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IOT TECHNOLOGY BASED TRAFFIC SIGNAL CONTROL

Ramya Mallepogu[1], Suveena Pedda Yenumula[2], Madhavi Latha Tapa[3],
P.Lokeshwara Reddy[4], Dr.G.Lakshminarayana[5]
Assistant Professor[4], Professor[5],UG Student[123]
DEPT OF ECE
SVR ENGINEERING COLLEGE, NANDYAL

ABSTRACT
The level of pollution at traffic lights has increased with the increased vehicle use, which results in harmful effects on humans those who are exposed to it directly. Pollution monitoring using internet of things (IoT) over traffic lights is proposed to monitor and check the temperature and humidity levels at the traffic signals through IoT. This proposed system uses gas sensor and temperature sensors to sense the presence of harmful gases like carbon monoxide, carbon dioxide, smoke, ammonia and humidity in the atmosphere. This information is constantly transmitted to the microcontroller and same is reported to the online server through Wi-Fi module. Based on this the traffic lights ON/OFF timing rates are automatically modified. This proposed method controls the pollution and temperature at traffic lights automatically.

I. INTRODUCTION

Now days, due to urbanization number of roads, vehicles are increasing rapidly. Traffic monitoring and controlling it challenge on many cities of our country. Most metro cities in the world are still suffering from traffic congestion and related problems [1]. It creates many issues such as travelling time delay between two major cities, Fuel wastage at intersection, air pollution due to emission, death on roads due accidents and many transport related problems. Studies show 30% dioxide emissions are from transportation systems, inefficient traffic management leads to fuel wastage of billion gallons per year, also poor designed traffic signals produce collaborate with users. Such a smart communication is given by IoT without human interaction. In this paper propose to use sensing technology to monitor vehicle traffic data using ultrasonic sensors detect traffic levels and transfer data to controller unit which processes data and display on the server. Traffic signal control method is used to reduce traffic problems and for emergency vehicle priority at signal. If at any lane high disruptions to traffic flows and increase delays [2]. Two major cities are connected by expressways which are causing deaths in accidents due to the number of vehicles and increasing their speed on highways. In recent years,researchers examined highway accidents involved many road users (vehicles, pedestrians, animals) and resulted in fatal victims and more than serious injury victims, which is neglected by human beings and government authorities. To solve such problems, intelligent road traffic management systems and authorities required in the highways which can monitor real-time traffic and traffic status at intersection in cities. This system process to need be done at 24*7 hrs to check traffic status on the roads and controls it, which could be done by using Internet of Things (IoT) technology and wireless technology. Latest approaches such as sensing technology used for real-time traffic monitoring Using sensors we can detect traffic level status at an intersection. Here designed system using sensor network and collect data about the traffic level status at the lanes. Ultrasonic sensors are used to monitor traffic levels and this data process at controller unit and transfer data through Wi-Fi module to the web server. This is IoT platform which analysis,real-time data. IoT is a novel paradigm that is rapidly gaining ground in the scenario of wireless telecommunications [3]. It is the latest technology, realized as network of things having unique identification and based on communication protocols. IoT allows objects to communicate with each other to receive data at the web server, to store and collect data and to traffic level detects then, signal gives more time to pass vehicles. This embedded system using wireless sensor network provides a framework for monitoring and controlling traffic related real-time information.

II. POWER SUPPLY
Block Diagram

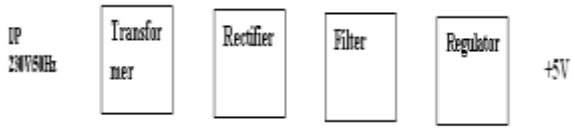


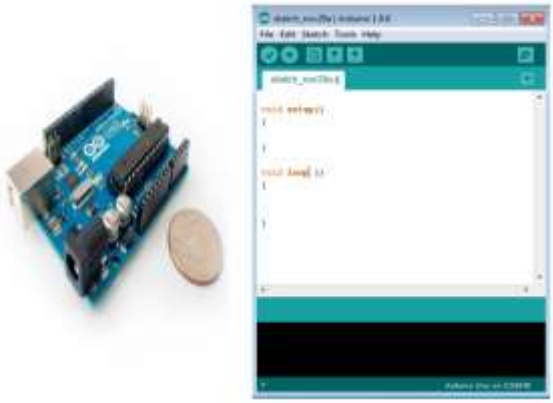
Figure Power Supply

III. HARDWARE
3.1 Arduino

Arduino is a prototype platform (open-source) based on an easy-to-use hardware and software. It consists of a circuit board, which can be programed (referred to as a microcontroller) and a ready-made software called Arduino IDE (Integrated Development Environment), which is used to write and upload the computer code to the physical board.

The key features are −

- Arduino boards are able to read analog or digital input signals from different sensors and turn it into an output such as activating a motor, turning LED on/off, connect to the cloud and many other actions.
- You can control your board functions by sending a set of instructions to the microcontroller on the board via Arduino IDE (referred to as uploading software).
- Unlike most previous programmable circuit boards, Arduino does not need an extra piece of hardware (called a programmer) in order to load a new code onto the board. You can simply use a USB cable.
- Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program.
- Finally, Arduino provides a standard form factor that breaks the functions of the micro-controller into a more accessible package.



Board Types

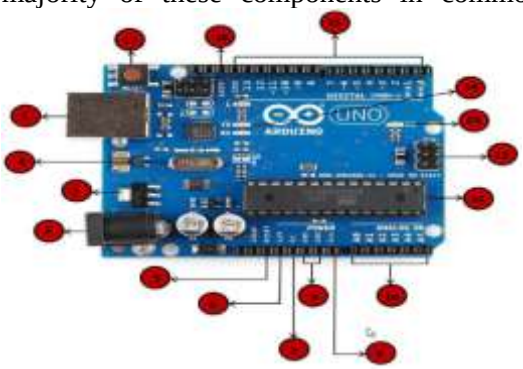
Various kinds of Arduino boards are available depending on different microcontrollers used. However, all Arduino boards have one thing in common: they are programed through the Arduino IDE.

The differences are based on the number of inputs and outputs (the number of sensors, LEDs, and buttons you can use on a single board), speed, operating voltage, form factor etc. Some boards are designed to be embedded and have no programming interface (hardware), which you would need to buy separately. Some can run directly from a 3.7V battery, others need at least 5V.

Here is a list of different Arduino boards available.

3.2 Board Description:

In this chapter, we will learn about the different components on the Arduino board. We will study the Arduino UNO board because it is the most popular board in the Arduino board family. In addition, it is the best board to get started with electronics and coding. Some boards look a bit different from the one given below, but most Arduinos have majority of these components in common



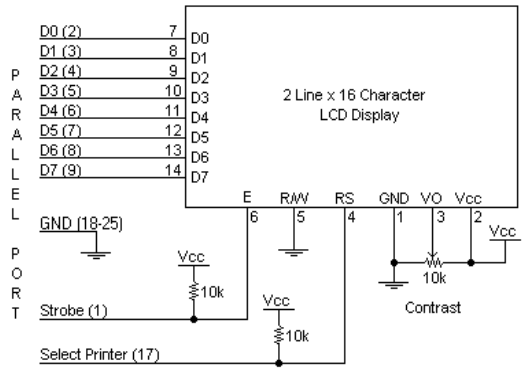
3.3 Liquid Cristal Display

A liquid crystal display (LCD) is a thin, flat display device made up of any number of color or monochrome pixels

arrayed in front of a light source or reflector. Each pixel consists of a column of liquid crystal molecules suspended between two transparent electrodes, and two polarizing filters, the axes of polarity of which are perpendicular to each other. Without the liquid crystals between them, light passing through one would be blocked by the other. The liquid crystal twists the polarization of light entering one filter to allow it to pass through the other.

A program must interact with the outside world using input and output devices that communicate directly with a human being. One of the most common devices attached to an controller is an LCD display. Some of the most common LCDs connected to the contollers are 16X1, 16x2 and 20x2 displays. This means 16 characters per line by 1 line 16 characters per line by 2 lines and 20 characters per line by 2 lines, respectively.

3.4 Schematic Diagram



3.5 PIN DESCRIPTION:

Most LCDs with 1 controller has 14 Pins and LCDs with 2 controller has 16 Pins (two pins are extra in both for back-light LED connections).

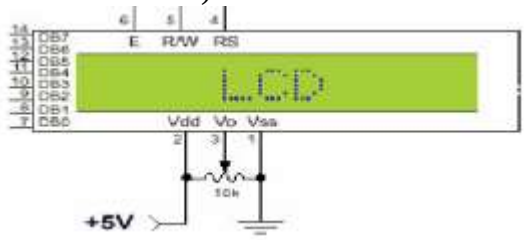


Figure Pin diagram of 1x16 lines LCD

3.6 CONTROL LINES:

EN: Line is called "Enable." This control line is used to tell the LCD that you are sending it data. To send data to the LCD, your program should make sure this line is low (0) and then set the other two control lines and/or put data on the data bus. When the other lines are completely ready, bring EN high (1) and wait for the minimum amount of time required by the LCD datasheet (this varies from LCD to LCD), and end by bringing it low (0) again.

RS: Line is the "Register Select" line. When RS is low (0), the data is to be treated as a command or special instruction (such as clear screen, position cursor, etc.). When RS is high (1), the data being sent is text data which should be displayed on the screen. For example, to display the letter "T" on the screen you would set RS high.

RW: Line is the "Read/Write" control line. When RW is low (0), the information on the data bus is being written to the LCD. When RW is high (1), the program is effectively querying (or reading) the LCD. Only one instruction ("Get LCD status") is a read command. All others are write commands, so RW will almost always be low. Finally, the data bus consists of 4 or 8 lines (depending on the mode of operation selected by the user). In the case of an 8-bit data bus, the lines are referred to as DB0, DB1, DB2, DB3, DB4, DB5, DB6, and DB7.

Logic status on control lines:

• E - 0 Access to LCD disabled
- 1 Access to LCD enabled
• R/W - 0 Writing data to LCD
- 1 Reading data from LCD
• RS - 0 Instructions
  - 1 Character

Writing data to the LCD:

1) Set R/W bit to low
2) Set RS bit to logic 0 or 1 (instruction or character)
3) Set data to data lines (if it is writing)
4) Set E line to high
5) Set E line to low

Read data from data lines (if it is reading) on LCD:

1) Set R/W bit to high
2) Set RS bit to logic 0 or 1 (instruction or character)
3) Set data to data lines (if it is writing)
4) Set E line to high
5) Set E line to low

3.7 MQ2 Gas Sensor

MQ2 Gas sensor Pinout

2D model of MQ-2 Gas sensor:

If you purchased sensor then you can use the following dimensions to create your own PCB for your application

3.8 DHT11–Temperature and Humidity Sensor

DHT11 Specifications:

- Operating Voltage: 3.5V to 5.5V
- Operating current: 0.3mA (measuring) 60uA (standby)
- Output: Serial data
- Temperature Range: 0°C to 50°C
- Humidity Range: 20% to 90%
- Resolution: Temperature and Humidity both are 16-bit
- Accuracy: ±1°C and ±1%

Note: The **DHT11 datasheet** can be found at the bottom of the page

DHT11 Equivalent Temperature Sensors:

DHT22, AM2302, SHT71

Other Temperature Sensors:

Thermocouple, TMP100, LM75, DS18820, SHT15, LM35DZ, TPA81, D6T

Difference between DHT11 Sensor and module:

The **DHT11 sensor** can either be purchased as a sensor or as a module. Either way, the performance of the sensor is same. The sensor will come as a 4-pin package out of which only three pins will be used whereas the module will come with three pins as shown above.

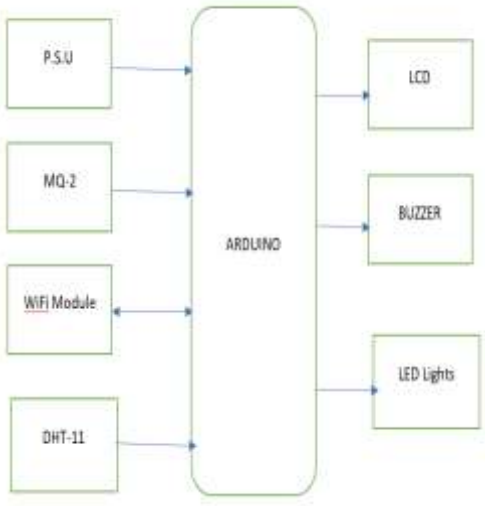
The only difference between the sensor and module is that the module will have a filtering capacitor and pull-up resistor inbuilt, and for the sensor, you have to use them externally if required.

3.10 Buzzer:

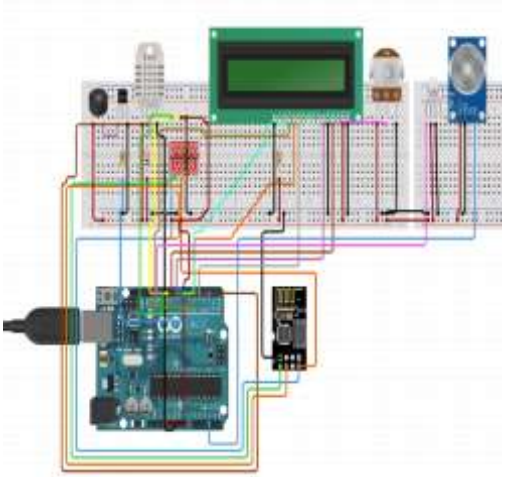
A buzzer or beeper is an audio signalling device, which may be mechanical, electromechanical, or piezoelectric (piezo for short). Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

IV. RESULT:

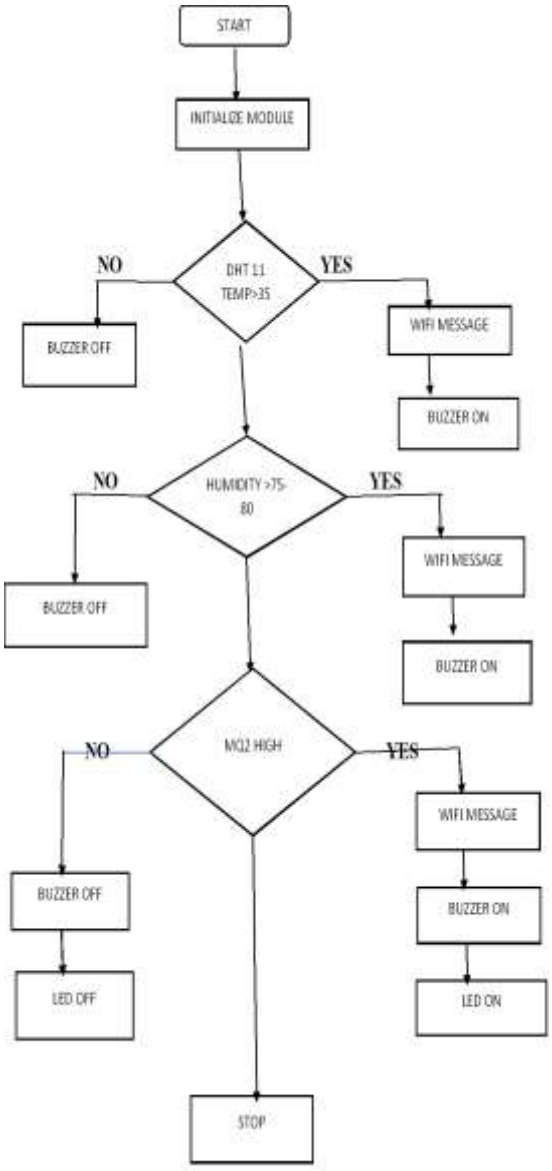
4.1Block Diagram



4.2 Schematic Diagram



4.3 FLOWCHART



V. CONCLUSION

Our country is ranked highest in the world for traffic related problems, thus there is the need to reduce traffic related issues such as long travelling time, fuel wastage, air pollution and transport related problems, this proposed system developed. Here developed system for real-time traffic monitoring using IoT platform which is reliable for users. This system also controls signal time, according to traffic levels at the lanes, gives priority to emergency vehicle. The proposed system is more reliable, easily operates by users and low cost system and easily equipped at any place.

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