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# Density Based Traffic Control System

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***Abstract*** **- The project is aimed at designing a density based dynamic traffic signal system where the timing of signal will change automatically on sensing the traffic density at any junction. Traffic congestion is a severe problem in most cities across the world and therefore it is time to shift more manual mode or fixed timer mode to an automated system with decision making capabilities. Present day traffic signaling system is fixed time based which may render inefficient if one lane is operational than the others. To optimize this problem we have made a framework for an intelligent traffic control system. Sometimes higher traffic density at one side of the junction demands longer green time as compared to standard allotted time We, therefore propose here a mechanism in which the time period of green light and red light is assigned on the basis of the density of the traffic present at that time. This is achieved by using IR (Infrared sensors). Once the density is calculated, the glowing time of green light is assigned by the help of the microcontroller (Arduino). The sensors which are present on sides of the road will detect the presence of the vehicles and sends the information to the microcontroller where it will decide how long a flank will be open or when to change over the signal lights. In subsequent sections, we have elaborated the procedure of this framework.**
***Keywords:*** **Traffic Control System, Ardiuno, IR Sensors**

## I.INTRODUCTION

### *A. Overview of the System*

The overview of this project is to implement Density based traffic control system using IR technology and PIC16F887 microcontroller. PIC16F887 has very efficient architecture which can be used for low end security systems and IR is widely adapted technology for communication.

### *B. Problem Description*

The problem with the traffic system is that for every minute the vehicles at the 4-way road will be heavy and the traffic lights shall be changed to each side for some fixed time. Even though there are no vehicles at particular side, the traffic signals will glow for given fixed time. Due to that there is time waste process. Due to this other side vehicles have to wait for the time to complete the process. So to reduce the wastage of time, we can implement the system that controls the traffic based on the heavy flow of vehicles at any particular side. With this system, we shall count the number of vehicles at each side at the junction and give the path to the particular side which has heavy flow of vehicles and keep remaining stop position. So that for this to count the number of vehicles at side of the junction, we shall use IR technology.

Our project aims at reducing traffic congestion and unwanted long time delay during the traffic light switch over especially when the traffic is very low. It is designed to be implemented in places nearing the junctions where the traffic signals are placed, in order to reduce the congestion in these junctions. It keeps a track of the vehicles in each road and accordingly adjusts the time for each traffic light signals. The higher the number of vehicles on the road the longer will be the time delay allotted for that corresponding traffic light signal.

## II NETWORK MODEL

### *A. Multi Layer Perception Type Artificial Neural Network Based Traffic Control [1]*

Real time traffic control is a main criterion of the urban traffic signal control system, and giving viable ongoing traffic signal control for a substantial complex traffic system is a testing issue. The objective of the work is to find and adjust the timing of signals based on the traffic density. Such a situation arises in a city where outbound vehicles during morning time and inbound vehicles during evening time is more while the vehicular movement in the opposite direction is less. To predict and adjust the timings of the signals on both sides of the road at the same time, Artificial Neural Network technique is used. A real time traffic survey of Light Motor Vehicle, Heavy Motor Vehicle, two and three wheeler vehicular movement in Thanjavur city is done. The number of vehicles (cars, auto, bikes, trucks and buses) and width of the road was given as a input and the output predicted was in terms of timing for the traffic signal at any particular place and for any particular width of the road. The width of the road is also taken into account which is essential in planning a city based traffic consisting of different road widths

Artificial Neural Network is a mathematical bundle intended to give experts and students the apparatus to train, predict, visualize and evaluate neural network models. A neural system model is a structure that can be conformed to create a mapping from a given arrangement of data components or connections among the data. The model is

trained using the set of data as input, commonly alluded as training set. After effective training, the neural system will have the capacity to perform forecasting, estimation, classification and reproduction of new data from the given set of data6.

*B. Traffic Control System Using Raspberry-PI [2]*

The project is designed to develop a system which performs execution based on density of vehicles (Vehicle count). After calculating the number of vehicles we will came to know in which side the density is high based on which signals will be allotted for a particular side.

Raspberry pi is used as a microcontroller which provides the signal timing based on the traffic density. And can provide facility to handle emergency vehicles automatically and efficiently. This system also provides the clearance for the emergency vehicle if any. For example fire emergency, ambulance emergency and VIP person's vehicles. The system is based on the AVR micro controller technology. The code for this project is compiled in high tech C compiler and the simulated with Proteus software. Complete system of automotive traffic control System

C. *Control agent*

1. *Transformer: A transformer is an electrical device which is used to convert electrical power from one Electrical circuit to another without change in frequency .Transformers convert AC electricity from one voltage to another with little loss of power. Transformers work only with AC and this is one of the reasons why mains electricity is AC. Step-up transformers increase in output voltage, step-down transformers decrease in output voltage. Most power supplies use a step-down transformer to reduce the dangerously high mains voltage to a safer low voltage. The input coil is called the primary and the output coil is called the secondary. There is no electrical connection between the two coils; instead they are linked by an alternating magnetic field created in the soft-iron core of the transformer. The two lines in the middle of the circuit symbol represent the core. Transformers waste very little power so the power out is (almost) equal to the power in. Note that as voltage is stepped down current is stepped up.*

   *Turns ratio = Vp/VS = Np/NS*
   *Power Out= Power In*
   *Vp = primary (input) voltage*
   *Np = number of turns on primarycoil*
   *Ip = primary (input) current*
2. *Rectifier:* A circuit which is used to convert ac to dc is known as RECTIFIER. The process of conversion ac to dc is called "rectification"
3. *Regulator:* Voltage regulator ICs is available with fixed (typically 5, 12 and 15V) or variable output voltages. The maximum current they can pass also rates them. Negative voltage regulators are available, mainly for use in dual supplies. Most regulators include some automatic protection from excessive current ('overload protection') and overheating ('thermal protection'). Many of the fixed voltage regulators ICs have 3 leads and look like power transistors, such as the 7805 +5V 1A regulator shown on the right. The LM7805 is simple to use. You simply connect the positive lead of your unregulated DC power supply (anything from 9VDC to 24VDC) to the Input pin, connect the negative lead to the Common pin and then when you turn on the power, you get a 5 volt supply from the output pin.
4. *Microcontroller:* The microcontroller AT89S52 with Pull up resistors at Port0 and crystal oscillator of 11.0592MHz crystal in conjunction with couple of capacitors of is placed at 18th & 19$^{th}$ pins of 89S51 to make it work (execute) properly.
5. *IR Module:* The IR transmitter and receiver are input and output devices. This is connected to the port P2 of the Microcontroller.
6. *LEDs:* Here the LEDs are connected to one of microcontroller port by using resistor.

*D. Parameters Considered*

*1. Density of roads*

a. If all roads are having no traffic, yellow signal appears.No road is allowed to be closed Density of roads is classified as:
b. Low
c. Medium
d. High

*2. Priority of roads*

a. If two or more roads of equal high priority any one road is opened.
b. Continuously for more than maximum duration
c. Without considering the density.

*3. Delay of roads*

The delay of each road is chosen according to the density

a. Low-20seconds
b. Medium-30seconds
c. High-60seconds

## III. SIMULATION RESULTS

*A. Software*

Software used is:

a. Keil software for C programming
b. Proteus for schematic design

*B. Keil µ Vision 3*

µVision3 is an IDE (Integrated Development Environment) that helps you write, compile, and debug embedded programs. It encapsulates the following components:

This software is used for execution of microcontroller programs. Keil development tools for the MC architecture

support every level of software developer from the professional applications engineer to the student just learning about embedded software development.

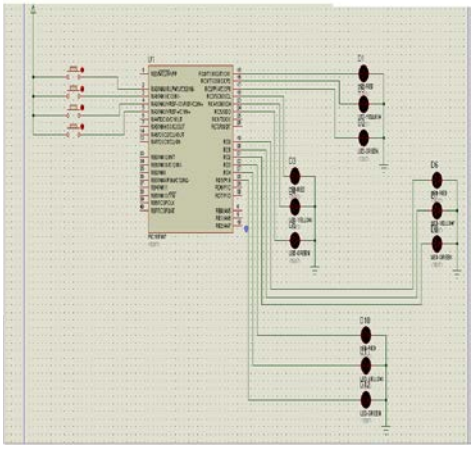

Fig: 1 Microcontroller environment

The industry-standard Keil C compilers, macro assemblers, debuggers, real, time Kernels, Single-board computers and emulators support all derivatives and help you to get more projects completed on schedule. The Keil software development tools are designed to solve the complex problems facing embedded software developers.

1. When starting a new project, simply select the microcontroller you the device database and the µvision IDE sets all compiler, assembler, linker, and memory options for you.
2. Numerous example programs are included to help you get started with the most popular embedded AVR devices.
3. The Keil µVision debugger accurately simulates on-chip peripherals (PC, CAN, and UART, SPl, interrupts, I/O ports, A/D converter, D /A converter and PWM modules) of your avr device. Simulation helps you understand h/w configurations and avoids time wasted on setup problems. Additionally, with simulation, you can write and test applications before target h/w is available.
4. When you are ready to begin testing your s/w application with target h/w, use the MONS1, MON390, MONADl, or flash MONS1 target monitors, the lSDS1 in-System
5. Debugger or the ULlNK USB- RTAG adapter to download and test program code on your target system.

## IV. CONCLUSION

To reduce the congestion and unwanted time delay in traffic, an advanced system is required. One such advanced technology is automatic signalling using IR sensors. The sensors help in Keeping Count of vehicles entering roads and subsequently allot time delay thereby giving accurate priority to each road for the time being. With this technique we have entered a new era of automatic traffic signal control.

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