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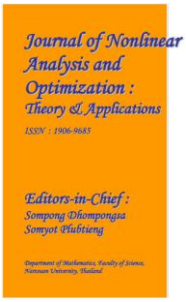

Density Based Traffic Control System with Ambulance Detection

Mr .C. Bhargav[1], C Narasimha Naidu[2], K Maruthi Reddy[3], C Mahesh Babu[4], G Yashwanth[5]

[1]*Assistant Professor, ECE Dept., St.Johns College of Engg. & Tech., Yemmiganur, Kurnool(Dist.), 518360, India*

[2]*Student, ECE Dept., St.Johns College of Engg. & Tech., Yemmiganur, Kurnool(Dist.), 518360, India*

[3]*Student, ECE Dept., St.Johns College of Engg. & Tech., Yemmiganur, Kurnool(Dist.), 518360, India*

[4]*Student, ECE Dept., St.Johns College of Engg. & Tech., Yemmiganur, Kurnool(Dist.), 518360, India*

[5]*Student, ECE Dept., St.Johns College of Engg. & Tech., Yemmiganur, Kurnool(Dist.), 518360, India*
Email ID:bargauv@gmail.com

Abstract:
Traffic congestion is a severe problem in most of the cities across the world and it has become a nightmare for the citizens. It is caused by delay in signal, inappropriate timing of traffic signaling etc. The delay of traffic light is hard coded and it does not depend on traffic. Therefore, for optimizing traffic control, there is an increasing demand in systematic quick automatic system. This paper is designed to develop a density based dynamic traffic signal control. The signal timing changes automatically on sensing the traffic density at the junction. The microcontroller used in this project is ARDUINO. The system contains IR sensors which will be mounted on the either side of the road on poles. It gets activated and receives the signal as the vehicles passes close by it.

A density based traffic control system with ambulance detection is an advanced traffic management system that uses sensors. The system detects traffic density and adjusts traffic signals accordingly to reduce congestion. improve safety and reduce travel time. The ambulance detection feature prioritized emergency vehicles, allowing them to reach their destination faster with fewer obstacles, potentially saving lives.

Keywords: Arduino nano, Micro controller, IR Sensor, Buzzer, Memroy, Printed Circuit Board(PCB), Jump Wires.

I. INTRODUCTION

In this system each separate vehicle is armed with special radio frequency identification (RFID) tag. They have used RFID reader, NSK,EDK-125-TTL,

LPC2148 a system-on-chip to read the RFID tags attached to the vehicle. The number of vehicles is counted that passes on a specific path during a specific path during a specified duration. Depending upon the density of vehicles on the particular junction, the traffic signals will vary.

Density based traffic control systems are becoming increasingly popular in urban areas to improve traffic flow and reduce congestion. These systems use real time data to monitor the flow of traffic and adjust

signal timings at intersections accordingly. One area of research is the field is the development of density based traffic control systems that can detect and prioritize emergency vehicles such as ambulances.

In a Study published in the International Journal of Scientific & Engineering Research, researchers proposed a density based traffic control system that uses wireless sensor networks' to detect the density of vehicles are intersections. The system is also equipped with a special ambulance detection mechanism that can identify the presence of a n ambulance and prioritize through the intersection.

II. METHODLOGY

The traffic density is used to detect the number of vehicles passing through a particular area of the road. This sensor can be an IR sensor or a camera based sensor. The output of this sensor is a signal that indicates the traffic density. The micro controller is the brain of the system. It receives the single from the traffic density sensor and decides whether to five priority to the ambulance or adjust the traffic signals based on the traffic density. The ambulance detection sensor is used to detect the presence of an ambulance on ther road. This sensor can be a GPS based sensor or a radio frequency (RF) based sensor

The traffic signal control unit controls the traffic signals based on the output from the micro controller. If the traffic density is high, the system will adjust the signals accordingly to ensure smoothly traffic flow. If ambulance is detected, the system will give it priority over regular traffic. The LED display is used to indicate the status of the traffic singles. It can display red, green and yellow lights to indicate; when it is safe to proceed. The power supply provides the necessary power to run the system.

The basic block diagram of the density based traffic control system is as shown in the above figure. It consists of four roads, IR Sensors, a micro controller unit and signal lights(LEDs). An IR sensor is an electronic device which can be used to sense certain parameters of its surrounding by either emitting or detecting radiations. It can also measure heat of an object and detect motion. It uses the infrared light to sense objects in front of them and map or fuses their distance. This system consists of 8 IR sensors as detector of 4 junctions. IT transmitter looks like an LED. This IR transmitter always emits Ir rays form it. The operating voltage of this is 2 to 3 V. These IR rays are invisible to the human eye. But we can see these IR radiations through camera. IR transmitter transmits IR rays that are received by IR radiations .Generally IR receiver has high resistance in the order of mega ohms but when it is receiving IR rays the resistance is very low. The operating voltage of IR receiver also 2 to 3 V. We have to place these IR pair in such a way that when we place an obstacle in front t of this IR pair, Ir receiver should b able to receive the IR rays. When power is supplied the transmitted IR rays hit the object and reflect back to the IR receiver.

III. SPECIFICATIONS

Micro controller Atmel ATmega168 or ATmega328

Operating Voltage□Logic Level) 5 V Input Volate□recommended) 7 -12 V Input Volate□limits)6 – 20 V

Digital I/O Pins: 14 (of which 6 provides PWM output)

Analog Input Pins: 8

DC Current per I/O Pin: 40 mA

Flash Memory: 16 KB(ATmega 168) or 32 (ATmega 328) of which 2 KB used by bootloader SRAM: 1 KB (ATmega168) or 2 KB (ATmega328)

EEPROM: 512 bytes(ATmega168) or 1 KB (ATmega328)

Clock Speed: 16 MHz Dimensions: 0.73 × 1.70(in inches) Features

1. Power Of blue LED,RST and LED for reset the Nano
2. Green (TX), red(RX) and orange (L), LED
3. Upgraded 5V voltage sourcing,more powerful drive capability
4. Mini B UsB for programming and serial monitor. TX & RX breakout for application as USB-UART converter.
5. Surface-Mount ICSP header
6. Standard 0.1’ spapcing DIP (Breadboard Friendly)
7. Power OF red LED, Green(Tx) and Green(L)LED.
8. Upgraded 5V voltage sourcing,more powerful drive capability
9. Mini B UsB for programming and serial monitor. TX & RX breakout for application as USB-UART converter.
10. Surface-Mount ICSP header

Item	Min	Typical	Max	Unit
Microcontroller	Atmega328&Atmega168			No units
Operating Voltage (logic level)	4.5	5.0	5.5	VDC
Input Voltage(Recommended)	7	9	12	V
Digital I/O Pins	14(Of which 6 provide PWM Output)			No units
Analog Input Pins	8			No units
DC Current per I/O Pin	40			mA
Flash Memory	32KB(Atmega328);16KB(Atmefa168)			No units
SRAM	2			KB
EEPROM	1			KB
Clock Speed	16			MHz
Dimensions	7.0x 17.0			mm
Weight				g

Usage

Table 4.1: Standard 2.54mm spacing DIP (breadboard friendly)

IV. ADVANTGES

1. Reduction of traffic congestion

By using a density based traffic control system, traffic can be efficiently managed and directed to avoid congestion which can significantly reduce travel time for all drivers.

2. Improved safety

By detecting and prioritizing ambulances, emergency vehicles can reach their destinations faszter and with fewer obstacles, chihc can help save lives in critical situations.

3. Cost Effective

A demsity based traffic contro system can be more cost effectivetha traditional traffic ontrolmethods as it relies on sensors and algorithms to mange traffic flow rather than manual labor.

4. Scalabillity

The system can be easily scaled to cover larger areas, making it ideal for use in critics and other densely populated areas.

1. Real Time Data Analysis

The system can continuously analyze real tinme traffic data and adjust traffic signals to mimprove flow, reduing delays and increasing efficiency.

V. APPLICATIONS

1. Prioritizing emergencvy vehicles
2. Optimizing Traffic Flow
3. Reducing Congestion
4. Enhancng Safety

VI. RESULTS

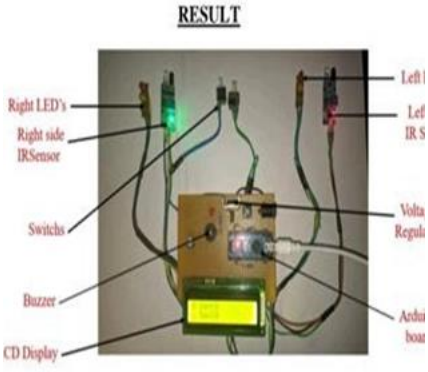

Fig 6.1. Project Kit

Fig 6.2. Vehicle counting on left side

Fig 6.3. Vehicle counting on right side

Fig 6.4. Clearing the root for higher density side

Fig 6.5. Ambulance is on left side

Fig 6.6. Ambulance is on right side

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