IoT Based Traffic Congestion Control for Smart Cities

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ABSTRACT:

As the use of vehicles is increasing day by day so the problem of traffic is arising. The problem that is faced due to more traffic is called as traffic congestion. The objective of this problem is to overcome the problem of traffic congestion so that its negative effects like delays, fuel wastage, wear and tear of vehicles, collisions, traffic jams, frustration of passengers and drivers can be avoided. An IR sensor is placed at some distance from the traffic lights [3]. This IR sensor will detect the traffic on the road and will then label that traffic as light, normal or heavy traffic. The assumption of the traffic by the IR sensor will be taken by the Arduino controller and that will be sent to the webpage through the GPRS module installed. Further, an advanced traffic management system is proposed, implemented using Internet of Things (IoT). The system is supported by a circuit embedded in the vehicle.

KEYWORDS: Congestion Control, Sensor, Arduino, Embedded.

1. INTRODUCTION:

IOT is an innovation which uses internet to control the physical items. Using IOT we can obtain outcome which is more precise, quick and exact. In IOT all database will be stored in computer. This storage is done through internet. Later this database is used accordingly to their requirements and applications. Components can be accessed from far place by using IOT, hence it reduces human work or involvement. This makes investment of system less. All different protocols can be used accordingly to respective domain in IOT. We all know that India is the second largest populated country in world. India faces a problem in traffic congestion, it needs a solution for this problem. If we design a control system for traffic in proper way this congestion problem would be solved. Hence by using IOT concept this can be solved. If traffic lights work's depending upon the vehicle number in a lane/road, then time management for traffic lights can be done and congestion could be reduced in great way.

Out of many various reasons for traffic congestion, vehicles waiting for a longer time at a signal lights also contribute significantly for the same. Emergency vehicles blocked by such huge traffic can put one’s life in danger. There is currently no mechanism available for the clearance of traffic in case of an emergency. The existing systems of manual control of traffic or predefined time for change of traffic lights are inefficient. The goal of traffic congestion
control and management system is to clear the accumulating traffic as soon as possible and also to pave way for the emergency vehicles. It is a known fact that even when there are less vehicles on one lane and more on another, the green signal is turned on for the same time thus wasting precious time on green signal for empty roads.

2. WORKING PRINCIPLE: Working principle of a traffic congestion control system is First by using IR sensor the traffic is analysed at a particular junction through micro controller that information updated by traffic control Desktop. It consists of Google map, the traffic situation and status in upcoming junction was sent to the user, the task of updating doesn’t take much effort from traffic department this can done in very simple way, the traffic department can just give the numbers as input (1,2,3,4) if he gives input as 1 then information sent to user as heavy traffic if input is given as 2 then it intimates user as accident and traffic jam if he gives input as 3 then information sent to user as light route and if input is 4 then it intimates to user as clean route hence traffic department can update their input according to current traffic status in their respective junctions, as application consist of Google map the alternate route for your destiny also get highlighted this web server.

Arduino board is connected to computer using USB cable. Motor driver is connected to arduino board for power supply through GND pin of Arduino and +ve and –ve pin of stepper motor driver. IN1, IN2, IN3, IN4 these pins are connected to the Arduino board pin 8, 9, 10, 11 to load the Arduino program into the IC of motor driver. Next four pins are responsible for rotating motor at different stages by 90 by receiving the command from IC. For blinking LED 9 pins are require, there are 8 LEDs for indication purpose. According to working principle one green LED should glow for releasing traffic at the same time red LED should glow on rest of three lanes for waiting time. Registers are used to maintain voltage.
2.1 POWER SUPPLY

A power supply is a device that supplies electric power to an electrical load. The term is most commonly applied to electric power converters that convert one form of electrical energy to another, though it may also refer to devices that convert another form of energy to electrical energy. A regulated power supply is one that controls the output voltage or current to a specific value; the controlled value is held nearly constant despite variations in either load current or the voltage supplied by the power supply's energy source. Every power supply must obtain the energy it supplies to its load, as well as any energy it consumes while performing that task, from an energy source.

Fig. 2 power supply

2.2 SERIAL COMMUNICATION

Serial communication is a way that enables different equipment to communicate with their outside world. It is called serial because the data bits will be sent in a serial way over a single line. A personal computer has a serial port known as communication port or COM Port used to connect a modem for example or any other device, there could be more than one COM Port in a PC. Serial ports are controlled by a special chip called UART (Universal Asynchronous Receiver Transmitter).

2.3 VOLTAGE LEVEL OF SERIAL COMMUNICATION

Diagrammatic oscilloscope trace of voltage levels for an uppercase ASCII "K" character (0x4b) with 1 start bit, 8 data bits, 1 stop bit The RS-232 standard defines the voltage levels that correspond to logical one and logical zero levels. Valid signals are plus or minus 3 to 15
volts. Logic one is defined as a negative voltage; the signal condition is called marking, and has the functional significance of OFF.

Fig. 3 Voltage level of Serial Communication

3. Arduino Microcontroller:

Microcontroller is a smaller version of a computer which has a memory unit, processor and input/output unit. Main advantage of the controller is that it consumes lesser space and makes the design very compact. The significance of microcontroller is that it can be useful for embedded applications where automation of the devices is of at most importance. The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an 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. Android is an open source platform, hence a controller with similar features should also be chosen and there comes the choice of using Arduino Microcontroller. Arduino Microcontroller is an open source prototyping platform which can sense the environment by the sensors which is given as the input to it.

Fig. 4 Arduino microcontroller
3.1 Light Emitting Diode (LED):

A Light Emitting Diode (LED) is one of the latest inventions and is extensively used these days. From your cell phone to the large advertising display boards, the wide range of applications of these magical light bulbs can be witnessed almost everywhere. Today their popularity and applications are increasing rapidly due to some remarkable properties they have. Specifically, LEDs are very small in size and consume very little power.

4. Red, green and blue LEDs:

As is evident from its name, LED (Light Emitting Diode) is basically a small light emitting device that comes under “active” semiconductor electronic components. It’s quite comparable to the normal general purpose diode, with the only big difference being its capability to emit light in different colors. The two terminals (anode and cathode) of a LED when connected to a voltage source in the correct polarity, may produce lights of different colors, as per the semiconductor substance used inside it.

Working Principle:

Fig. 5 Red, Green, Blue LED
5. Conclusion:

The proposed system result is as we expected. By this proposed system time management for signal lights is done which will reduce the traffic congestion problem. And the system has automatic and manual operation. When lost vehicle is identified an email will be dropped. Tracking of stolen automobile is done successfully and is fast. Clearance of traffic for emergency automobile is successfully implemented. Hence, many precious life would be saved. The architecture and functionalities of the proposed system are described along with supervised learning used to determine the attributes of traffic management. This advanced system, once implemented would drastically reduce traffic congestion in big cities and improve the security of vehicles.

6. REFERENCES:


