Design & Implementation of Intelligent Traffic Jam Control System

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Abstract— **An accident is unexpected, unusual, unintended and identifiable external event which occurs at any place and at any time. Every time something happens on the road, there is no time limit on how much this event might delay drivers from reaching their destination within a timely matter. It is fine if there is no particular consequences associated with such delay, but usually we all intend to arrive on time and none of us wants to sit in traffic for hours.**

It is provide an intelligent traffic control system which is used to count the no. of vehicles passing through the highway and controlling the overcrowding between two points. This system is a real time road traffic counting, classifying, and analyzing system along with monitoring of the traffic. We have to customize the Loop detectors for vehicle count in traffic condition which is heterogeneous and with limited lane discipline.

Traffic models play an important role in both today's traffic research and in many traffic applications such as traffic flow prediction, incident detection and traffic control. Traffic jam is highly dependent on parameters such as time, day, season, weather and unpredictable situations such as accidents, special events or construction activities.

A traffic control system that solves these problems by continuously sensing and monitoring traffic conditions and adjusting the timing of traffic lights according to the actual traffic load is called an intelligent traffic control system.

I. INTRODUCTION

This set up involves visual inspection of the highway with traffic jam situation. It gives us a solution for jam conditions. There are traffic lights on highway which works continuously in fixed time period of 60 or 30 seconds, but it never helps to reduce traffic jam problems. Our project is an advanced automatic system which counts the no. of vehicles in a particular region of highway, and control traffic light if no. of vehicle exceeds reference data.

This project can be used at local, national & international level. On any road of local region, state highway, national highway, one way road, two way road, 4-lane and 6-lane road, our project will work with accuracy.

The average number of vehicles on Indian roads is growing at an enormous rate — 10.16% annually since last five years. Mumbai, a metropolitan city, has over 590 vehicles per km of road. Bangalore, another metropolitan city, has about 5 million vehicles plying on a road network of barely 3000 kms. This is leading to increasing levels of road congestion, longer and unpredictable travel times and wastage of time and fuel for commuters. Growth in infrastructure has been slow due to various reasons such as high cost, lack of space, bureaucracy, etc.

Many congestion detection techniques are already being used in developed countries. But unlike traffic in developed countries, traffic on Indian city roads is characterized by high variability in size and speed of vehicles. The same road is shared by buses, trucks, cars, vans, auto rickshaws, motor-bikes, bicycles, and pedestrians. Traffic is often chaotic, with no semblance of a lane-system common in developed countries. Thus, as we discuss in Section II, the various congestion detection techniques used in developed countries will not be directly applicable in an Indian context.

Fig. 1: Traffic Jam

This is a possible reason behind the fact that the Traffic component of Google Maps, that shows roads in red, yellow and green, according to decreasing congestion level, does not display traffic conditions on Indian roads. In a different field of work, in the area of wireless networks, prior literature shows that wireless link behavior suffers in absence of clear line of sight between the sender and receiver. In this project, we exploit this prior knowledge and design a new congestion detection technique that can handle chaotic traffic. Our technique comprises of a wireless sender-receiver pair across a

road. The sender continuously sends packets. The receiver measures metrics like signal strength, link quality and packet reception

The basis of our proposed road congestion detection technique is the differential behavior of RF wireless links in LOS (line-of-sight) vs NLOS (non-LOS) conditions. The project mentions the use of the RF technology, counters and traffic light. Since many measures have been taken for the reduction of traffic congestion but that are not self sufficient.

This project can be made useful for local region and it could be extended further for metropolitan cities. RF technology has been used in the project that makes it more versatile and powerful. Here the RF Technology is using NLOS (Non- Line of Sight communication). Simple traffic light controller cannot reduce the traffic problem. Hence a mechanism of controller using comparator and RF Technology is being used. The RF technology used is NLOS communication that can be used for curved road section, if exist between the transmitter and receiver.

II. DESIGN & IMPLEMENTATION OF INTELLIGENT TRAFFIC JAM CONTROLLER

It consists of five major parts:

1. POWER SUPPLY

Solar power is the conversion of sunlight into electricity, either directly using photovoltaic (PV), or indirectly using concentrated solar power (CSP). Concentrated solar power systems use lenses or mirrors and tracking systems to focus a large area of sunlight into a small beam. Photovoltaic convert light into electric current using the photoelectric effect.

Solar technologies are broadly characterized as either passive solar or active solar depending on the way they capture, convert and distribute solar energy. Hence we have used the solar panel to provide power supply to different components.

2. RF TRANSMITTER & RECEIVER SECTION

Radio Frequency, any frequency within the electromagnetic spectrum associated with radio wave propagation. When an RF current is supplied to an antenna, an electromagnetic field is created that then is able to propagate through space. Many wireless technologies are based on RF field propagation.

An RF Module (Radio Frequency Module) is a small electronic circuit used to transmit and/or receive radio signals on one of a number of carrier frequencies. RF Modules are widely used in electronic design owing to the difficulty of designing radio circuitry.

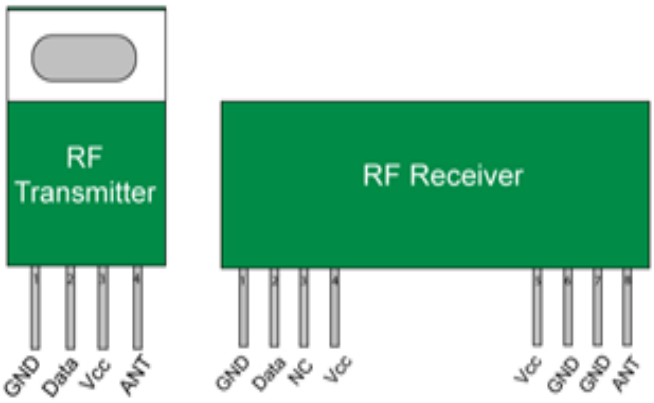

Fig. 2: RF transmitter & receiver

RF TRANSMITTER

A radio transmitter is usually part of a radio communication system which uses electromagnetic waves (radio waves) to transport information (in this case sound) over a distance. In electronics and telecommunications a transmitter or radio transmitter is an electronic device which, with the aid of an antenna, produces radio waves. The transmitter itself generates a radio frequency alternating current, which is applied to the antenna. When excited by this alternating current, the antenna radiates radio waves.

RF RECEIVER

A tuned radio frequency receiver (TRF receiver) is a radio receiver that is usually composed of several tuned radio frequency amplifiers followed by circuits to detect and amplify the audio signal. Prevalent in the early 20th century, it can be difficult to operate because each stage must be individually tuned to the station's frequency.

A device that converts radio waves into intelligible sounds or other perceptible signals. Also known as radio; radio set; receiving set. Radio receivers are the most common electronic equipment worldwide and a vital part of all radio, television, and radar systems. Since the 1960s, radio receiver performance has improved greatly, while size, weight, and cost have fallen dramatically. In the past, radio receivers were built from analog circuits, but increasingly they are realized by digital signal processing.

3. COUNTER

Traffic volume studies are conducted to determine the number, movements, and classifications of roadway vehicles at a given location. These data helps to identify critical flow time periods, determining the influence of large vehicles or pedestrians on vehicular traffic flow. The length of sampling period depends on the type of count being taken and the intended use of recorded data.

Two methods are available for conducting traffic volume counts:

1. Manual count method 2. Automatic count method

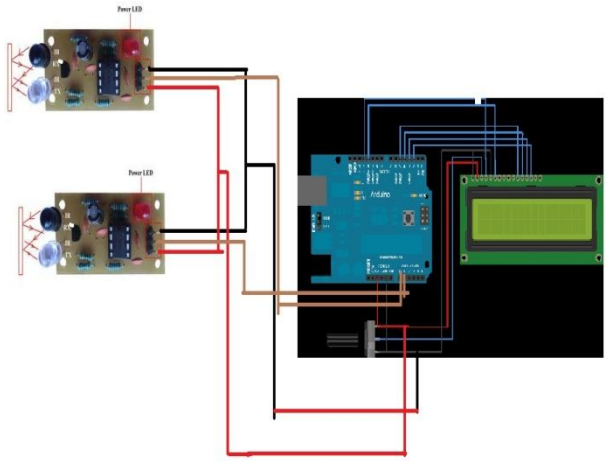

Fig. 3: Counter Circuit

4. TRAFFIC LIGHT

Fig. 4: Traffic Light

Traffic lights, also known as traffic signals, traffic lamps, signal lights, stop lights and robots, are signaling devices positioned at road intersections, pedestrian crossings and other locations to control competing flows of traffic. Traffic lights alternate the right of way accorded to road users by displaying lights of a standard color (red and green) following a universal color code. In the typical sequence of color phases:

- The green light allows traffic to proceed in the direction denoted.
- The red signal prohibits any traffic from proceeding.

5. CONTROLLER SECTION

In this project we use the arduino uno microcontroller. This Microcontroller is based on atmega328 microcontroller. It has analog input & digital input output pins. These input pins are connected to sensors & output pins are connected to alert alarm. Output of eye blink sensor is feed into microcontroller.

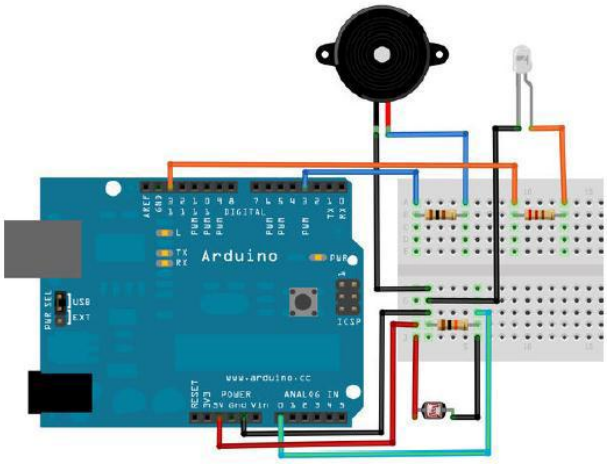

Fig. 5: Microcontroller Circuitry

Processing take place in microcontroller & give the output. This microcontroller works on operating voltage 5V, clock frequency 16MHZ, current 40mA, input voltage 7V.

III. BASIC PRINCIPLE AND TECHNIQUES

The Intelligent Traffic signal Control System consists of four important parts. The first part is the counter section and second part is RF transmitter and receiver section. The third part is the controller section and the fourth part is traffic light.

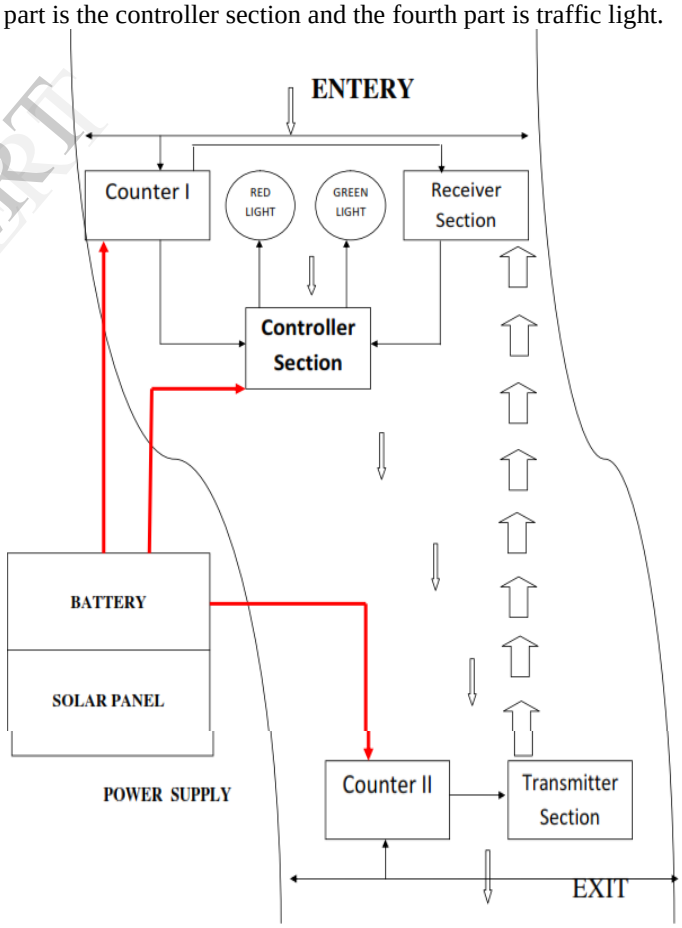

Fig. 6: Traffic Jam Controller Demonstration

Here we use automatic counting method. Automatic counts are recorded using one of three methods: portable counters, permanent counters, solar panel for providing power supply to the components. In this traffic control system we used two counters, one counting the no. of vehicles entering and other one counts the exits vehicles. So basically counter 2 counts the no. of vehicle exist then it transmitted data to the transmitter then the transmitter send this data to the receiver using the wireless technique. Now receiver transmitted the data to the controller then counter 1 count the no. of entering vehicles and this counter send the data to controller. This controller compares the two data received by the counter 1 and counter 2 with standard data. If the standard data is less than comparator result then the red light will glow for one minute and when there is no overcrowding then green light will glow. So in this way we control the traffic on highway.

- The green light allows traffic to proceed in the direction denoted.
- The red signal prohibits any traffic from proceeding.

IV. FUTURE ASPECTS

This project can be enhanced in such away as to control automatically the signals depending on the traffic density on the roads using sensors like IR detector/receiver module extended with automatic turn off when no vehicles are running on any side of the road which helps in power consumption saving. · No. of passing vehicle in the fixed time slot on the road decide the density range of traffics and on the basis of vehicle count microcontroller decide the traffic light delays for next recording interval.

In future this system can be used to inform people about different places traffic condition. This can be done through RADIO. Data transfer between the microcontroller and computer can also be done through telephone network, data call activated SIM This technique allows the operator to gather the recorded data from a far end to his home computer without going there. Traffic lights can be increased to N number and traffic light control can be done for whole city by sitting on a single place. In ambulance system, the data of the patient in the ambulance can be sent to the Hospitals via GSM technology. Thus, it can provide early and fast treatment of the patient. it can be extended to combine metal detector for detection of illegal arms, eye blink detector, overload detector and for collision prevention.

V. CONCLUSION

Hence the conclusion could be defined as it is using only fewer resources just the solar panel, microcontroller, comparator, RF transmitter and the receiver, so it demonstrate the causes of traffic jam and provide an intelligent solution by electronic circuit.

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