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Intelligent Traffic Light Control System based on Real Time Traffic Flows

Prof. Anjali Deore[1], Kalyani Pawar[2], Vaishnavi Shetty[3], Chanchal Patil[4], Prachi Walekar[5]
[2, 3, 4, 5]*BE.Student,* [1]*Department of Computer Engineering SITRC Nashik, Savitribai phule Pune University, INDIA*

Abstract: ***Traffic signal management is one of the major problematic issues in the current situation. Such scenarios, every signal are getting 60 seconds of timing on the road at a regular interval, even when traffic on that particular road is dense. As per this proposed model in this article, which will be optimized the timing interval of the traffic signal purely depends on the number of vehicles on that particular roadside. The major advantage of this system is that it can able to decrease the more waiting time for the drivers to cross road signal. In this model, we are using the clustering model which is based on ultrasonic sensor. Using this sensor count of vehicles new model will be liable to determine expected required timing as per provided inputs to the signal which is vehicles count. The input of these systems is vehicles counts on each side of the road from crossing signal. And this input will be determined on much time is to be provided. "Case studies on this system are traffic network and real-time traffic sub-networks are organized to get the effectiveness of the proposed model."***
Keywords: Internet of things, traffic automation, k nearest neighbours, ultrasonic sensors

I. INTRODUCTION

One of the important things in the Internet of things in smart cities is the Intelligent Transportation System (ITS). ITS improves Vehicle to vehicle and Vehicle to Infrastructure communication for improving road facilities rather than increasing road capacities or developing new roads. This is possible because of ITS, it utilizes advanced information and communication, and this communication will be helpful for decreasing traffic congestion and to reduce the accidents on the road, which is dangerous in the urban areas. Managing traffic signal timing is one of the key thing in the urban areas. Managing time on the road will decrease the waiting time of the drivers on the road, and that will help to reduce the fuel consumption. This is done with the help of the ITS. In this system, we are going to use ultrasonic Sensors, Arduino and LED for traffic signals. Ultrasonic sensor have parts in it, one is the transmitter and second is a receiver. The transmitter is used to transmit the light in the LED. When this connection is interrupted, the counting process is started. The line of sight concept is used in this approach.

II. PROBLEM STATEMENT

In recent years popularity of private motor vehicles is getting urban traffic more and more crowded. As result traffic monitoring is becoming one of important problems in big smart-city infrastructure all over the world. Some of these concerns are traffic congestion and accidents that usually cause a significant waste of time, property damage and environmental pollution. Any type of congestion on roads ultimately leads to financial losses. Therefore, there is an urgent need to improve traffic management. The appearance of the Internet of Things (IoT) provides a new trend for intelligent traffic development.

III. LITERATURE SURVEY

[1] The system used both automatic timer based control and manual control to drive the traffic. The functionality of system was verified using simulation with VHDL language and the verified on the hardware.
[2] The controller developed using MATLAB is based on the waiting time of vehicles in the current green phase and traffic density at current green phase, and traffic density at the other intersection. A traffic model based on queuing theory and First In First Out(FIFO) is developed to study the performance of traffic controllers under different situations. Also a comparison is established between Vehicle actuated Controller(VAC) and Fuzzy Traffic Contrller(FTC). [3]The drawback of Traffic Light Controllers(TLC) based on microcontrollers and microprocessors is that it uses the pre-defined hardware, that is it does not have the flexibility of modification on real time basis. LabVIEW based Traffic control system is relatively easier approach because it is very easier to design, redesign, and debug in graphical programming language like LabVIEW. [4] Proposed on board vehicle system using GPS technology to give accidental information about the vehicle. The proposed system has the advantage of less complicated design, low cost and low power consumption.
[6] Highlights on the advantage of Xilinx System Generator for computer vision techniques. It is timely and more comfortable way than that permitted by Very High-Speed Integrated Circuits Hardware Description Language (VHDL) or Verilog hardware

description languages (HDLs). [7] Presented the low cost traffic light controller using ChipScope Pro and Virtual Input Output on FPGA platform. A fixed cycle time traffic controller with special signaling for pedestrian crossing is presented.[10] Proposed an adaptive traffic light control algorithm. Here the sequence and length of traffic lights is adjusted in accordance with the real time traffic lights is adjusted in accordance with the real time traffic detected thereby increasing throughput and lowering vehicle's average waiting time, compared with a fixed-time control algorithm and an actuated control algorithm. The real time traffic information is transferred using a wireless sensor network and the algorithm is implemented on the transportation testbed.

IV. METHODOLOGY

Since the ultrasonic sensors can work all day and their testing accuracy is high, these sensors are deployed around the entrances of intersections to obtain the quantity of the traffic flows, as shown in Fig.1. The concrete traffic rules are also shown in the Fig.1. The transmitter sends out the ultrasonic signal at a frequency of 40 KHz and the wavelength is about 6mm. The signal will be reflected and then received by a transducer receiver which featured as piezoelectric effect. The receiver can produce weak voltage signal at a mV unit [2]. When the ultrasonic sensors detect the amount of the traffic, it will judge whether the driveway is duty or not through the difference between the left signal duration time and the needed time for going through the testing distance, as shown in the Fig.1. In order to obtaining the amount of the traffic which is ready to go through the traffic light, each lane should be deployed 2 or 3 groups of the ultrasonic sensors,as shown in fig.2.

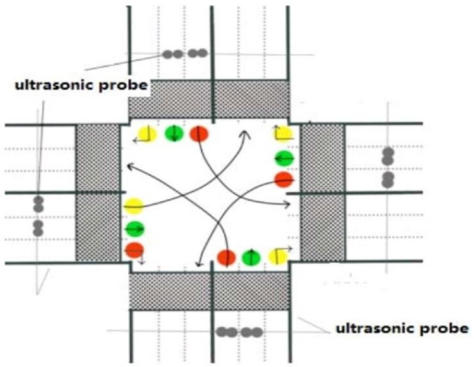

Fig. 1. Schematic diagram of ultrasonic probe installation

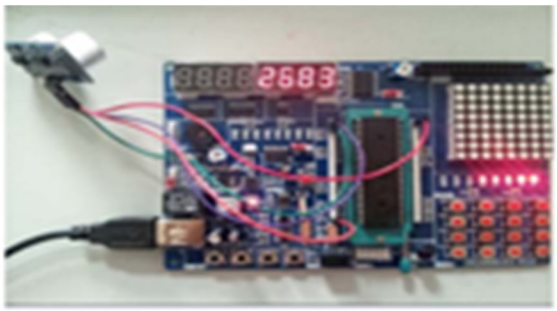

Fig. 2. Ultrasonic testing circuit

The signal chip microcomputer detects the number of vehicles in the straight lane (east and west direction) at every 5 seconds before the light in the north and the south direction turns red, which is used to adjust and set the duration of the green light in the east and west direction. This duration can be increased when the number of vehicles rises. 5 seconds before the light in the straight line turns red, the signal chip microcomputer will detect the number of cars in the left-turn lane. It sets the duration of traffic light according to the same rule as in the former occasion. If no cars wait at the intersection, the signal chip microcomputer starts to detect another crossed direction until all directions at the intersections are detected.The signal chip microcomputer in this system is used for the core of testing and controlling indication. Signal lights consist of 4 groups of Light Emitting Diodes (LED) which has three colors including red, yellow and green, and the countdown display modules of all the directions are composed of 2 slices and 8 segment digital tubes. The signal chip microcomputer controls the indication modules of digital tube as well as the traffic light after it judges and handles the traffic signals from the ultrasonic sensors. Then the current time is showed in the modules.

A. Ranging module

The controlling port of the ultrasonic sensor sends out a high level signal which should be higher than 10μS and meanwhile starts the timer. The port of the receiver receives the high level signal and then reads the result displayed by the timer. The result is considered as the available adjustment range for the current signal duration time. Further the actual distance can be calculated by the sound propagation speed. Considering the available signal duration time and the actual distance to the signal, the system will judge whether the vehicle is able to go through the intersection or not according to the distance between the vehicle and the intersection.

B. Countdown Display Circuit

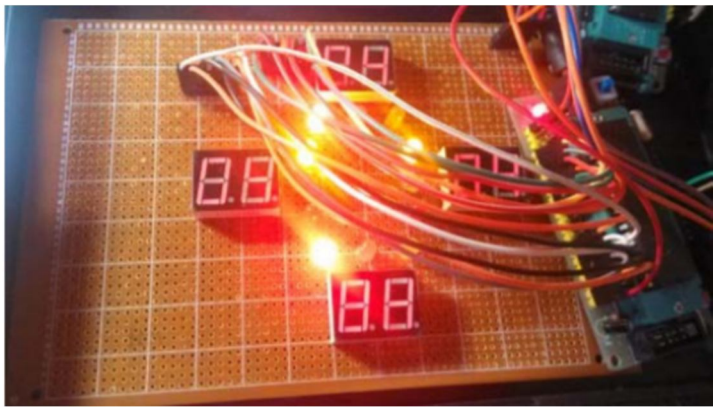

Fig. 3. Countdown display circuit

In this circuit, the LED is used to indicate the countdown time, as shown in Fig.5. As this circuit is just a design model, the low power display module is enough to perform the function of countdown display. Taking a 8 common cathode segment digital tube as an example, all the cathodes of the LED are connected. Therefore, a LED needs 1 line to select bit and 8 lines to select segments. By controlling the high or low level, the countdown display will indicate a number.

V. ARCHITECTURE

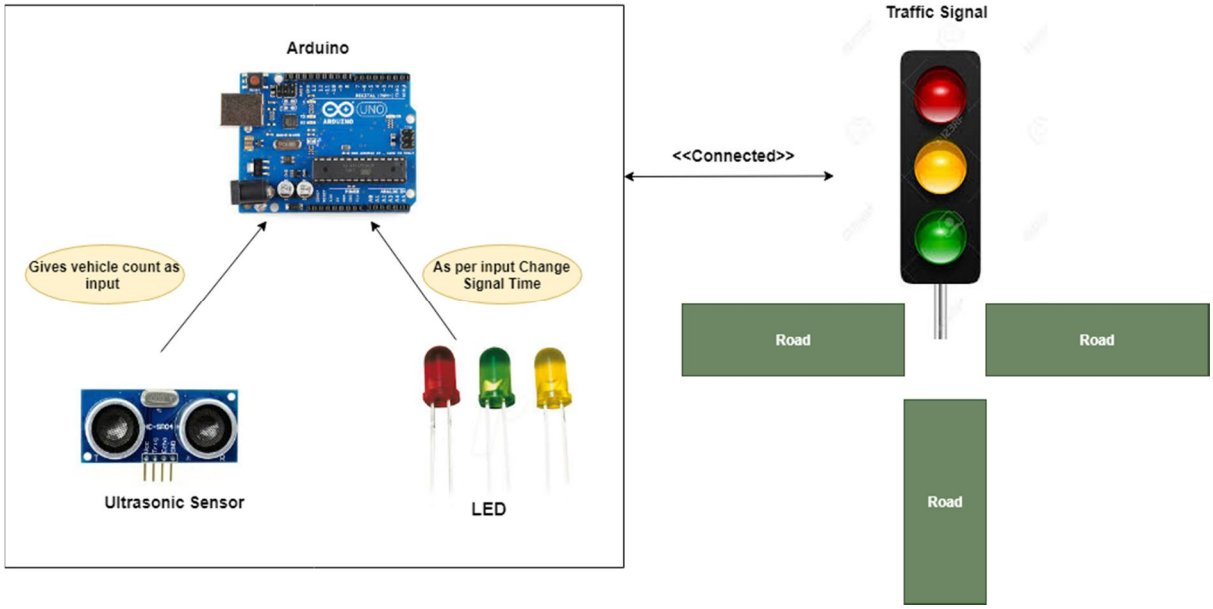

Fig.4. Architecture Diagram

In the above architecture diagram sensor collects data for four side road crossing as the vehicle counts. According to the count as inputs, this is going to decide the signal timing intervals to get higher time limits for that particular signal to avoid the traffic queuing in a dense number of vehicle.

VI. CONCLUSION

Intelligent traffic light control system based on real time traffic flow has been developed by using multiple features of hardware components in IOT. Traffic optimization is achieved using IOT platform for efficient utilizing allocating varying time to all traffic signal according to available vehicles count in road path. TMS will helpful to client user to know timing arability and traffic flow count in any area of their nearby locality of any regions.

VII. ACKNOWLEDGMENT

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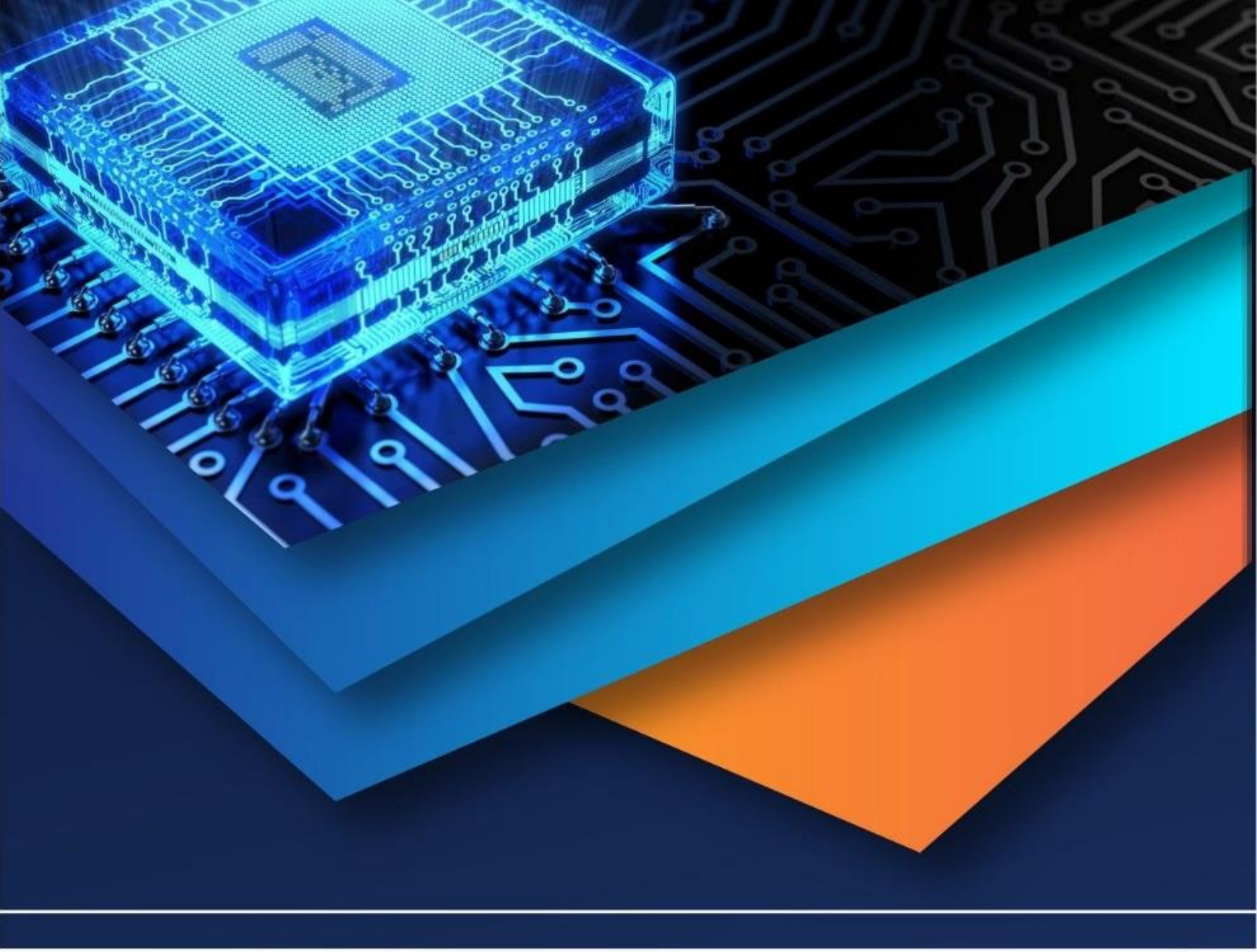

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