© 2016 IJSRST | Volume 2 | Issue 2 | Print ISSN: 2395-6011 | Online ISSN: 2395-602X
Themed Section: Science and Technology

Implementing Smart Traffic Control System for Congestion Management

Dr. L. Bhagyalakshmi, Narmadha. M, Nisha. C, Nitharshana. S

Department of Information Technology, Easwari Engineering College, Chennai, Tamil Nadu, India

ABSTRACT

This paper presentsSmart Traffic light Control System for congestion management which is implemented using Infra-Red sensors. An infrared sensor is an electronic instrument which is used to sense certain characteristics of its surroundings by either emitting or detecting infra-red radiations. Infrared sensors are also capable of measuring the heat being emitted by an object and detecting motion. It helps us to know more about the congestion of traffic and reduce it. Sensors are kept at both the sides of the road and it is kept at a distance of 500 metre away from the signal and that place is built in such a way that only one car can pass through the lane.Sensors sense the number of cars passed and alter the timer of the green light.If the number of cars passed is low, the timer will be set for 10 seconds and if the number of cars passed is high, the timer will be set for 30 seconds. This is how congestion management is done.

Keywords: PIC16F877A, Congestion Control, Traffic Junction

I. INTRODUCTION

The effects of increased congestion are typically characterised by slower speeds, longer journey times, increased queuing at junctions or bottleneck, increased stopping and starting, more time spent stationary, less predictable journey times. As a result of these effects, congestion also has both economic and environmental impacts. Although increased demand for the road network can often be driven by economic growth, the presence of congestion can also hold back further growth as more time is spent travelling at the expense of other productive activities. In addition, the inability to accurately predict journey times due to congestion can result in wasted time as individuals either arrive late for appointments or arrive early by allowing too much time for their journey. Environmentally, increased congestion can lead to increased pollution and carbon emissions as vehicles spend more time stationary or at very low speeds where engine efficiency is lower. In addition, greater levels of congestion can result in increased wear and tear to vehicles due to the high frequency of braking and acceleration that often occur in slow moving congestion. Generally work done in various phases has been organized into Sections. Section 2 gives details about the existing system and its drawbacks. Section 3 gives details about proposed system, design and architecture. Section 4 gives details about different modules and their operations. Section 5 discuss about conclusion and the possible future enhancements for our project.

II. METHODS AND MATERIAL

1. Literature Survey

Traffic congestion has been one of the fundamental problems by modern cities since the wide usage of automobiles. Time is equal to money in today's society. Just a normal few minutes trip to the convenience store may take up to hours due to traffic jam or slowdown .According to police ,congestions are actual cause of some issues like road rage, road bullies and major accidents. Using fixed time at traffic signal extends the waiting time at each traffic signal and hence, makes people wait for hours together, there are several factors that contribute to the occurrence of traffic congestion.The rapid increase in the numbers of private

automobiles ownership due to the development of the country and economy is certainly an undeniable one. Not only it put a dent on the environment with the amount of greenhouse gases it produced, but also precious natural resources like gasoline and diesel are greatly exploited and wasted. The government should further reduce the subsidies on the gasoline and diesel to raise awareness on how important these resources are. Car pooling and taking public transportation should be practiced by the public.

Figure 1. Traffic Congestion

The small road capacity is another contributing factor. As the number of private cars increase traffic congestion occurs when the needed road capacity is not fulfilled. Simple improvements of the road infrastructure can easily solve this problem. for example; wider roads ,overpasses and even underground tunnels could be built to trim down the traffic .since congestion occurs frequently in cities ,local government municipal can consider passing laws on restricting the number of cars owned in a family. Traffic police are not available at all signals during a day which becomes an advantage for people to break traffic rules and wait for hours at same position. from a road user perspective, managing such situation requires either reduction of vehicular traffic volume or freeing up available spaces on the road.

On taking survey of traffic jam recorded at Ramapuram, Bharathisalai signal, the main junction near SRM ,which creates heavy traffic every single due to improper traffic police and traffic signal maintenance ,three colleges and hospital being located in the same road, At peak hour around 7:30am people wait for more than 30 minutes due to inefficient traffic control .without any proper signal system and traffic polices ,only YRC members take up duty and try to control traffic to an extent. Given below is image of the signal junction. This live difficulty we faced every day made us to solve this issue by using infrared sensors to overcome traffic issue in this locality.

Figure 2. Ramapuram Junction, Chennai

The existing system contains automatic signal control system. Here, each vehicle is equipped with an RFID tag. When it comes in range of RFID reader, it will send the signal to the RFID reader. The RFID reader will track how many vehicles have passed through for a specific period and determines the congestion volume. Accordingly, it sets the green light duration for the path. But this system cannot sense long distance and it cannot be properly detect all the RFID tag of vehicles in the signal.

2. Proposed Model

The proposed model explains that after the red light signal, number of cars that pass through the IR sensors are detected. The IR sensors are wired with the Traffic controller where the counter takes the count of the number of car that pass through the IR sensors. The number of cars detected by the counter is sent to the PIC controller where the code is written. The PIC controller compares the number of cars detected with the threshold value.If the number of cars detected is lesser than the threshold value then the green light times is not altered. If the number of cars detected id higher than the threshold value then the green light timer is altered accordingly.

A. LCD

Liquid crystal display is very important device in embedded system. It offers high flexibility to user as it can display the required data.LCD cannot communicate with the microcontroller and therefore a LCD driver is used. LCD driver is a link between the microcontroller and LCD. Datasheet of LCD is required to know about LCD driver for e.g. JHD 162A is name of LCD having driver HD44780U and interfacing of LCD has to be done according to the driver specification. To understand the algorithm of LCD datasheet of both LCD and LCD driver is required. Major task in LCD interfacing is the initialization sequence. In LCD initialization command bytes has to be sent to LCD and set the interface mode, display mode, address counter increment direction, set contrast of LCD, horizontal or vertical addressing mode, color format. This sequence is given in respective LCD driver datasheet. Studying the function set of LCD lets you know the definition of command bytes. It varies from one LCD to another. If you are able to initialize the LCD properly 90% of your job is done.

B. Microcontroller (PIC16F877A)

Peripheral Interface Control (PIC) 16F series has a lot of advantages as compared to other series. It executes each instruction in less than 200 nanoseconds. It has 40 pins and has 8K program memory and 368 byte data memory. It is easy to store and send UINs. At the junction, it is easy to store large number of emergency vehicles. Before switching to green, it should satisfy all the conditions. Simple interrupt option gives the advantage like jump from one loop to another loop. It is easy to switch any time. It consumes less power and operates by vehicle battery itself without any extra hardware. Figure 3 shows the PIN Diagram of PIC16F877A.

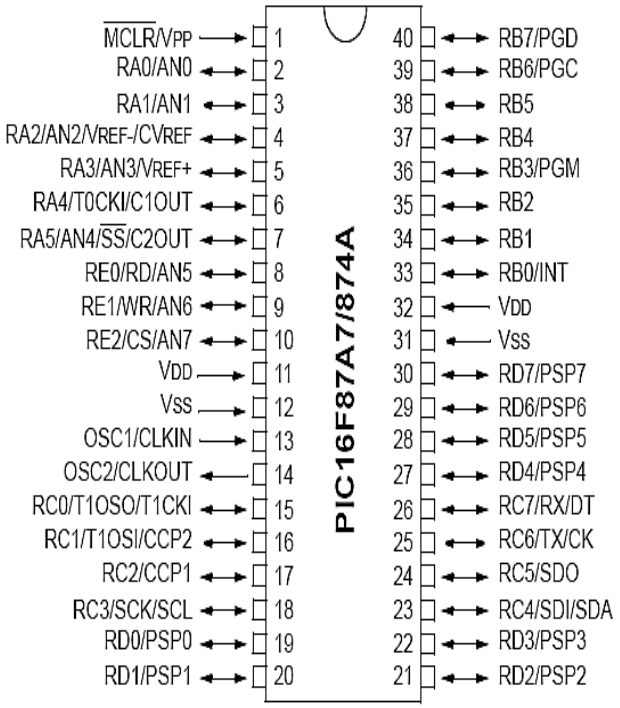

Figure 3. Pin Diagram of PIC16F87A7A7/874A

C. MAX 232

The MAX232 is an integrated circuit, first created by Maxim Integrated Products, that converts signals from an RS-232 serial port to signals suitable for use in TTL compatible digital logic circuits. The MAX232 is a dual driver/receiver and typically converts the RX, TX, CTS and RTS signals.

The drivers provide RS-232 voltage level outputs (approx. ± 7.5 V) from a single + 5 V supply via on-chip charge pumps and external capacitors. This makes it useful for implementing RS-232 in devices that otherwise do not need any voltages outside the 0 V to + 5 V range, as power supply design does not need to be made more complicated just for driving the RS-232 in this case.

The receivers reduce RS-232 inputs (which may be as high as ± 25 V), to standard 5 V TTL levels. These receivers have a typical threshold of 1.3 V, and a typical hysteresis of 0.5 V.

The later MAX232A is backwards compatible with the original MAX232 but may operate at higher baud rates and can use smaller external capacitors – 0.1 μF in place of the 1.0 μF capacitors used with the original device.

The newer MAX3232 is also backwards compatible, but operates at a broader voltage range, from 3 to 5.5 V.

D.RS232

In RS232 there are two data lines RX and TX. TX is the wire in which data is sent out to other device. RX is the line in which other device put the data it needs to send to the device.

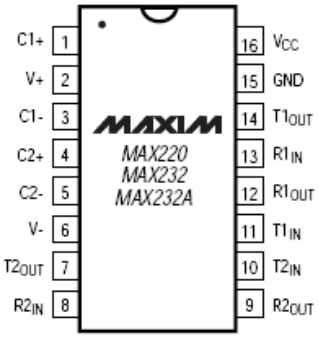

Figure 4. Pin Diagram

E. USART

The BRG supports both the Synchronous Asynchronous modes of the USART. It is a dedicated 8-bit baud rate generator. The SPBRG register controls the period of a free running 8-bit timer. In Synchronous Asynchronous mode, bit BRGH also controls the baud rate. Table 3.12 shows the formula for computation of the baud rate for different USART modes which only apply in Master Mode (internal clock). Given the desired baud rate and FOSC, the nearest integer value for the SPBRG register can be calculated using the formula in Table 3.12. From this, the error in baud ratecan is determined. It may be advantageous to use the high baud rate (BRGH = 1), even for slower baud clocks. This is because the FOSC/ (16(X + 1)) equation can reduce the baud rate error in some cases. Writing a new value to the SPBRG register causes the BRG timer to be reset (or cleared). This ensures the BRG does not wait for a timer overflow before outputting the new baud rate.

F. IR SENSORS

IR Transmitter and receiver are used to control any device wirelessly. TV remote and TV are the best example of IR transmitter receiver. TV generally consist TSOP1738 as the IR receiver, which senses modulated IR pulses and convert them into electrical signal. Here in our circuit we are building IR remote and its receiver. We are using IR LED as transmitter and TSOP1738 as IR receiver. IR LED emits infrared light, means it emits light in the range of Infrared frequency. We cannot see Infrared light through our eyes; they are invisible to human eyes. The wavelength of Infrared (700nm – 1mm) is just beyond the normal visible light. Everything which produces heat, emits infrared like our human body. Infrared have the same properties as visible light, like it can be focused, reflected and polarized like visible light. Other than emitting invisible infrared light, IR LED looks like a normal LED and also operates like a normal LED.

F. Working Model

IR sensors are wired with the Traffic controller where the counter takes the count of the number of car that pass through the IR sensors. The number of cars detected by the counter is sent to the PIC controller where the code is written. The PIC controller compares the number of cars detected with the threshold value.If the number of cars detected is lesser than the threshold value then the green light times is not altered. If the number of cars detected id higher than the threshold value then the green light timer is altered accordingly. Consider that the threshold value is above 10, then the green light timer will be set for 30 seconds or else the timer will be set for 10 seconds.

Figure 5. IR sensor

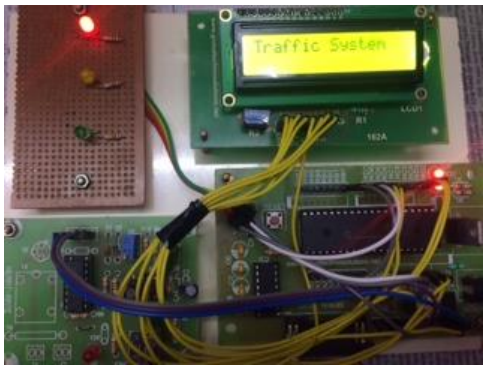

Figure 6. Complete Circuit

III. CONCLUSION

In the proposed system, a new method for traffic congestion and management has been presented. At first, cars/two wheelers that pass through the IR sensors are detected and counted by the counter. The number of cars/two wheelers is compared with the threshold value. If it is less than the threshold value then the timer of the green light is not altered. If is higher than the threshold value then the timer of the green light signal is altered accordingly.Our proposed system does not perform ambulance detection during traffic congestion. An ambulance that is stuck in traffic congestion can be cleared using a Zigbee that senses the UID of the ambulance and changes the signal to green. Then the green light timer will be set for 30 seconds or else the timer will be set for 10 seconds.means it consumes 20mA current and 3vots power. IR LEDs have light emitting angle of approx. 20-60 degree and range of approx. few centimeters to several feet; it depends upon the type of IR transmitter and the manufacturer. Some transmitters have the range in kilometers.

IV. REFERENCES

[1] Faisal A. Al-Nasser, HosamRowaihy, (2011)'Simulation of Dynamic Traffic control system based on wireless sensor network',IEEE Symposium on computers &Informatics,pp 40-50

[2] Harpal Singh, Krishan Kumar, HarbansKaur, (2012)'Intelligent Traffic lights based on RFID,International journal of Computing & Business Research

[3] Y.S Huang, P.J.Su , (2009)'Modelling and analysis of traffic light control systems',IEEE journals & Magazines,vol.3,isuue-3,pp 340-350

[4] Roy Want, (2006)'An Introduction to RFID technology',IEEE Journal pervasive computing ,vol.5,issue 1,pp 105-113

[5] Wu Hejun, Miao Chanyun, (2010)'Design of intelligent traffic light control system based on traffic flow,IEEE Conference publication vol.3,pp 368-371

[6] Xue Yuan, XiaoliHao, Houjin Chen and Xueyewei, (2014) 'Robust traffic sign Recognition based on color global and local oriented edge magnitude patterns,'IEEE Transactions on intelligent transport systems,vol.15,no.4

[7] C.Yang, X.Lu, K.Liu, (2011)'Research of intelligent control model and system on traffic light time',IEEE conference publication,pp 5578-5581