AUTOMIZED TRAFFIC SIGNALLING SYSTEM BASED ON TRAFFIC DENSITY AND INTER COMMUNICATION BETWEEN TRAFFIC SIGNAL JUNCTIONS

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Abstract: **In recent years popularity of private cars is getting urban traffic more and more crowded. As result traffic is becoming one of important problems in big cities in all over the world.**

Some of the traffic concerns are congestions and accidents which have caused a huge waste of time, property damage and environmental pollution. the intelligent traffic administration system, based on Internet of Things, which is featured by low cost, high scalability, high compatibility, easy to upgrade, to replace traditional traffic management system and the proposed system can improve road traffic tremendously.

The Internet of Things is based on the Internet, network wireless sensing and detection technologies to realize the intelligent recognition on the tagged traffic object, tracking, monitoring, managing and processed automatically.

IndexTerms: ***lpc2148microcontrolar,IRsensors,leds, ESP8266 wifi module.***

I. Introduction

Traffic lights, developed since 1912, are signaling devices that are conceived to control the traffic flows at road intersections, pedestrian crossings, rail trains, and other locations. Traffic lights consist of three universal colored lights: the green light allows traffic to proceed in the indicated direction, the yellow light warns vehicles to prepare for short stop, and the red signal prohibits any traffic from proceeding [1].

Nowadays, many countries suffer from the traffic congestion problems that affect the transportation system in cities and cause serious dilemma. In spite of replacing traffic officers and flagmen by automatic traffic systems, the optimization of the heavy traffic jam is still a major issue to be faced, especially with muliple junction nodes [2]. The rapid increase of the number of automobiles and the constantly rising number of road users are not accompanied with promoted infrastructures with sufficient resources. Partialsolutions were offered by constructing new roads, implementing flyovers and bypass roads, creating rings, and performing roads rehabilitation.

However, the traffic problem is very complicated due to the involvement of diverse parameters. First, the traffic flow depends on the time of the day where the traffic peak hours are generally in the morning and in the afternoon; on the days of the week where weekends reveal minimum load while Mondays and Fridays generally show dense traffic oriented from cities to their outskirts and in reverse direction

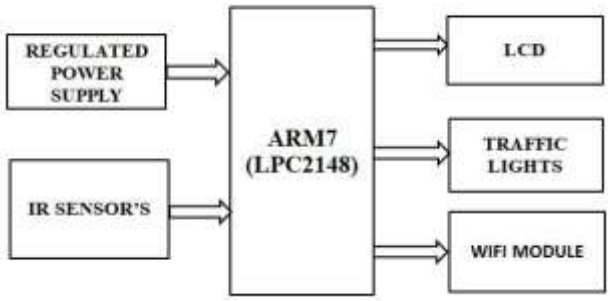
The conventional traffic system needs to be upgraded to solve the severe traffic congestion, alleviate transportation troubles, reduce traffic volume and waiting time, minimize overall travel time, optimize cars safety and efficiency, and expand the benefits in health, economic, and environmental sectors. This paper proposes a simple, low-cost, and real time smart traffic light control system that aims to overcome many defects and improve the traffic management. The system is based on lpc2148 microcontroller that controls the various operations, monitors the traffic volume and density flow via infrared sensors (lR), and changes the lighting transition slots accordingly. Moreover, a handheld portable device communicates wirelessly with the traffic master controller by means ofwifi transceivers in order to run the appropriate subroutines and allow the smooth displacement of emergency vehicles through the intersection.

II.INTELLIGENT TRAFFIC CONTROL SYSTEM

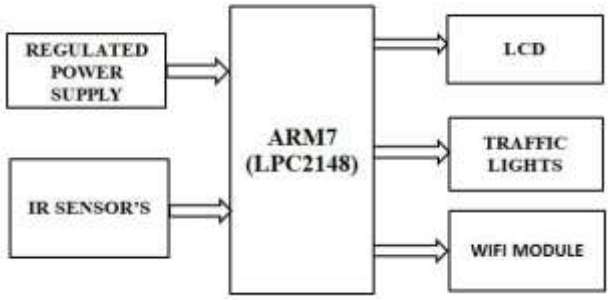
The design of intelligent traffic control system is an active research topic. Researchers around the world are inventing newer approaches and innovative systems to solve this stressful problem. Models based on mathematical equations are applied to estimate the car waiting time at a junction, the number of cars in the waiting queue, the extension of the waiting cars along the lane, the optimal timing slots for green, yellow, and red lights that best fit the real and veritable situation and the efficient combination of routing. In fact, the mutual dependencies between nearby intersections lead to a complicated formulation with cumbersome parameters. These parameters are accidental, hazardous, dependent, and the worse point is the variance of these parameters with time. Thus, finding a dynamic, consistent, and convenient solution is quite impossible. Researchers from different disciplines are collaborating to explore feasible solutions that reduce traffic congestion. Therefore, various methodologies are constantly proposed in the literature and many techniques are implemented profiting from the technological advances of microcomputers, recent manufactured devices and sensors, and innovative algorithms modeling, as much as possible, the complication of traffic lights.

III.BLOCK DIAGRAM

MASTER DIAGRAM



SLAVE DIAGRAM



A. BLOCK DISCRIPTION

The main objective of this project is to control the traffic depending upon the density .As there is much time wastage with the traffic lights which involves the Time, we are designing the new system which controls the traffic depending upon the density.Here we place IR transmitter and the IR receivers at both ends of the roads. Whenever the vehicles pass in-between them the continuity will be lost. Hence the microcontroller senses the density is high. Then the microcontroller will be making the light (green) to be glow much time at the place where the traffic is high.And inter communication between the two junctions based on traffic density. The system uses a compact circuitry build around flash version LPC2148 Microcontroller with a non-volatile memory. Programs will be developed in EMBEDDED C language. FLASH MAGIC is used for loading of programs into microcontroller.

B. IR TRANSMITTER & RECIEVER

The purpose of the transmitter is to transform the information we want to send into a signal that can be propagated by the channel. In the case of our wired copper channel, this means we want the information to be transformed into a modulated voltage level, something like the pulse train. For a wireless channel, however, the transmitter needs to encode the information onto an EM wave that can be easily propagated.

B.A IR TRANSMITTER

The IR transmitter part consists of an Infra-red light emitting diode that can capable of sending modulated data within infra-red band. To match the receiver frequency the data is modulated at 38.7 KHZ by configuring 555 timer at a stable mode of operation, which generates frequency using the components R2 and C2 as shown in above fig. This frequency can be varied over a long range just by varying the present R1 and C1.

B.B IR RECIEVER

The IR receiver consists of TSOP 1738 module which is a simple yet effective IR proximity sensor built around the TSOP 1738 module. The TSOP module is commonly found at the receiving end of an IR remote control system; e.g., in TVs, CD players etc.[3] These modules require the incoming data to be modulated at a particular frequency and would ignore any other IR signals. It is also immune to ambient IR light, so one can easily use thesesensors Outdoor or under heavily conditions. Such modules are available for different carrier frequencies from 32 kHz to 42 kHz. In this particular proximity sensor, we will be generating a constant stream of square wave signal using IC555 centered at 38 kHz and would use it to drive an IR led. So whenever this signal bounces off the obstacles, the receiver would detect it and change its output. Since the TSOP 1738 module works in the active-low configuration, its outputwould normally remain high and would go low when it detects the signal (the obstacle).

B.C WIFI MODULE

ESP8266 was designed by the Chinese company Espressif Systems for uses in Internet of Things (IoT) systems. ESP8266 is a complete WiFi system on chip that incorporates a 32-bit processor, some RAM and depending on the vendor between 512KB and 4MB of flash memory. This allows the chip to either function as a wireless adapter that can extend other systems with WiFi functionality, or as a standalone unit that can by itself execute simple applications. Depending on the specific module variant (ESP-1 to ESP-12 at the time of this thesis) between 0 and 7 General Purpose Input/Output (GPIO) pins are available, in addition to Rx and Tx pins of the UART, making the module very suitable for IoT applications.

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

B.D LCD display

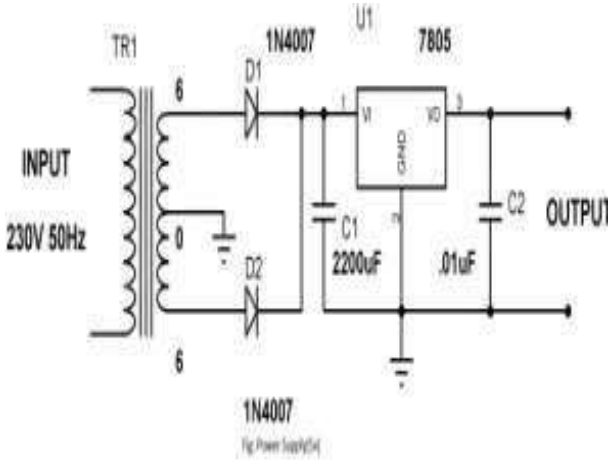
Liquid Crystal Display (LCD) [24] is a power economical, tenuous, flat-panel display, simply programmable, and can be used in many digital and electronic circuits. It employs a matrix structure in which the active element forming the pixel cell is located in the intersection of two electrode buses. Particularly, the 16x2 LCD used in the implemented prototype is able to display data over 2 lines, each of 16 characters.

Actually, two types of registers are used to configure the LCD; the command register is recommended for the control instructions as LCD initialization, clearing the screen, setting the cursor position, and controlling display. While the data register holds the ASCII code of the characters that are promptly appeared on the display.

Many microcontroller devices use 'smart LCD' displays to output visual information. LCD displays designed around LCD NT-C1611 module, are inexpensive, easy to use, and it is even possible to produce a readout using the 5X7 dots plus cursor of the display. They have a standard ASCII set of characters and mathematical symbols. For an 8-bit data bus, the display requires a +5V supply plus 10 I/O lines For a 4-bit data bus it only requires the supply lines plus 6 extra lines(RS RW D7 D6 D5 D4). When the LCD display is not enabled, data lines are tri-state and they do not interfere with the operation of the microcontroller.

IV.CIRCUITDIAGRAM&DISCRIPTION

C. POWER SUPPLY



The schematic diagram gives the basic hardware connections used in the project. Beginning from the power supply the secondary of the step-down transformer wires are given to the two ends (2, 4) of bridge rectifier which is having the four diodes in the bridge format. The other two ends 1, 3)are connected to the input(pin 1) and output pin 3 of the 7805 regulator and pin no 2 is connected to ground as shown in schematic diagram. The 1000 micro farad capacitor is connected in between the bridge rectifier and regulator to eliminate the ac ripples presented in the rectified output. The 100 micro farad capacitor is used to eliminate the noise at regulator output. Now 5V is available at the pin no 3 of regulator and connected to pin no 40 of micro controller.[6]

IR TRASMITTER & RECIEVER

1) IR TRANSMITTER: The IR LED isarranged with a resistor, in such a way that Vcc is applied to the positive terminal of the IR LED.[7] These are connected to the port 1 of the microcontrollar

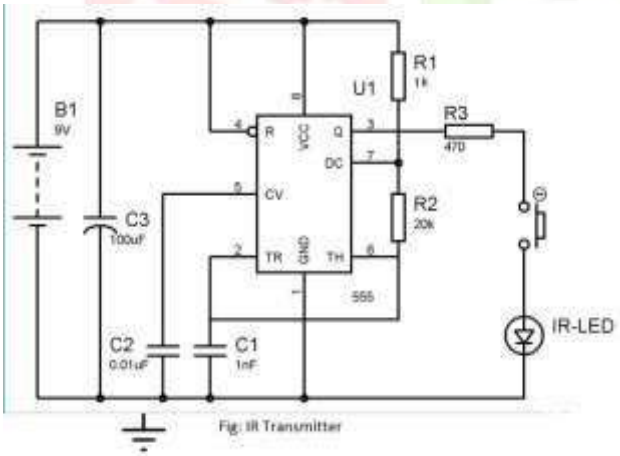


Fig: IR Transmitter

2.*IR RECIEVER:* The IR receivers are arrangedwith the transistor logic as shown in the diagram.

The two transistors are connected in such a manner that collector terminal is connected to the base terminal of the other. The photo diode is connected to the base of the transistor along with the combination of the resistor.

The IR Receivers are connected to the port 2 P2.0, P2.1, P2.2, P2.3 pins of the microcontroller.

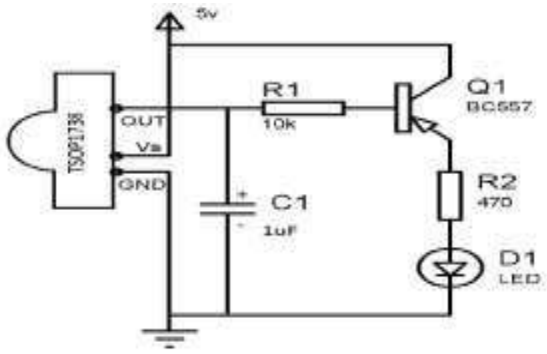


Fig: IR Receiver

3) *MICROCONTROLER*:

Let us go through the features of LPC214x seriescontrollers.8 to 40 kB of on-chip static RAM and 32 to 512 kB of on-chip flash program memory.128 bit wide interface/accelerator enables high speed 60 MHz operation.In-System/In-Application Programming via on-chip boot-loader software.Single flash sector or full chip erase in 400 ms and programming of 256 bytes in 1ms.EmbeddedICE RT and Embedded Trace interfaces offer real-time debugging with theon-chip RealMonitor software and high speed tracing of instruction execution. USB 2.0 Full Speed compliant Device Controller with 2 kB of endpoint RAM.In addition, the LPC2146/8 provides 8 kB of on-chip RAM accessible to USB by DMA. One or two 10-bit A/D converters provide a total of 6/14analog inputs, with conversion times as low as 2.44 us per channel.Single 10-bit D/A converter provides variable analog output. Two 32-bit timers/external event counters (with four capture and four comparechannels each), PWM unit (six outputs) and watchdog. Low power real-time clock with independent power and dedicated 32 kHz clock input.Multiple serial interfaces including two UARTs (16C550), two Fast I2C-bus(400 kbit/s), SPI and SSP with buffering and variable data length capabilities.Vectored interrupt controller with configurable priorities and vector addresses.Up to 45 of 5 V tolerant fast general purpose I/O pins in a tiny LQFP64 package.Up to nine edge or level sensitive external interrupt pins available. On-chip integrated oscillator operates with an external crystal in range from 1 MHz to30 MHz and with an external oscillator up to 50 MHz.Power saving modes include Idle and Power-down. Individual enable/disable of peripheral functions as well as peripheral clock scaling foradditional power optimization. Processor wake-up from Power-down mode via external interrupt, USB, Brown-OutDetect (BOD) or Real-Time Clock.

D. SOFTWARE REQUIREMENT*Keilsoftware for C programming

*Proteus for schematic design

*flash magic software

E. RESULT:

This project is mainly designed to reduce traffic problems, i.e. in general the four sides of the road at a signal point are controlled at regular intervals of time with a certain time delay. But in order to reduce the time at one side of the signal point with respect to the other side where there is more traffic we use IR sensors. It mainly consists of a microcontroller. IR transmitter placed nearer to the signal point and when it detects more density of traffic at any side it and it transmits signal to the receiver. The receiver receives this signal to the microcontroller.

F. ADVANTAGES:

a)A modernised way of controlling traffic.

b)Number of road accidents can be reduced to a large extent.

c)Easy traffic regulation in busy cities such as Metro cities, mega cities etc..

d)Help the traffic police in easy control of traffic and to save time.

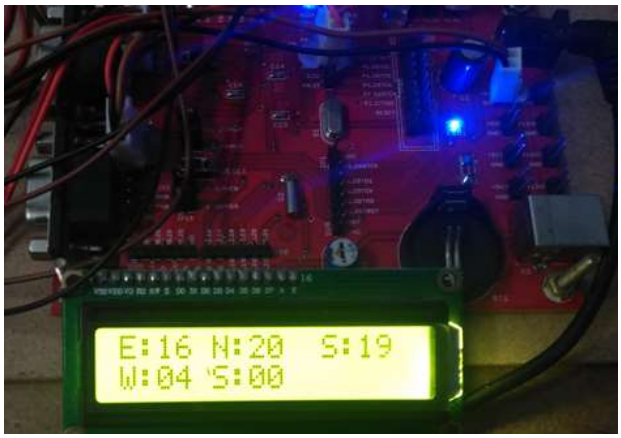
G. FUTURE SCOPE:

The advancement of technologies and the miniature of control devices, appliances and sensors have given the capability to build sophisticated smart and intelligent embedded systems to solve human problems and facilitate the life style. Our smart traffic light control system endeavors to contribute to the scientific society to ameliorate the existing traffic light systems and manage the flow of automobiles at the intersections by implementing innovated hardware and software design systems.

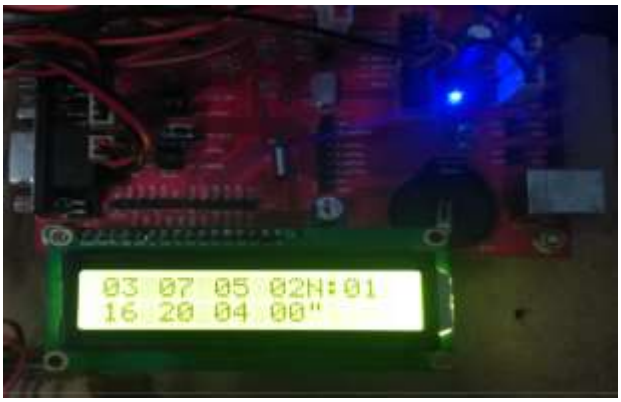
The proposed smart traffic system consists of a traffic light controller that manages the traffic lights of a "+" junction of mono directional roads. The system is capable of estimating the traffic density using IR sensors posted on either side of the roads. Based on this information, the time dedicated for the green light will be extended to allow large flow of cars in case of traffic jam, or reduced to prevent unnecessary waiting time when no cars are present at the opposite route. The system is complemented by portable controller for the emergency vehicles stuck in the traffic. By means of secure communication using wifiwireless system, the portable controller triggers the traffic master controller to the emergency mode and provides an open path until the stuck emergency vehicle traverses the intersection.The designed system is implemented, realized electronically, and tested to ensure complete validation of its operations and functions. The current design can be promoted by monitoring and controlling an intersection with double roads. Future improvements can be added such aspedestrian crossing button, delay timing displays, as well as car accidentand failure modes. The integration of different traffic controllers at several junctions will be investigated in the future in order to accomplish a complete synchronization. To study the system performance, traffic data can be recorded and downloaded to computer platform where statistical data analysis studies could be applied to better understand the traffic flows between the intersections. Finally, traffic light controller could be powered by solar power panels to reduce grid electricity consumption and realize green energy operations.

IV.OUTPUTS

MASTER



SLAVE



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