf, Charles Tripp, and David Biagioni, three deep RL methods—proximal policy optimization (PPO), Ape-X deep Q-network (DQN), and asynchronous advantage actor-critic agents (A3C)—are explored for ramp meter signal control.[10]

III. EXISTING SYSTEM

Under present scenario, traffic control is achieved by the use of a system of hand signs by traffic police personnel, traffic signals, and markings. Under current circumstances, traffic lights are set on in the different directions with fixed time delay, following a particular cycle while switching from one signal to other. This system creates unwanted and wasteful congestion on one lane while the other lanes remain vacant.

IV. PROPOSED SYSTEM

The system we propose identify the density of traffic on individual lanes and thereby regulate the timing of the signals' timing. IR trans receivers count the obstructions and provide an idea about the traffic density on a particular lane and feed this response to a controller unit which will make the necessary decisions as and when required. Arduino IDE is the software required.

S.NO:	Component Name	Count
01.	Atmega2560 Microcontroller	1
02.	Liquid Crystal Display	1
03.	IR Sensor	4
04.	Traffic light LEDs with Model	1
05.	5V/3A Power Supply	1
06.	Power chord	1

TABLE I. HARDWARE REQUIREMENTS

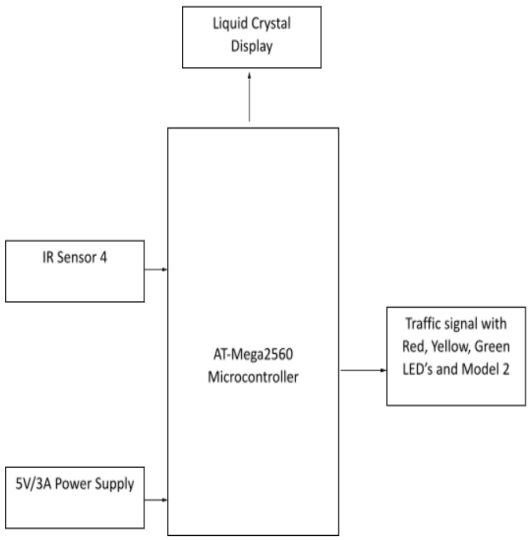

Fig.1. Block diagram of proposed system.

V. EXPERIMENT AND RESULT

The software implementation of the design is done using Arduino IDE software. The traffic signal LEDs, four IR Sensors and the LCD display is connected to the AT-Mega2560 Microcontroller and it is powered through 5V/3A power supply. Each lane will have two sensors, the first one indicates the medium traffic level and the second one indicates the high traffic level. At the low traffic time each signal is given 20 seconds for Green light indication. During the medium level traffic, the duration of the green light is increased by 20 seconds that is it lasts for 40 seconds and during the high-level traffic, the duration of the green light is increased and it lasts for 60 seconds.

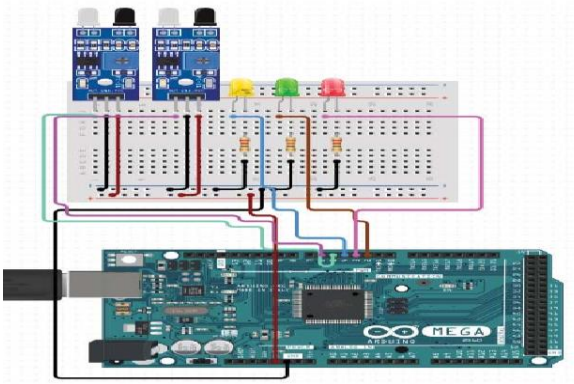

Fig.2. Pin diagram of proposed system.

OUTPUT FROM THE LCD DISPLAY:
During Low traffic level

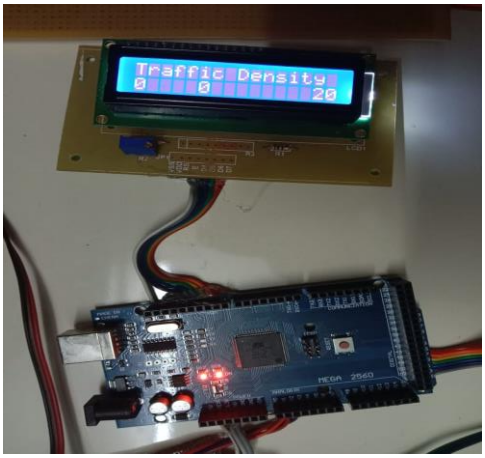

Fig.3. LCD display during low traffic level

During Medium traffic level

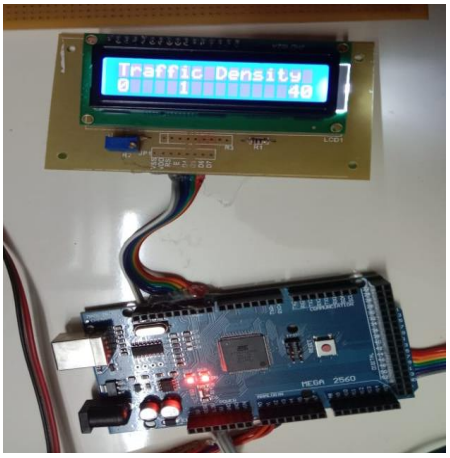

Fig.4.LCD display during medium traffic level

During high traffic level

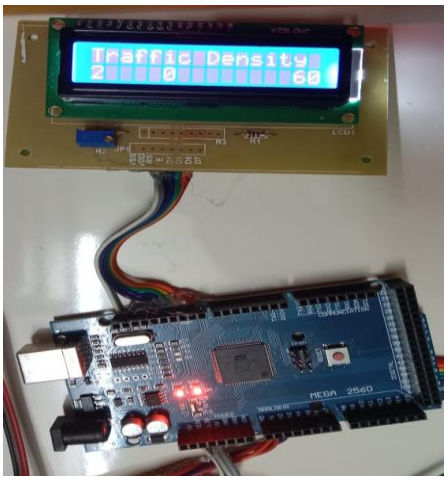

Fig.5.LCD display during high traffic level

VI. CONCLUSION

In this paper, an automatic way for regulating traffic using the IR sensors is proposed. The components used in the project, like Arduino and sensors are slowly becoming an indispensable part of our daily routines. This program can be adapted by the larger cities and the timings can be changed based on the traffic condition on that city. This method of controlling traffic can reduce man hours and yield great impacts in the society.

VII. FUTURE ENHANCEMENT

In future we can power this project using solar panels which will create a great impact in the society. We can also introduce a module in which the ambulances can easily passes the traffic signal by giving the control of traffic signal to ambulance drivers.

REFERENCES

[1] Sk Mahammad Sorif, Dipanjan Saha, Pallav Dutta, "Smart Street Light Management System with Automatic Brightness Adjustment Using Bolt IoT Platform", 2021 IEEE International IOT, Electronics and Mechatronics Conference.

[2] Imran Kabir, Shihab Uddin Ahamad, Mohammad Naim Uddin, Shah Mohazzem Hossain, Faija Farjana, Partha Protim Datta, Md. Raduanul Alam Riad and Mohammed Hossam-E-Haider, "GSM-GPRS Based Smart Street Light", 2021 2nd International Conference on Robotics, Electrical and Signal Processing Techniques.

[3] Shreyas M. Paralikar, Sayali V. Mahajan, Nihal G. Kolage, Prof. Sulakshana B. Mane, "Automatic Street Light Controller", International Research Journal of Engineering and Technology (IRJET), Volume: 07 Issue: 02| Feb 2020.

[4] Dr. Jayalakshmi B, Anjali V, Nithin Raj R, Nakul Nair, Rahul T M, "IoT Based Energy Efficient Automatic Streetlight", Proceedings of the International Conference on Intelligent Computing and Control Systems.

[5] Archibong, Ekaette Ifiok, Ozuomba, Simeon, Ekott, Etinamabasiyaka, "Internet of Things (IoT)-based, Solar Powered Street Light System with Antivandalisation Mechanism",2020 International Conference in Mathematics, Computer Engineering and Computer Science.

[6] Sakshi Gupta, Sreenitya Mandava, B. Chandrakanth Reddy, "Arduino UNO Based Visitors Counting System for Vaccination Rooms", International Research Journal of Engineering and Technology (IRJET), Volume: 08 Issue: 11| Nov 2021.

[7] Jess Tyron G. Nodado, Hans Christian P. Morales, Ma Angelica P. Abugan, Jerick L. Olisea, Angelo C. Aralar, Pocholo James M. Loresco, "Intelligent Traffic Light System Using Computer Vision with Android Monitoring and control", Proceedings of TENCON 2018 – 2018 IEEE Region 10 Conference.

[8] Zhiyi Li, Reida Al Hassan, Mohammad Shahidehpour, Shay Bahramirad, and Amin Khodaei, "A Hierarchical Framework for Intelligent Traffic Management in Smart Cities", IEEE TRANSACTIONS ON SMART GRID, VOL. 10, NO. 1, JANUARY 2019.

[9] Maryam Alami Chentoufi and Rachid Ellaia, "A Hybrid Particle Swarm Optimization and Tabu Search algorithm for adaptive traffic signal timing optimization", 2018 IEEE International IOT, Electronics and Mechatronics Conference.

[10] Yi Hou, Xiangyu Zhang, Peter Graf, Charles Tripp, and David Biagioni, "A Cyber-Physical System for Freeway Ramp Meter Signal Control Using Deep Reinforcement Learning in a Connected Environment", 2021 IEEE Intelligent transportation Systems Conference (ITSC) Indianapolis, USA. September 19-21, 2021.

[11] SayaliArkade, Akshada Mohite, Rutuj, Vikas, "IoT Based Street Lights for Smart City" International Journal for Research in Applied Science & Engineering Technology (IJRASET), Volume 4 Issue XII, December 2016.

[12] Ritisha Salvi, Shraddha Margaj, Kavita Mate1, Bhakti Aher, Smart Street Light Using Arduino Uno Microcontroller" International Journal of Innovative Research in Computer and Communication Engineering, Vol. 5, Issue 3, March 2017.

[13] Parkash, Prabu V, Dandu Rajendra, "Internet of Things Based Intelligent Street Lighting System for Smart City" International Journal of Innovative Research in Science, Engineering and Technology, Vol. 5, Issue 5, May 2016.

[14] Jeetendra Swami, Himanshu Patel, Krishna Patel and Ms. Nisha Bhalse, "IoT Based Street Light Automation System" International Journal of Trend in Research and Development, Volume 6(2), ISSN:2394-9333.

[15] Dr.A.S.C.S. SASTRY, K.A.S.K. Bhargav, K. Surya Pavan, M. Narendra "Smart Street Light System using IoT" International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056, p-ISSN: 2395-0072, Volume: 07 Issue: 03 | Mar 2020.

[16] J. Arthi, W. Lydiapreethi, and B. Gunasundari, "IOT Based Smart LED Street Lighting System" IJRTI | Volume 2, Issue 4 | ISSN: 2456-3315.