Density Traffic Control using Pizo Sensor and RFID Tag

Prathamesh P Chavan[1] Prajakta Chavan[2]
[1]UG Student [2]Assistant Professor
[1]Department of Electronics & Telecommunication Engineering [2]Department of Electronics & Communication Engineering
[1,2]KLEMSSCET Udyanbag Belgaum Karnataka 590005 India

Abstract— Globally traffic congestion is considered to be an important issue, which can be reduced by proper traffic monitoring system. More recently, the advancement in wireless sensor technology shows a great promise in designing Intelligent Transportation System (ITS) due to its flexibility and cost-effectiveness for deployment. The aim of this project is to develop a prototype vehicle traffic monitoring system using piezo based density calculation and RFID wireless technology for smart control. In conventional system traffic lights are designed on fixed time basis. The main objective of the proposed system is to operate the traffic light on instantaneous traffic density or have an adaptive traffic signal. The piezo sensors continuously senses the pressure of the vehicle and sends output voltage to the microcontroller which determines the length of time the signal must be given green signal. Vehicular Ad-Hoc Networks (VANETs) technology is the most promising technology to increase traffic security and proficiency, and to enable various other related applications in the domain of vehicular communication. Applications using VANETs have diverse properties. Applications such as clearance to emergency vehicles (e.g. Ambulance, Fire Trucks), Vehicle-to-Vehicle (V2V) Communication is important to properly manage traffic situations. In this proposed method RFID reader detects the RFID tag given to special vehicles allowing those vehicles to gain first priority. These applications are classic models of what we call an intelligent traffic control System which aims to enhance security and efficiency in traffic management using new technologies for measuring instantaneous traffic and V2I communication to provide smart control.

Key words: Density Traffic Control, Pizo Sensor and RFID Tag

I. Introduction

The total number of vehicles in the world has experienced a remarkable growth, increasing traffic density which results in more and more accidents. Therefore the manufactures, researchers and government is shifting focus towards improving the on road safety rather than improving the quality of the roads. The good development in the wireless technologies emerged various new type of networks, such as Vehicular Ad Hoc Network (VANET), which provides communication between vehicles themselves and between vehicles and road side units. A survey of various Intelligent Traffic Systems (ITS) and various routing protocols with respect to our proposed scheme is described in this paper. It also introduces a new scheme consist of a smart city framework that transmit information about traffic conditions that will help the driver to take appropriate decisions. It consists of a warning message module composed of Intelligent Traffic Lights (ITLs) which provides information to the driver about current traffic conditions.

Fig. 1: Traffic Congestion

With the increase of road traffic volume in major cities and towns of most of the countries experiencing traffic congestions, accidents and greenhouse emissions leading to poor quality of city life. With the increased volume of road traffic it is necessary to introduce advanced intelligent road traffic information system which can adaptively monitor and control vehicle movements to minimize congestions, journey time and greenhouse emissions from vehicles. At the same time with the introduction of new generation electric vehicles significant opportunities could arise to use automatic traffic signaling systems to improve the road safety. An electric vehicle control system could be overridden by an automatic process based using real-time signaling rather than always relying on a driver's response and judgments. A simple example could be enforcing speed zone in a schooling area, in this case a speed controller can transmit speed information over the VANET (Vehicular Ad hoc Network) which could be used by the car control unit and change the car speed to comply with the speed zone. Similarly in accident risk areas or in case of bad weather conditions traffic systems can enforce different driving conditions via a VANET based signaling system.

A VANET based system can also be used to obtain road traffic information such as traffic volume, different vehicles intended destination/routes, type of vehicles, etc. to control traffic signals, cycles, timing and other control parameters which can improve traffic flows as well as improve vehicle energy efficiencies by the reducing the engine operating time.

A road infrastructure unit known as the RSU is responsible for periodically broadcasting signaling and other road traffic information on the downlink of a communication network. The car on board unit sends vehicle information such as car ID, type, destination/route, etc. via the uplink to the RSU. The OBU supplies information packet via the IEEE802.11p link on the uplink. The RSU supplies the information to the traffic analysis server that controls the traffic signal parameters. For a wide area networked based traffic control system the RSUs are connected by a backbone network where RSUs can exchange traffic information.

A. *Project Objective*

The main objective of this project is to control the traffic signals based on the density of vehicles at the junction. Along with smart control using vehicular ad hoc network technology. Nowadays, after congestion is a main problem in major cities where in the traffic signal lights are programmed for particular time intervals. However, sometimes the demand for longer green light comes in at the one side of the junction due to hue traffic density. Thus, the traffic signal lights system is enhanced to generate traffic light signals based on the traffic on roads at that particular instant.

If the traffic density is high on a particular side, more priority is given for that side. The sensors continuously keep on sensing the density on all sides of the junction. While the sensors detect high density they correspondingly give first priority for a longer green light at that junction. The side with the next priority level follows the first priority level, the density of the vehicles is year marked in three zones: low, medium and high based on the timing allotted to them accordingly.

The objective being adhering first priority to the priority traffic control and then to the density based control it always checks for the priority marked vehicles first. RFID module is used to provide smart control by allowing certain special vehicles to be allowed to move first.

II. LITERATURE REVIEW

Density, speed, and flow are the three critical parameters for road traffic analysis. High-performance road traffic management and control require real-time estimation of space mean speed and density as input for large spatial and temporal coverage of the roadway network. In Adaptive Traffic Control System which receives information from vehicle such as position and speed and then it utilize to optimize the traffic signal. The system specifies the use of onboard sensors in vehicle and standard wireless communication protocol Specified for vehicular applications. They implement various traffic Signal control Algorithms. intelligent traffic system for VANET suggest that creation for smart city framework for VANET consisting of Intelligent Traffic Lights which transmit warning messages and traffic statistic. In That System Various Routing Protocol Has Been Discus And Compare.[1]

This article studied about the dynamic traffic control system and based on radio propagation model for predicting path loss &link. The Intelligence road Traffic signaling System. In that system OBUs used. OBUs used destination information for calculating load traffic on road for reducing the conjunction on road. [2] The general belief is that it is more difficult to estimate and predict traffic density than traffic flow .In Intelligent Traffic Light and Density Control using IR Sensors and Microcontroller the author propose that the delay of Signal not depend on traffic density, the traffic using microcontroller this system reduce traffic jams problem cause by traffic light to extent. The system contains IR Transmitter and IR Receiver. IR count the vehicles on the road Microcontroller generates the result.

Priority Based Traffic Lights Controller Using Wireless Sensor Network the author implements Adaptive Traffic control System based on (WSN) wireless sensor Network. In that System Time manipulation Used for controlling Traffic Light.[3] This System Control Traffic over Multiple intersections. As such, it is becoming very crucial to device efficient, adaptive and cost-effective traffic control algorithms that facilitate and guarantee fast and smooth traffic flow that utilize new and versatile technologies. [4] An excellent potential candidate to aid on achieving this objective is the Wireless Sensor Network (WSN). Many studies suggested the use of WSN technology for traffic control. In, a dynamic vehicle detection method and a signal control algorithm to control the state of the signal light in a road intersection using the WSN technology was proposed. [5] In this paper, an intelligent traffic light control system based on WSN is presented. The system has the potential to revolutionize traffic surveillance and control technology because of its low cost and potential for large scale deployment. [6]

Existing Methods	Proposed Method
Inductive loop	Piezo based system
These detectors are very sensitive to the installation process, they can only be installed in a good pavement, and they must be reinstalled every time a road is repaved.	It is able to detect when and where vehicle passes.
Video image processing	Piezo based system
Such a system need to overcome detection artifacts caused by shadows, weathers and reflections from roadway surface.	Since it is installed on roads it is able to detect each vehicle discreetly hence monitor traffic flow
Ultrasonic Detectors	Piezo based system
Difficulty in identifying lane-straddling vehicles traveling side by side and suspectibilty to high wind speeds	Since detection is based on physical contact with the sensor so it is highly accurate

Table 1: Existing Methods & Proposed Method

III. BLOCK DIAGRAM

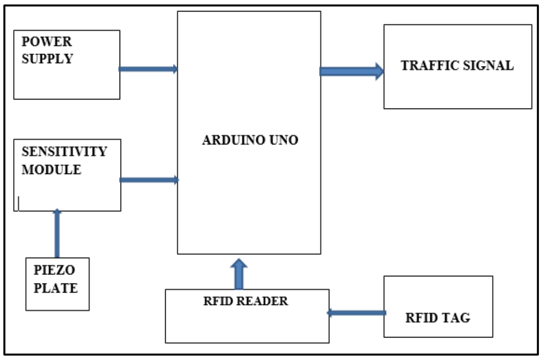

Fig. 2: Block Diagram

The traffic lights will provide instructions to the users (drivers and pedestrians) by displaying lights of standard color. The three colors used in traffic lights are Red, Yellow and Green. The system must be used to control the traffic lights for smooth and safe movement of traffic. These control systems consists of electro mechanical controllers with clockwork mechanisms or modern solid state computerized systems with easy setup and maintenance. In this project, an Arduino based Traffic Light Controller system is designed. It is a simple implementation of traffic lights system but can be extended to a real time system with programmable timings, pedestrian lighting etc.

A. Arduino Uno

It is important to understand that the Arduino board includes a microcontroller, and this microcontroller is what executes the instructions in the program. The ATmega328 microcontroller is the MCU used in Arduino UNO R3 as a main controller. ATmega328 is an MCU from the AVR family; it is an 8-bit device, which means that its data-bus architecture and internal registers are designed to handle 8 parallel data signals.

B. Piezo Sensor

A piezoelectric sensor is a device that uses the piezoelectric effect, to measure changes in pressure, acceleration, temperature, strain, or force by converting them to an electrical charge. The prefix piezo is Greek for 'press' or 'squeeze'

C. RFID

Radio-frequency identification (RFID) uses electromagnetic fields to automatically identify and track tags attached to objects.
RFID consists of

- RFID tag
- RFID reader

1) Sensitivity Module

Sensitivity module enhances the sensitivity of the piezo before it is applied to the microcontroller.

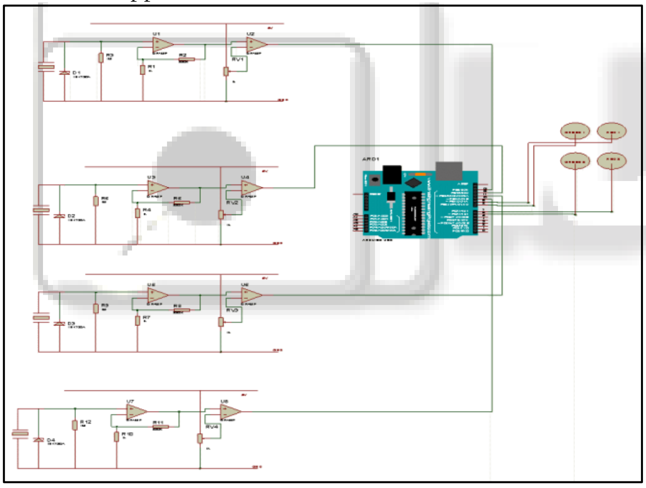

Fig. 3: Circuit Model

IV. HARDWARE DESCRIPTION

A. Arduino Uno Microcontroller

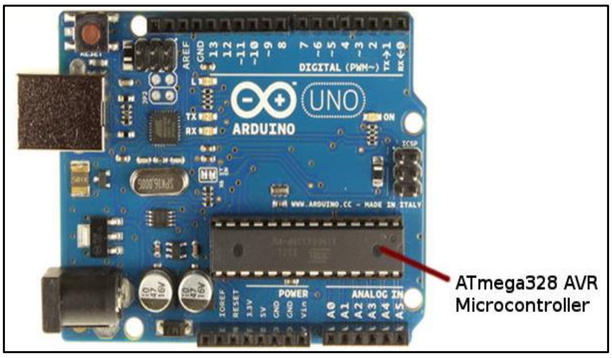

Fig. 4: Arduino Uno

1) Pin Description

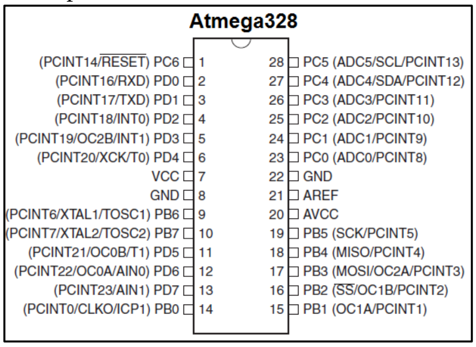

Fig. 5: Pin Diagram

2) The Microcontroller

It is important to understand that the Arduino board includes a microcontroller, and this microcontroller is what executes the instructions in your program. If you know this, you won't use the common nonsense phrase "Arduino is a microcontroller" ever again.

The ATmega328 microcontroller is the MCU used in Arduino UNO R3 as a main controller. ATmega328 is an MCU from the AVR family; it is an 8-bit device, which means that its data-bus architecture and internal registers are designed to handle 8 parallel data signals.

ATmega328 has three types of memory:

- Flash memory: 32KB nonvolatile memory. This is used for storing application, which explains why you don't need to upload your application every time you unplug arduino from its power source.
- SRAM memory: 2KB volatile memory. This is used for storing variables used by the application while it's running.
- EEPROM memory**:** 1KB nonvolatile memory. This can be used to store data that must be available even after the board is powered down and then powered up again.

3) Power

The MCU accepts supply voltages from 1.8 to 5.5 V. However, there are restrictions on the operating frequency; for example, if you want to use the maximum clock frequency (20 MHz), you need a supply voltage of at least 4.5 V.

4) Digital I/O

The MCU has three ports: PORTC, PORTB, and PORTD. All pins of these ports can be used for general-purpose digital I/O or for the alternate functions indicated in the pinout below. For example, PORTC pin0 to pin5 can be ADC inputs instead of digital I/O.

There are also some pins that can be configured as PWM output. These pins are marked with "~" on the Arduino board.

- Note: The ATmega168 is almost identical to the ATmega328 and they are pin compatible. The difference is that the ATmega328 has more memory—32KB flash, 1KB EEPROM, and 2KB RAM compared to the ATmega168's 16KB flash, 512 bytes EEPROM, and 1KB RAM.

5) AVCC

The power pin for the A/D unit.

6) AREF

The input pin used optionally if you want to use an external voltage reference for ADC rather than the internal Vref. You can configure that using an internal register.

7) UART Peripheral

A UART (Universal Asynchronous Receiver/Transmitter) is a serial interface. The ATmega328 has only one UART module.

The pins (RX, TX) of the UART are connected to a USB-to-UART converter circuit and also connected to pin0 and pin1 in the digital header. You must avoid using the UART if you're already using it to send/receive data over USB.

8) SPI Peripheral

The SPI (Serial Peripheral Interface) is another serial interface. The ATmega328 has only one SPI module.

Besides using it as a serial interface, it can also be used to program the MCU using a standalone programmer. You can reach the SPI's pins from the header next to the MCU in the Arduino UNO board or from the digital header as below:

- 11<->MOSI
- 12<->MISO
- 13<->SCK

9) TWI

The I^{2}C or Two Wire Interface is an interface consisting of only two wires, serial data, and a serial clock: SDA, SCL.

B. Radio-frequency Identification (RFID)

Radio-frequency identification (RFID) uses electromagnetic fields to automatically identify and track tags attached to objects. The tags contain electronically stored information. Passive tags collect energy from a nearby RFID reader's interrogating radio waves. Active tags have a local power source such as a battery and may operate at hundreds of meters from the RFID reader. Unlike a barcode, the tag need not be within the line of sight of the reader, so it may be embedded in the tracked object. RFID is one method for Automatic Identification and Data capture (AIDC).

RFID tags are used in many industries, for example, an RFID tag attached to an automobile during production can be used to track its progress through the assembly line; RFID-tagged pharmaceuticals can be tracked through warehouses; and implanting RFID microchips in livestock and pets allows for positive identification of animals. Since RFID tags can be attached to cash, clothing, and possessions, or implanted in animals and people, the possibility of reading personally-linked information without consent has raised issues.

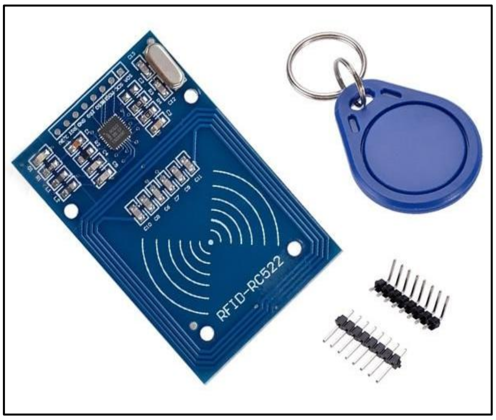

Fig. 6: RFID Rc522

1) RFID Working

RFID belongs to a group of technologies referred to as Automatic Identification and Data Capture (AIDC). AIDC methods automatically identify objects, collect data about them, and enter those data directly into computer systems with little or no human intervention. RFID methods utilize radio waves to accomplish this. At a simple level, RFID systems consist of three components: an RFID tag or smart label, an RFID reader, and an antenna. RFID tags contain an

C. Piezo Sensor

A piezoelectric sensor is a device that uses the piezoelectric effect, to measure changes in pressure, acceleration, temperature, strain, or force by converting them to an electrical charge. The prefix piezo is Greek for 'press' or 'squeeze'.

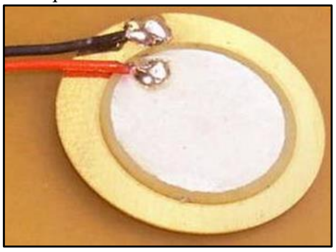

Fig. 7: Piezo Plate

D. Sensitivity Module

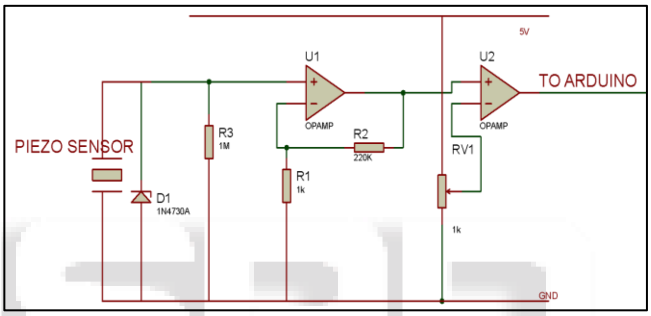

Fig. 8: RFID Rc522

1) Components of the Module

LM358 OpAmp (2)

- Piezo sensor: Potentiometer
- 1mega-ohm resistor
- Zener 5.1V
- 1Watt diode 220K,
- 100K resistor

2) OPAMP

An operational amplifier (often op-amp or opamp) is a DC-coupled high-gain electronic voltage amplifier with a differential input and, usually, a single-ended output.[1] In this configuration, an op-amp produces an output potential (relative to circuit ground) that is typically hundreds of thousands of times larger than the potential difference between its input terminals.

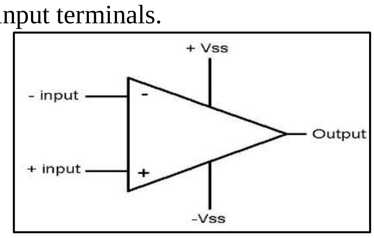

Fig. 9: Opamp Symbol

Operational amplifiers had their origins in analog computers, where they were used to perform mathematical operations in many linear, non-linear and frequency-dependent circuits.

The popularity of the op-amp as a building block in analog circuits is due to its versatility. Due to negative feedback, the characteristics of an op-amp circuit, its gain, input and output impedance, bandwidth etc. are determined by external components and have little dependence on temperature coefficients.

E. Pin Configuration of LM358 IC

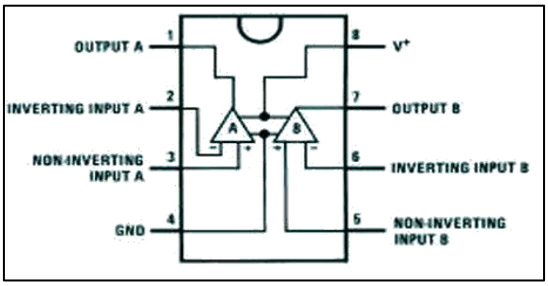

Fig. 10: Pin Diagram Of LM358

1) Working

– The first step is to put your circuit together.
– The image below shows the completed circuit using a solderable breadboard.
– In the bottom left of the image the green and yellow wires are coming from the piezo element. The yellow is the ground, the green is the positive output. A resistor is used for the component to prevent voltage spikes.
– A Zener diode is added in parallel to protect other parts of the circuit.
– The signal is taken into the op amp. The op amp amplifies the signal from the piezo element, and sends that signal from one side of the op amp to the other. The right side of the op amp receives the signal, and is used for amplification of the signal. The left side gets the amplified signal from the right side, and is used as comparator, determining which values to designate as high or low. The potentiometer adjusts the sensitivity of the comparator, and thus the sensitivity of the trigger.

The output of the comparator provides the input for the arduino.

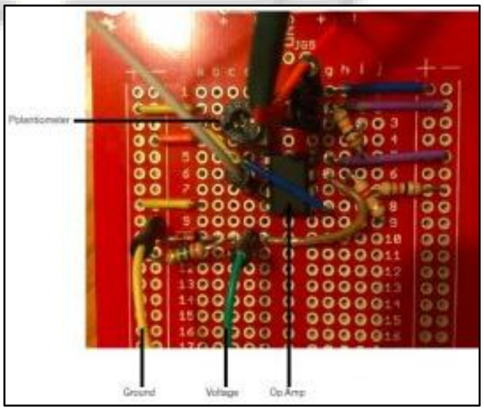

Fig. 11: PCB Layout of Sensitivity Module

V. SOFTWARE DESCRIPTION

A. Arduino IDE Platform

The Arduino IDE is a cross-platform Java application that serves as a code editor and compiler and is also capable of transferring firmware serially to the board. The development environment is based on Processing, an IDE designed to introduce programming to artists unfamiliar with software development. The programming language is derived from Wiring, a C-like language that provides similar functionality for a more tightly restricted board design, whose IDE is also based on Processing. The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. It runs on Windows, Mac OS X, and Linux. This software can be used with any Arduino board.

B. Arduino Codes

1) To make pizo stable
https://drive.google.com/open?id=0B_aK1arQvedzMUZMVlRiZ0pHUEE
2) To control traffic light
https://drive.google.com/open?id=0B_aK1arQvedzOUJrRHhOeC14S3M
3) To control rfid of ambulance
https://drive.google.com/open?id=0B_aK1arQvedzWmZ0TVM0S0t1NWs

VI. PIEZO PROJECT IMPLEMENTATION

This project is implemented in two stages
– Density calculation using piezo senso
– Priority based signaling using VANET application

A. Density Calculation using piezo sensor

Basically in our proposed system we measure the density of a two lane road using piezo sensors. The plates are laid under the road as shown in the figure

Fig. 12: Piezo Installations

– Lane 1 consists of piezo sensor-1 and piezo sensor-2
– Lane 2 consists of piezo sensor-3 and piezo sensor-4

The arrangement of piezo plates near the traffic signal is such that it will be able to calculate different cases of traffic density.

Each piezo sensor is connected to the sensitivity module. The sensitivity module will increase the piezo sensitivity by the use of comparator and provides a output signal of amplitude 5V (HIGH).The output of each module is given to the arduino uno microcontroller. Thus the microcontroller gets the density of each lane based on which it checks for different cases and provides adaptive control over traffic.

Table to show the various cases that the microcontroller looks for,

P1	P2	P3	P4	Output	Green 1	Red 1	Green2	Red2
Low	Low	Low	Low	Equal	ON	OFF	OFF	ON
High	High	Low	Low	Lane 1	ON	OFF	OFF	ON
High	Low	High	Low	Alternate	ON	OFF	OFF	ON

High	Low	Low	High	Alternate	ON	OFF	OFF	ON
Low	High	High	Low	Alternate	ON	OFF	OFF	ON
Low	High	Low	High	Alternate	ON	OFF	OFF	ON
Low	Low	High	High	Lane 2	OFF	ON	ON	OFF
High	High	High	High	Equal	ON	OFF	OFF	ON

Fig. 2: Table of Traffic Cases

1) Case 1

When all the piezo plates are under pressure by the traffic. This results in yielding high outputs from P1, P2, P3,P4 to the microcontroller. This denotes high and equal density on each lane. Microcontroller gives equal preference to each lane by providing alternate green signals for a predetermined time to each lane.

2) Case 2

When both piezo plates of lane 1 are under pressure by the traffic and lane 2 is free. This results in yielding high outputs from P1, P2 and low output from P3, P4 to the microcontroller. This denotes high density on lane 1 compared to lane 2. Thus Microcontroller gives preference to lane 1 by providing green signal for a predetermined time to lane 1 first.

3) Case 3

When both piezo plates of lane 2 are under pressure by the traffic. This results in yielding high outputs from P3, P4 and low output from P1, P2 to the microcontroller. This denotes high density on lane 2 compared to lane 1. Thus Microcontroller gives preference to lane 2 by providing green signal for a predetermined time to lane 2 first.

4) Case 4

If P1 and P3 is high or P1 and P4 is high or P3 and P2 is high then it indicates equal density on each lane only being different in the position. Thus the microcontroller gives equal preference to each lane by providing alternate green signals for a predetermined time to each lane.

Table to show the various cases that the microcontroller looks for.

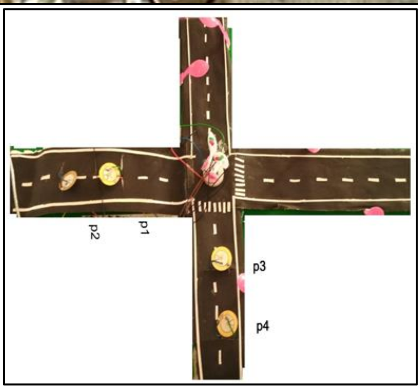

Fig. 14: Table of Traffic Cases

B. Priority based signaling using VANET application

Whenever an emergency vehicle like Fire Brigade Vehicle, Ambulance or Police on pursuit, the transmitter will transmit the RF signals to RF receiver fitted with the traffic poles, they will automatically turn green and rest of the signal stay RED. After passing of that vehicle, all the functionality of the traffic signal will be normal as per specified n this model we have used RFID reader, RFID tag, ARDUINO, RF transmitter and receiver system for automatically controlling the traffic signal when the emergency vehicle is detected. Initially the traffic signal works normally. When an emergency vehicle crosses the path the RFID tag positioned at the vehicle get driven by the antenna that enables to receive electromagnetic power from the RFID reader.

The RFID reader detects the ID and transmits the information through wireless communication using the RF transmitter and receiver system operating at the range of30 kHz & 300 GHz. On receiving the information at the receiver system, the ARDUINO controller controls the traffic light. By this way the traffic light turns to green signal until the ambulance passes the traffic junction. Thus the emergency vehicle can pass the junction without any delay

Fig. 15: RFID Transceiver

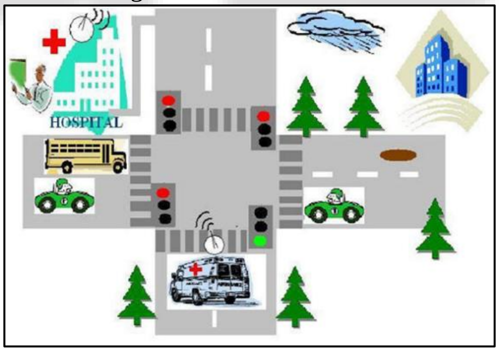

Fig. 16: Priority Based Traffic Scenario

C. Proposed Model

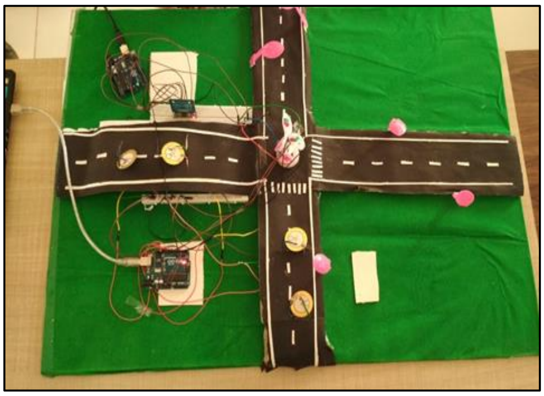

Fig. 17: Overall Project Model

D. Advantages

1) Capacity of Piezo

The generating capacity of piezoelectric devices can be crudely over-approximated by assuming that the vibrations in the road are caused by traffic alone, and that each "vibration event" from one vehicle is independent of another (i.e. the vibrations are sufficiently dampened before the next vehicle passes). Under these assumptions, the total energy harvested by piezoelectric devices along a one-kilometer stretch is at most the number of cars that pass multiplied by the vibrational energy that one car transfers to the road.

Expended Energy= (Gasoline Used) × (Energy Density of Gasoline) × (Thermal Efficiency)

$$= \frac{1\ \text{km} \times 0.621\ \text{mi/km} \times 2.8\ \text{kg/gal} \times 4.43 \times 10^{7}\ \text{J/kg} \times 0.4}{20\ \text{mi/gal}}$$

$$= 1.54\ \text{MJ}$$

This overestimation provides an appropriate upper bound to the amount of energy absorbed by piezoelectric devices from one car moving across a one kilometer strip (i.e. no more than 1.5 MJ). Of course, some of this "mechanical" (i.e. non-thermal) energy is lost as various forms of friction and used for other processes inside the vehicle (such as air conditioning), and not nearly all of the vibrational energy will be absorbed by the devices in the road. If the devices are embedded on a busy street, then such a street will generate at most this amount of energy multiplied by the number of cars moving across the street.

2) Profitability

With the price of gasoline hovering around $4 a gallon for the past year, the cost of driving a 20 mpg car across one kilometer is about $0.124. And by recent retail prices of residential electricity on the West Coast, the 0.19 MJ generated by one car costs about $0.0064, or about one twentieth the cost of the gasoline burned across this one-kilometer strip. [6] At this rate, the road will generate a revenue of $33,565 per year.

As an approximate, the price of a piezoelectric device can be estimated by its most expensive element, namely the piezoelectric component. This component, according to Innowattech's patent, is comprised of about 50% lead-zirconate titanate (PZT) ceramic and is about 14×14×2 cm3 in dimension. [7] Given that piezoelectric sheets of the same material currently cost $165 in bulk from Piezo Systems (for 100 sheets of 10.64 cm3 each), the cost per cm3 of this material is about $0.155. Since the devices are embedded 30 cm apart from each other and in two rows per lane, a kilometer of a two-way street will contain 13,333 devices, each device costing $30.39, adding to a total of $405,253. Even without considering the manufacturing or installation costs, it would take about 12 years to earn back this amount from the device revenue.

3) Energy Source

Piezoelectricity can also serve as an alternative energy source of the future. The sensors used to measure traffic density can act as energy source which can be saved in batteries or can be used for street lights

4) Novel Method to Calculate Traffic Density

Calculating of vehicles density in traffic images is a challenging research topic as it has to directly deal with hostile but realistic conditions on the road, such as uncontrolled illuminations, cast shadows, and visual occlusion. Yet, the outcome of being able to accurately count and resolve vehicles under such conditions has tremendous benefit to traffic surveillance. Accurate vehicle count enables the extraction of important traffic information such as congestion level and lane occupancy. Since here the measurements are based on pressure put on piezo it is unlikely to undergo any type of issues that are faced in visual surveillance.

5) Versatile System

Many applications of VANET can be incorporated to provide an automated environment to control traffic like GPS, GSM Module can be used.

6) Adaptability

The traffic light is controlled based on the instantaneous traffic density as measured which helps to overcome the problems faced in fixed time traffic light signal.

7) Priority Based

The project firstly focuses on the priority marked vehicles which helps to serve humanity in a better way. Example include preferring ambulance, fire brigades etc. vehicles over the common traffic.

8) Smart system architecture size.

9) Increasing public health savings by reducing the amount of emissions thanks to decreasing traffic congestion.

10) Improving operation for all users, especially for transit bus routes. Enhanced public transport time and reliability.

11) Great ability in handling unpredictable change for traffic volumes and patterns on special days and times. Ability to provide a dynamic response to traffic demands.

12) Adequate handling of traffic patterns and volumes.

13) Possibility to handle long pedestrain clearance time.

14) Responsiveness to day-to-day and time-of –day fluctuations on demand.

15) Good responsiveness to traffic congestion resulting from crashes, quick clearing of backups.

16) In case of low volume traffic demand the traffic signal timing will adjust reduced overall delays.

E. Limitations

1) Sensitivity of Piezo

Piezo plays a crucial role in this proposed method thus it must produce an optimum output. Its sensitivity needs to be increased before providing the output to the microcontroller.

2) Lack of People Interest

Often piezo sensor is considered to provide current in micro and milli ampere which led people to neglect the power of piezo. In this proposed method piezo can also be used as an energy source which requires proper design. The negligence in the research towards it may lose one of the clean energy harvesters.

3) Static Force

Piezo sensor cannot be used to measure truly static measurements. A static force results in a fixed amount of charge on the piezoelectric material.

VII. CONCLUSION AND FUTURE SCOPE

A. Conclusion

Density Based Signal Management in Traffic System show how the Traffic Light Signal controls, including with the implement of Traffic Scheduling Algorithm which is used to gain information from the piezo sensors and RFID. The acquired data from Road Units reschedule the traffic light timing according to the traffic condition for low or high density road traffic. If the density of the road traffic is high then Maximum density of traffic will allow maximum default timing for traffic lights. Minimum density of traffic will allow traffic with minimum timing for traffic lights. If the traffic rate on both sides is Equal or gap within traffic then according to arrival time traffic light signal set to minimized, they collect information from the special RFID tagged vehicles for scheduling traffic. In that system they aggregate vehicle in equal platoon. They decide the equal size platoon on each lane and the processing time is also equal and schedules the traffic. For avoiding the scheduling problem in our system we will not fixed the time for traffic signal. Our System is adaptive System Each Road Unit covers 500 meters sized cell that allow the all cars approaching a junction can communicate with the Road unit that comprises the piezo sensor and RFID.

The RFID via the broadcast packets send the signalling information based on received traffic information. At traffic junction or traffic circle the microcontroller first checks for any priority vehicles by reading the RFID tag and then proceeds for the density calculation using piezo. Thus the system reacts to the instantaneous traffic and provides an adaptive control over traffic.

B. *Future Scope*

The following work can be carried out as a follow up of the current work.

1) Piezoelectricity can also serve as an alternative energy source of the future for practical applications, the sensor can be attached with the wheel of a vehicle to get the wheel vibration, which can be used for measuring vehicle speed.
2) Multiple sensors can be placed beside the road to measure the vehicle speed between the appearances of the two peaks can be calculated. Thus speed can be determined by the dividing the distance between two sensors with the calculated time.
3) A GPS system can be added to determine the particular speed violation location of vehicles as a feature of identical proofs of the offenders.
4) V2V communication can upgrade the project to an automated control.

REFERENCES

[1] Mohit Dev Srivastava1, Prerna2, Shubhendu Sachin3, Sumedha Sharma4, Utkarsh Tyagi "Smart Traffic Control System Using PLC and SCADA"2012
[2] Ch. Bhanu Prakash, K Sirisha, "Design and Implementation of a Vehicle Theft Control Unit using GSM and CAN Technology"2014
[3] P. Sai Chaitanya, V. Vikram, 3B. Kalesh, "Automatic Vehicle Speed Control System Using Wireless fidelity"
[4] P. Sai Chaitanya*, V. Vikram, G. Shruthi, "Embedded Traffic Control System UsingVANET" 2016
[5] Miss. Sadaf A. Shaikh 1, Prof. L.M.R.J. Lobo," An Intelligent V2V Communication Based Traffic Control System"2016
[6] M.Absar Alam and Fiasal Ahmed; +"Urban Transport System and Congestion: Case Study Of Indian Cities", Transportation and communications bulletin for Asia and the Pacific.,No82,2013.
[7] Md. Abdus Samad Kamal, Member, IEEE, Jun-ichi Imura, Member, IEEE, Tomohisa Hayakawa, Member, IEEE, Akira Ohata, and Kazuyuki Aihara. "Smart Driving of a Vehicle Using Model Predictive Control for Improving Traffic Flow", IEEE Transaction On Intellgent Transportation System, vol.15,No.2 April 2014.
[8] Rajeshwari Sundar, Santhoshs Hebbar, and Varaprasad Golla; IEEE, "Implementing Intelligent Traffic Control System for Congestion Control, Ambulance Clearance, and Stolen Vehicle Detection", IEEE Sensors Journal, Vol. 15, No. 2, February 2015.
[9] S. Sharma, A. Pithora, G. Gupta, M. Goel, and M. Sinha, "Traffic light priority control for emergency vehicle using RFID", Int. J. Innov. Eng. Technol., vol. 2, no. 2, pp. 363–366, 2013

