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Smart Road Crossing Indicator using Arduino

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Abstract:

This project mainly focuses on reducing the problems that occur while crossing roads and control traffic effectively. The ideal idea for smart roads is a accident prevention system. It is a project with an innovative idea for safety on roads. Here, we use Arduino UNO as a controller, connects Hall Effect sensors, LED (traffic signals), Servo motor and Wi-Fi module. If there is an obstacle in front of the Hall Effect sensor and it is a vehicle then it sense the magnetic field and then it indicates as a heavy traffic. Based on density (heavy/less) of traffic green signal timer changes. There is also a pedestrian gate works for pedestrians with the help of servo motor. All the signal can monitor in a blynk app with the help of wifi module.

Keywords — **Hall effect sensor, Arduino UNO, Servo motor, blynk app, Wi-Fi-module**.

I. INTRODUCTION

Traffic lights, developed since 1912, are signaling devices that are conceived to manage the traffic flows at road intersections, pedestrian crossings, etc. Number of accidents occur in India due to various reasons and the rate of accidents per hour is one among the highest in the world. Road safety has become a serious issue all over the world. Pedestrian crossings and diversions on highways are the main accident prone areas. Half of all road fatalities worldwide occur to children, pedestrians, cyclists, and elderly persons, making them some of the most vulnerable road users. Over speeding increases the probability of fatal injuries. The use of cell phones while driving, failure to wear a seatbelt, or failure to wear a helmet are all examples of reckless driving that should be avoided. Driver fatigue and sleepiness also contribute to crashes. Other contributing concerns include poor road design and a lack of pedestrian paving.

Nowadays, the city's main streets and any pedestrian-only areas are crowded. Pedestrian crossing constitutes a major problem for planning urban areas, managing traffic, and constructing roadways. This paper specifically presents the design of controlling the traffic very effectively and also the safety of pedestrians. It facilitates the detection of traffic by the use of hall effect sensor and tend to reduce the traffic by increasing the green signal timing with the use of Arduino. It also has automatic pedestrian gate for the safety of pedestrian to make them only cross when the green signal is present.

II. HARDWARE DESCRIPTION

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A. ARDUINO

The Arduino Uno is a microcontroller board which has ATmega328 from the AVR family. There are 14 digital input/output pins, 6 Analog pins and 16MHz ceramic resonator. USB connection, power jack and also a reset button is used. Its software is supported by a number of libraries, which makes the programming easier.

B. REGULATED POWER SUPPLY

Power supply is a supply of electrical power. A device or system that supplies electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU. The term is most

commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others.

C. *LED*

A light-emitting diode (LED) is a semiconductor light source. LED's are used as indicator lamps in many devices, and are increasingly used for lighting. Introduced as a practical electronic component in 1962, early LED's emitted low-intensity red light, but modern versions are available across the visible, ultraviolet and infrared wavelengths, with very high brightness.

D. *HALL EFFECT SENSOR*

The Hall coefficient is defined as the ratio of the induced electric field to the product of the current density and the applied magnetic field. It is a characteristic of the material from which the conductor is made, as its value depends on the type, number and properties of the charge carriers that constitute the current.The Hall Effect comes about due to the nature of the current in a conductor.

E. *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.

F. *SESP8266 WI-FI MODULE*

The ESP8266 Wi-Fi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor.

III. WORKING METHODOLOGY

The project is developing a smart cross walk at traffic signals which helps to control the traffic very effectively. The proposed system is consisting of automatic pedestrian gate along with traffic signals. The system makes use of High-power LED's as traffic lights. It is possible to introduce dynamic time traffic signals where the green signal timer assigns based on the present conditions of traffic. In this project, when more vehicle density is identified by the hall effect sensors in a particular side, then green timer increases automatically. After the predefined amount of time, the signal turns to red. The status of the traffic signal will be send to the blynk app through esp8266 Wi-Fi module.
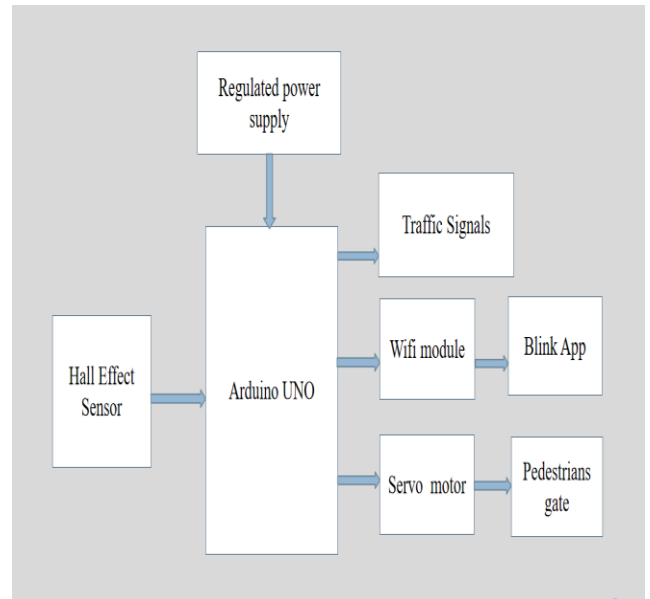
A.

Fig 1. Block diagram of the system

This system is very effective in avoiding all kinds of accidents related to pedestrians. It instructs the public to follow the traffic rules. The ATMEGA328 Arduino board is connected to traffic signals, Hall Effect sensor, Wi-Fi module, servomotor and these traffic signals have a timing of 6 sec for all the sides, there is even signal at the pedestrian gate, servomotor is also present which controls the gate according to the signal. When all the signals are red then pedestrian gate will be opened, we have placed the Hall Effect sensor at a certain distance from the traffic signal where it looks like heavy traffic. The magnet represents the vehicles. When the vehicles are up to the Hall Effect sensor it represents high traffic. There will be electron flow in hall effect sensor when the vehicle comes nearer to it the magnetic field disturbs the electron flow and voltage decreases and it is the

output of the hall effect sensor and sends as input to the Arduino and accordingly the green signal timing of that side is increased to 12sec.The total traffic signal can be monitored in the mobile phone by using blynk app when we connect to that username. This can be monitored by anyone who has that username and password.

IV. RESULTS AND DISCUSSION

A. *IMPPLEMENTING TRAFFIC SIGNALS*

The traffic signals are implemented on PCB printed circuit boards. The traffic signals carry a countdown timer to indicate remaining time before red/green lights are turned off. The timing is given as 6seconds and all are connected to the Arduino and code is dumped into it.
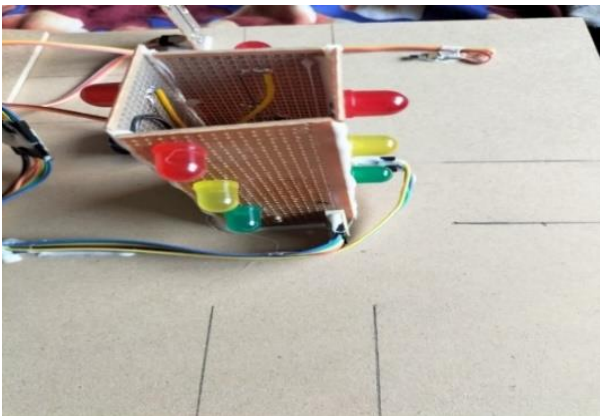

Fig 2. Traffic lights implementation

B. *MEASURING TRAFFIC DENSITY*

The main controlling module of the whole system is Arduino. The system makes a use of traffic signals, Hall Effect sensor, and servomotors motor along with pedestrian gate is interfaced to the arduino Microcontroller. The Hall Effect sensor measures the density of the traffic. Whenever there is a lot of traffic Hall Effect sensor senses the constant magnetic field and sends signal to the arduino. And then the timing of the signals changes to 12 seconds.
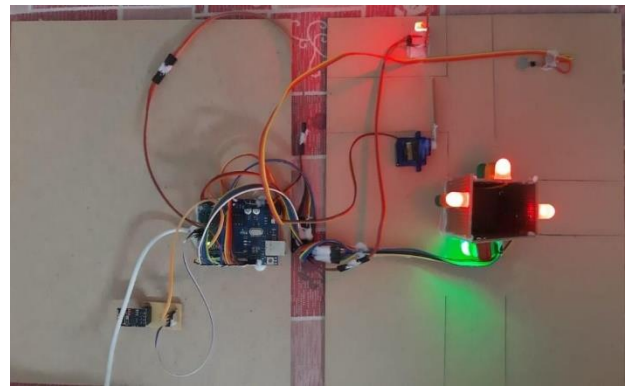

Fig 3. Measuring traffic density

C. *CONTROLLING PEDESTRIAN CROSSING BASED ON TRAFFIC DENSITY*

When arduino receives the signal from the hall-effect sensor then it controls the pedestrian crossing signals according to it. When there is a lot of traffic the green signal timing would be doubled. When there is normal traffic the signal timing would be same. Accordingly the signal for the pedestrian's changes and gate will be controlled.

D. *MONITORING TRAFFIC SIGNALS ON MOBILE PHONE USING BLYNK APP*

Here we are monitoring our traffic signals in mobile phone using blynk app. Anyone who are having that username and password and login and see the traffic signals. This would be very helpful for citizens to know about the traffic before hand and take their route based on that.
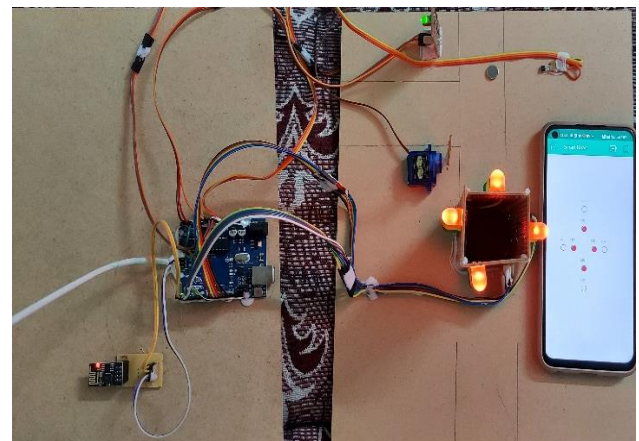

Fig 4. Monitoring traffic signals on mobile phone

V. CONCLUSION

Nowadays, many countries suffer from the holdup problems that affect the transportation in cities and cause serious dilemma. There's exigent

need of efficient traffic management system in our country, as India meets with 384 road accidents daily. In spite of replacing traffic officers and flagmen by automatic traffic systems, the optimization of the heavy foot-dragging continues to be a significant issue to be faced, especially with multiple junction nodes. Many solutions were offered by constructing new roads, implementing flyovers and bypass roads, creating rings, and performing roads rehabilitation.

The proposed smart traffic system manages the traffic lights of a junction of any directional road. The system is capable of estimating the traffic density using sensors posted on either side of the roads. Supporting this information, the time dedicated for the green light is extended to allow large flow of cars just in case of stoppage, or reduced to forestall unnecessary waiting time when no cars are present at the selected route. With field application of this technology, the maddening chaos of traffic are effectively channelized by distributing the time slots supported the merit of the vehicle load in certain lanes of multi junction crossing. We've successfully implemented the prototype at laboratory scale with remarkable outcome.

VI. FUTURE SCOPE

The technical contributions of this project are going to be valuable assets for the related applied researches on improving transportation. This system can be integrated with CCTV for surveillance of individuals for future references and just in case of emergencies. The statistical data analysis studies may be applied to understand the traffic flows between the intersections. Future improvements like car accident tracking, - the combination of various traffic controllers at several junctions can be done to accomplish an entire synchronization. We can even use video feeds to automatically detect the amount of road users

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including pedestrians and therefore the sort of vehicles at intersection. We can connect and arrange a screen with a timer / counter on the board with a voice announcement that alerts people at different places from the traffic lights. Camera with Image Processing techniques will be implemented to watch the reckless vehicles, detects all vehicles crossing the junctions all the time. Researchers are working with city managers to maximise approaches and are available up with efficient means of easing congestion in roads.

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