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TRAFFIC ANALYSIS USING IOT

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Abstract— **Traffic congestion is a major problem in many cities of India along with other countries. Failure of signals, poor law enforcement and bad traffic management has lead to traffic congestion. One of the major problems with Indian cities is that the existing infrastructure cannot be expanded more, and thus the only option available is better management of the traffic. Traffic congestion has a negative impact on economy, the environment and the overall quality of life. Hence it is high time to effectively manage the traffic congestion problem. There are various methods available for traffic management such as video data analysis, infrared sensors, inductive loop detection, wireless sensor network, etc. All these methods are effective methods of smart traffic management. But the problem with these systems is that the installation time, the cost incurred for the installation and maintenance of the system is very high. Hence a new technology called Smart Traffic Analysis System which helps to detect strength of traffic on each side and release the traffic based on strength so that it will reduce congestion problem.**

Keywords—**Traffic Analysis, Ardino, IOT, Ultra Sonic**

I. INTRODUCTION

In our country, the traffic management systems are very old. In our city what happens the traffic is generated in many sides , so the managing signals are working properly but not flexible. In existing systems signal time that assigns to each and every having same and long time.

In existing system having 1.25 min for changing light which is fixed. And the vehicles at another sides are waiting for changing light. In this system we are assigned time for changing lights of signal. The vehicles are coming from each sides, and to control them traffic signals are established.

Some times what happens the number of vehicles are more at one side and at another side no. of vehicles are less, so that the if less vehicles side are getting more time to pass from signal which is not needful and another side vehicles are waiting.

To manage this time and provide efficient management system we are creating this. In which first the traffic is analysed from each side and depending on count of the vehicles we are deciding how much time is sufficient for the sides. And we are handling each side traffic easily.

Choice of topic with reasoning

The Internet of Things (IoT) is a rapidly evolving technology that allows for the interconnectivity of devices and sensors to exchange data and information. One area where IoT has great potential is in the field of traffic control. The ever-increasing number of vehicles on the roads has resulted in traffic congestion, longer travel times, and increased air pollution. Therefore, there is a pressing need to address these challenges, and IoT-based traffic control systems offer a promising solution.

IoT-based traffic control systems can provide real-time data on traffic volume, vehicle speed, and road conditions. The use of this data to optimize traffic flow can help to reduce congestion, minimize travel times, and improve road safety. IoT sensors can also detect emergency vehicles and prioritize their passage through traffic, which can help to save lives in critical situations.

Moreover, IoT-based traffic control systems can improve environmental sustainability. With the use of sensors, the systems can identify vehicles that are emitting harmful pollutants and notify authorities for appropriate action. Additionally, smart parking systems can reduce emissions by directing drivers to the nearest available parking spot, reducing the time spent circling the block in search of parking.

IoT-based traffic control systems can also enhance communication between drivers, road authorities, and emergency services. Through mobile apps, drivers can receive real-time traffic updates and get directions to avoid congested areas, improving overall road safety. Emergency services can also be quickly alerted to incidents on the roads, reducing response times and potentially saving lives.

In conclusion, the use of IoT in traffic control has immense potential to transform how we manage traffic on our roads. The technology can provide real-time data, optimize traffic flow, reduce congestion, improve environmental sustainability, enhance road safety, and enable effective communication between drivers, road authorities, and emergency services. As we move towards a more connected world, IoT-based traffic control systems have become increasingly important to create smarter, safer, and more sustainable cities. Therefore, the topic of IoT-based traffic control is an essential area of research, and it is critical to continue exploring its potential applications to help solve the transportation challenges of the future.

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II. LITRATURE REVIEW

There have been several research papers exploring the use of IoT in traffic control systems. Here is a brief summary of some key findings:

1. **"IoT-based Intelligent Traffic Control System" by P. S. Yadav and S. K. Shrivastava:** This paper proposes an IoT-based traffic control system that uses sensors to detect vehicles and adjust traffic lights accordingly. The system also includes an algorithm for optimizing traffic flow and reducing congestion.
2. **"Smart Traffic Control System Using IoT and Machine Learning" by N. N. Mahajan et al.:** This paper presents a smart traffic control system that uses IoT sensors to collect real-time data on traffic volume, vehicle speed, and road conditions. The data is analyzed using machine learning algorithms to predict traffic patterns and optimize traffic flow.
3. **"Real-time Traffic Control System Using IoT" by S. T. Hamza et al.:** This paper describes a real-time traffic control system that uses IoT sensors and cloud computing to monitor traffic conditions and adjust traffic signals. The system also includes a mobile app for drivers to receive real-time traffic updates.
4. **"IoT-enabled Smart Traffic Management System" by M. R. D. Reddy et al.:** This paper proposes an IoT-enabled traffic management system that uses sensors to collect data on traffic flow, vehicle speed, and road conditions. The data is analyzed using machine learning algorithms to predict traffic patterns and optimize traffic flow.
5. **Tizhoosh, H. R. (2018). Artificial intelligence and traffic control. Nature Machine Intelligence, 1(3), 128-130.** In this article, the author discusses the potential of using artificial intelligence in traffic control systems to improve safety and efficiency.
6. **Doshi, A., Goel, S., & Bansal, R. (2019). Intelligent Traffic Control System Using Deep Learning.** In Proceedings of the 2019 International Conference on Robotics and Automation for Humanitarian Applications (RAHA) (pp. 1-5). IEEE. The authors propose an intelligent traffic control system using deep learning techniques to reduce traffic congestion and improve travel times.
7. **Islam, M. A., Shahid, S., Alam, M. M., & Adhikari, S. (2020). Smart traffic control system using artificial intelligence.** In 2020 IEEE 2nd International Conference on Electronics, Communication and Aerospace Technology (ICECA) (pp. 1-6). IEEE. The authors present a smart traffic control system that uses artificial intelligence techniques to improve traffic flow and reduce congestion.
8. **Shivanand, B., & Jayakumar, K. (2019). AI-Based Traffic Signal Control System**. In 2019 International Conference on Automation, Computational and Technology Management (ICACTM) (pp. 179-183). IEEE. The authors propose an AI-based traffic signal control system that uses reinforcement learning to adapt to changing traffic conditions and improve traffic flow.
9. **Zhang, Y., Wang, Q., Wang, J., & Wang, J. (2020). An AI-Based Traffic Control System Using Big Data Analysis.** IEEE Transactions on Industrial Informatics, 16(6), 4069-4079. The authors present an AI-based traffic control system that uses big data analysis to predict traffic conditions and optimize traffic signal timings in real-time.
10. **Yang, X., Wang, Y., Lu, X., & Zhang, D. (2020). A Multi-Objective Traffic Control System Based on Artificial Intelligence.** IEEE Access, 8, 50161-50171. The authors propose a multi-objective traffic control system that uses artificial intelligence techniques to balance the objectives of reducing travel times, improving safety, and reducing emissions.
11. **Zhou, M., Li, Y., Zhang, X., & Chen, L. (2019). An Intelligent Traffic Control System Based on Deep Reinforcement Learning.** In 2019 IEEE International Conference on Computational Science and Engineering (CSE) and IEEE International Conference on Embedded and Ubiquitous Computing (EUC) (pp. 501-507). IEEE. The authors propose an intelligent traffic control system based on deep reinforcement learning that adapts to changing traffic conditions and optimizes traffic signal timings.

Overall, these papers demonstrate the potential for IoT to improve traffic control systems by providing real-time data and enabling more efficient traffic management.

III. STUDY OF EXISTING SYSTEM

The traffic is not handled by the traffic signal and causes traffic congestion. Traffic congestion occurs when a volume of traffic or modal split generates demand for space greater than the available street capacity; this point is commonly termed saturation. This cause is generated due to changing the signal light requires long time.

There are a number of specific circumstances which cause or aggravate congestion; most of them reduce the capacity of a road at a given point or over a certain length, or increase the number of vehicles required for a given volume of people or goods.

The existing system is not so sufficient to handle the traffic on the road, because it does not work dynamically .It having fixed configurations which does not change dynamically. In the existing system there is fixed time to each side of the road , to clear the traffic after signal turns green. But not every time the traffic is same at each side of the road. So sometimes traffic jam will be occurred

IV. DESIGN PROCEDURE

The idea was to implement a traffic light controller for an intersection with eight lights. Each street has one lane

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which then divides into two lanes one to turn left only and the other to go straight or to turn right, at the intersection. One of the streets is a main street, meaning that the lights to go straight are always green unless there are cars on the intersecting street or a car on the main street appears on the left only lane.
The diagram below best illustrates this picture:

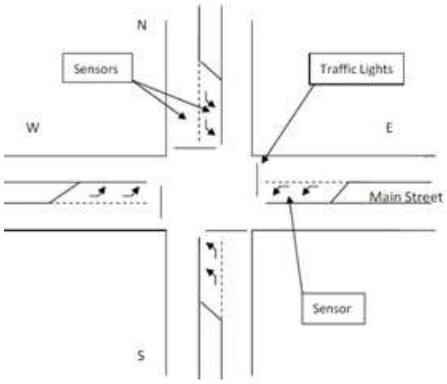

Fig. Design of Traffic System

V. ALGORITHM

Step 1: Start the system.
Step 2: First road1 signal turns into red, then sensor1 starts to measure the traffic on road1.
Step 3: When road1 signal turns into green. Depending on volume of traffic on road1, the system will assign the specific time to clear the traffic.
Step 4: When the time period ends, the road1 signal turns into red again.
Step 5: Then system will start the working of road2. After that road2 signal turns into red, then sensor2 starts to measure the traffic on road2.
Step 6: When road2 signal turns into green. Depending on volume of traffic on road2, the system will assign the specific time to clear the traffic.
Step 7: When the time period ends, the road2 signal turns into red again.
Step 8: The working continues until the user stop the working of system.
Step 9: Stop

VI. HARDWARE COMPONENTS

1. Arduino UNO:-
Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.
Overview
The Arduino Uno is a microcontroller board based on the ATmega328. It has 20 digital input/output pins (of which 6 can be used as PWM outputs and 6 can be used as analog inputs), a 16 MHz resonator, a USB connection, a power jack, an in-circuit system programming (ICSP) header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started

Processor:	ATmega328 @ 16 MHz
Program memory size:	31.5 Kbytes
User I/O lines:	20
Max current on a single I/O:	40 mA
Minimum operating voltage:	7 V
Maximum operating voltage:	12 V

2.Ultra Sonic Sensors :-
An ultrasonic sensor is an electronic device that measures the distance of a target object by emitting ultrasonic sound waves, and converts the reflected sound into an electrical signal. Ultrasonic waves travel faster than the speed of audible sound (i.e. the sound that humans can hear). Ultrasonic sensors have two main components: the transmitter (which emits the sound using piezoelectric crystals) and the receiver (which encounters the sound after it has travelled to and from the target).

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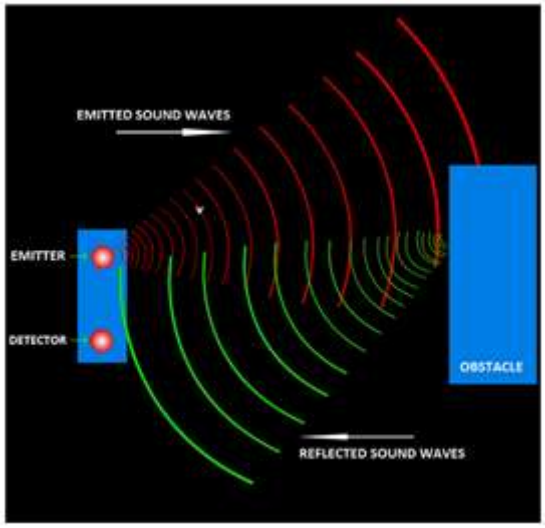

Fig . Working of Ultarsonic Sensors

3. Servo Motor:-
A servo motor is an electrical device which can push or rotate an object with great precision. If you want to rotate and object at some specific angles or distance, then you use servo motor. It is just made up of simple motor which run through servo mechanism. If motor is used is DC powered then it is called DC servo motor, and if it is AC powered motor then it is called AC servo motor. We can get a very high torque servo motor in a small and light weight packages. Doe to these features they are being used in many applications like toy car, RC helicopters and planes, Robotics, Machine etc.

Fig . Servo Motor

4. RGB Led:-
RGB LED means red, blue and green LEDs. RGB LED products combine these three colors to produce over 16 million hues of light. Note that not all colors are possible. Some colors are “outside” the triangle formed by the RGB LEDs.

Fig . RGB LED

5. Jumper wire:-
A jump wire (also known as jumper wire, or jumper) is an electrical wire, or group of them in a cable, with a connector or pin at each end (or sometimes without them – simply "tinned"), which is normally used to interconnect the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering.

Jumper Wire Arduino IDE:-
The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.

Writing Sketches
Programs written using Arduino Software (IDE) are called sketches. These sketches are written in the text editor and are saved with the file extension .ino. The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom righthand corner of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor.

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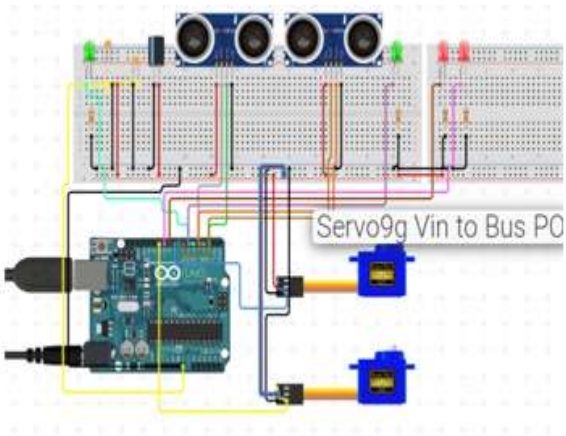
System Connection Design:-



VII. CONCLUSION

This system will proposed for reducing traffic jams on signals. It will saves the time of people and reduces accidents in traffics. It will overcome the problems which are generated in existing system. It will also reduces the manually management of traffic on signals.

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