Design and Implementation of Smart Traffic Control System

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Declaration

It is declared hereby that this project paper or any part of it has not been submitted to anywhere else for the award of any degree.

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CERTIFICATION

This is to certify that this project entitled ―Design and Implementation of Smart Traffic Control System with IOT‖ is done by the following students under my direct supervision. This project work has been carried out by them in the laboratories of the Department of Electrical and Electronic Engineering under the Faculty of Engineering, Sonargaon University (SU) in partial fulfillment of the requirements for the degree of Bachelor of Science in Electrical and Electronic Engineering.

Supervisor

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The report titled as on **"Design and Implementation of Smart traffic control System with IOT"** has been prepared to fulfill the requirement of our practical program. In the process of doing and preparing our practical report, we would like to pay our gratitude to some persons for their huge help and vast co-operation. At first, we would like to show our gratitude to the University authority to permit us to do our practical. Specially, we would like to thank to our honorable teacher Md. Rais Uddin Mollah, Lecturer and Asst. Coordinator, Department of Electrical & Electronics Engineering, Sonargaon University (SU), Dhaka, for his patience and valuable advice, sympathetic assistance, co-operation, contribution of new idea. Deep theoretical and hardware knowledge & keen interest of our supervisor in this field influenced us to carry out this project. His endless patience, scholarly guidance, continual encouragement, constant and energetic supervision, constructive criticism, valuable advice, reading many inferior draft and correcting them at all stage have made it possible to complete this project.

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Abstract

Traffic Congestion and traffic monitoring is one of the important problems all over the world. A significant amount of research work carried out on traffic management systems, but intelligent traffic monitoring is still an active research topic due to the emerging technologies such as the Internet of Things (IoT) and Artificial Intelligence (AI). The integration of these technologies will facilitate the techniques for better decision making and achieve urban growth. However, the existing traffic prediction methods mostly

dedicated to highway and urban traffic management, and limited studies focused on collector roads and closed campuses. Besides, reaching out to the public, and establishing active connections to assist them in decision-making is challenging when the users are not equipped with any smart devices. This research proposes an IoT based system model to collect, process, and store real-time traffic data for such a scenario. The objective is to provide real-time traffic updates on traffic congestion and unusual traffic incidents through roadside message units and thereby improve mobility. These early-warning messages will help citizens to save their time, especially during peak hours. The Arduino platform is the microcontroller preference for this idea. Also, to make this idea more effective and productive, a Light Emitting Diode (LED) advertising displays has been incorporated into its implementation to take advantage of the red light wait time to disseminate useful information or facts.This proposed system is cost-effective, very simple to install and easy to maintain.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1.1 Project outlines

IOT Based Home Automation final project paper is arranged into following chapter:

- **Chapter 1:** Basically, is an introduction of the project. In this chapter, provides the background of the project, objective, goal of project and the project outline.
- **Chapter 2:** Focused on familiarization of the elements and devices and there features those used in this project.
- **Chapter 3:** Mainly focused on methodologies for the development of traffic control system. Details on the progress of the project are explained in this chapter.
- **Chapter4:** Presents the results obtained. All discussion is concentrating on the result and performance of our designed project.
- **Chapter 5:** Concludes overall about the project. Future recommendations are also discussed in this chapter.

CHAPTER I

INTRODUCTION

1.1: Introduction

The wide variety of vehicles on the road has been risen dramatically in recent years. For this, traffic jam is growing trouble that everybody suffers with on an everyday basis. Now a day manually traffic management becomes very difficult, ineffective and expensive. Modern age is the age of Science, information and Technology. Internet made our life easier and faster.To persons who journey or adventurers, congestion means lost time, missed opportunities, and dissatisfaction. To an employer, congestion means lost workers efficiency, delivery delays and increased costs. To resume at work and to disseminate useful information to various offices within a given area during peak hours, becoming more difficult for workers and other member of the community. Due to congestion problems, traffic of four road lanes is controlled using microcontroller for 24 hours and this decrease waiting time for the road users.

Traffic administration has the goal to constantly improve traffic system and regulation. As the figure of vehicle users constantly rises and possessing shifted by running infrastructures are restricted, rational monitoring of traffic will turn a point of focus in the posterior. Fudge traffic congestions is beneficial to both ambience and economics.The wise transportation process (WTP) estimates the traffic parameters and optimizes traffic sign to reduce vehicle delays and stop. Fixed control on traffic is basically not control following to the volume, but in the way of programming which is meanwhile stable in the scheme. Congestions in traffic system occur when there are more vehicles than the road can handle. This situation makes the trip longer than it should be as it increases the queuing of vehicles. This phenomenon is also known as traffic jam. Congestions in traffic can be a result of accident, going through wrong way, for VIP passing, unauthorized parking etc. it can be happened due to bad road layout, misunderstanding traffic rules also. This junction is a staggered link between the two main entrance and exit roads. Due to its staggered nature, maneuvering into any of the two roads can be very hard and dangerous. Therefore, the need for a traffic control system is crucial. Human traffic control at this junction is impractical as the road itself is too narrow to accommodate a human traffic officer. Also, the staggered nature of this junction makes it difficult to find a suitable place to locate a traffic officer.

Therefore, an electronic traffic control system (microcontroller based) is more than suitable as it defies these two limitations for a human traffic officer Things. In the emerging

modern society, electronics, robots and artificial intelligence are replacing humans in many fields of endeavor one of which is traffic controlling.

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Figure: Traffic jam in Bangladesh using manual system.

1.2: Historical Background

The current drills for traffic signal monitoring are given below: **a)**

Soft Traffic Administration Plan:

The traffic is monitor by one individual only. If there are four streets from where vehicles are oncoming, then the man should have monitor the traffic. He has to relief the vehicles one by one street. But it's not simple to manage when much traffic is there.

b) Intellectual Traffic Administration Plan Using Wireless Technologies: This is used to affecting appearance of traffic close any round and joint and then capable to way the traffic based on the solidity in wished for way.

Presently the availability of might origins like coal, biomass, and hydro electrical plants is narrow thus the acquaintance to conduct enough ability from the mentioned origins has turn usual. Attenuation of force from road lights is one of the noticeable force fall, attempts to conduct optimum force using automation conduct to much modern processes of force and money defense. With the ample accessibility of fair lighting novelty like Light Emitting Diode (LED) lights and totally approachable distant web organization, fast respondent, reliable cause and force wielding road lighting frameworks turn to be fact.

[1] **Vishakha S. Thakre et.al** has proposed the design of a smart traffic light controller using embedded system that could provide dynamic time interval for traffic lights according to the length of vehicles present at each lane. It also handles the occurrence of emergency vehicles by making the all the signals red other than the one from where the emergency vehicle is approaching. The proposed system also has facilitated user with the GSM technology by sending the information of traffic congestion as an SMS on the mobile phone network.

[2] **Faruk Bin Poyen et.al** has designed 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. Once the density is calculated, the glowing time of green light is assigned by the help of the Arduino microcontroller. 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.

[3] **Bilal Ghazal et.al** has designed a traffic light control system to realize smooth motion of the cars on the roads. The proposed system evaluates the traffic density and calculates the appropriate time slots for each traffic lights in order to overcome the problems of the mutual interference between adjacent traffic light systems, the disparity of cars flow with time, the accidents, the passage of emergency vehicles, and the pedestrian crossing are not implemented in the existing traffic system.

[4] **C. Bhuvaneshwari et.al** have analyzed the street light with auto tracking system by which one can increase the conversion efficiency of the solar power generation. Here, the sun tracking sensor is the sensing device which senses the position of the sun time to time and gives the output to the amplifier based on light density of the sun.

[5] **& [6] S. Suganya et.al and W. Yue** have proposed about Street Light Glow on detecting vehicle movement using sensor is a system that utilizes the latest technology for sources of light as LED lamps. It is also used to control the switching of street light automatically according to the light intensity.

[7] **M. Abhishek et.al** have implemented design of traffic flow based street light control system with effective utilization of solar energy in the year 2015. They used the renewable source of energy i.e. the solar power for street lighting.

[8] **K. Santha et.al** have surveyed on Street Lighting System Based on Vehicle Movements. The system operates in the automatic mode which regulates the streetlight according to brightness and dimness.

[9]**Srikanth et.al** proposed a Zig Bee based Remote Control Automatic Street Light System. The system is designed with the help of Zig Bee modules that helps in detecting the faulty lights and control the light.

[10]**Steve Chadwick** reports on the two installation case studied in Scotland and Wales and explain the details and benefits of the technology. The system was called as MINOS that had a track record of over 100,000 units installed and working successfully.

[11]**Radhi Priyasree** explains a system to reduce the power consumption of street lights by avoiding inefficient lighting which wastes significant financial resources each year. This is done by dimming the lights during less traffic hours.

From this composition metering, the systems everyone has carry through and applied is soft and simple to realize. These papers are focused to further redact a numerous skilled method and commit things automated.

1.3: Impacts of Traffic Blockage

Traffic blockage has a number of minus outcome.

a) Wasting of costly time of motorists and passengers.
a) Delay, that may sequel in slow coming for job, office, school.
b) Inability to guess accurate travelling time.
c) Increased wasting of fuel and air pollution also.
d) Blockage of traffic may block the passage of emergency vehicles travelling.
e) Top possibility of blockage due to tight pause and certain giving up and active.
f) Its reduce regional economic health.
g) For traffic blockage late arrival for employment, meetings and education, resulting in lost business, disciplinary action or other personal losses.

h) For emergency patient sometimes ambulance couldn't reach hospital in time and lost life the patient.

i) Fire service transport couldn't reach in time, as a result they couldn't do their duty properly and for this losses is indescribable.

j) Stressed and frustrated motorists, encouraging road rage and reduced health of motorists.

k) Higher chance of collisions due to tight spacing and constant stopping and going.

1.4: Purpose of This Project

Various studies and surveys have allotted that, on a routine basis most of the traffic blockage or traffic jams occur because of traffic light system. Traffic congestion is nothing but an additional waste of time from one's daily routine. It is noticed that most of the traffic congestion is occur during the morning and late afternoon. Basically during that time, the students and employers go to school, college, University or office so they also be late for their office or institutions at the traffic light spot. By decreasing the congestion of cities we can also decrease the extra waste of energy like CNG, Petroleum for special case electricity also. As a deeply populated developing country like Bangladesh whose GDP is on an average 6% and whose greater of the external currency from stock are spent on score petroleum and electricity, can't pay to loss such a significant resource.

The fixed stroll of people from rustic to rural limit in find of fresher assembly has produced in rural demography blow up and over-skimmed infrastructures. One of such over-skimmed infrastructure is the street, a circumstance which has culminated to grown traffic. Though traffic lights have ever been used for directing the activity of traffic, traffic assessing in chief capitals around the earth has unflinching to be a topic of worry.

Also, the consecutive traffic square signals fall off in time legislation, because it locates same time intervals to every road it is governing. This raise unnecessarily

anticipation for the drivers, which could not be bearable in whole case, as being in time, is significant to each. Nowadays one of the grave cruxes faced in any capital is traffic blockage. Find stuck within bulky traffic is a problem for every and each person driving the vehicles and also to the traffic police dwelling the traffic. In case of high traffic, generally traffic is controlled by a traffic policeman standing in the middle of the road and such traffic police is deployed in all the junctions along the road and controls the flow of traffic through hand signal.

1.5: Aim of This Project

a) To scheme an intelligent traffic monitoring method.
b) To build an intelligent traffic regulator circuit in the breadboard.
c) Attempt for its performance.
d) Output commercialization.
e) To scheme the monitoring method with less value material's.

The principle motive of this project is to scheme a smart self-traffic symbol monitoring method. Traffic blockage is one of the principal issues to be calculated. Commonly vehicular traffic splits at the joints of the street and are striated by the traffic symbol. Traffic symbols necessity a favorable adjustment and monitor to assure the sleek and immune gush of the vehicular traffic. During the crowd moments, the traffic on the streets is at its top. Also, there is a chance for the emergency vehicles to gore in the traffic jam. Therefore; there is a necessity for the progressive monitor of the traffic during crowd moments. Hence we mention an intelligent traffic signal moderator. The raised method attempts to reduce the possible of traffic jams, containing by the traffic lights, to whatever limit by wiping the street with over density of vehicles. The process is based on the ARDUINO MEGA technology.

CHAPTER II

THEORY OF THE PROJECT

2.1 Introduction

This chapter includes the total over view of the device. In this chapter we have followed-up the theory of Arduino Nano, IR obstacle sensor and other components. Here we can know that the total system overview of the projects.

And we will also know that how the equipment is working with each other.

2.2 Theory

The system architecture of the automatic output appliance can be divided into 3 main Modules. They are:

- CPU
- Communication system
- Control system
- power adapter
- Full wave Rectifier
- LCD Display

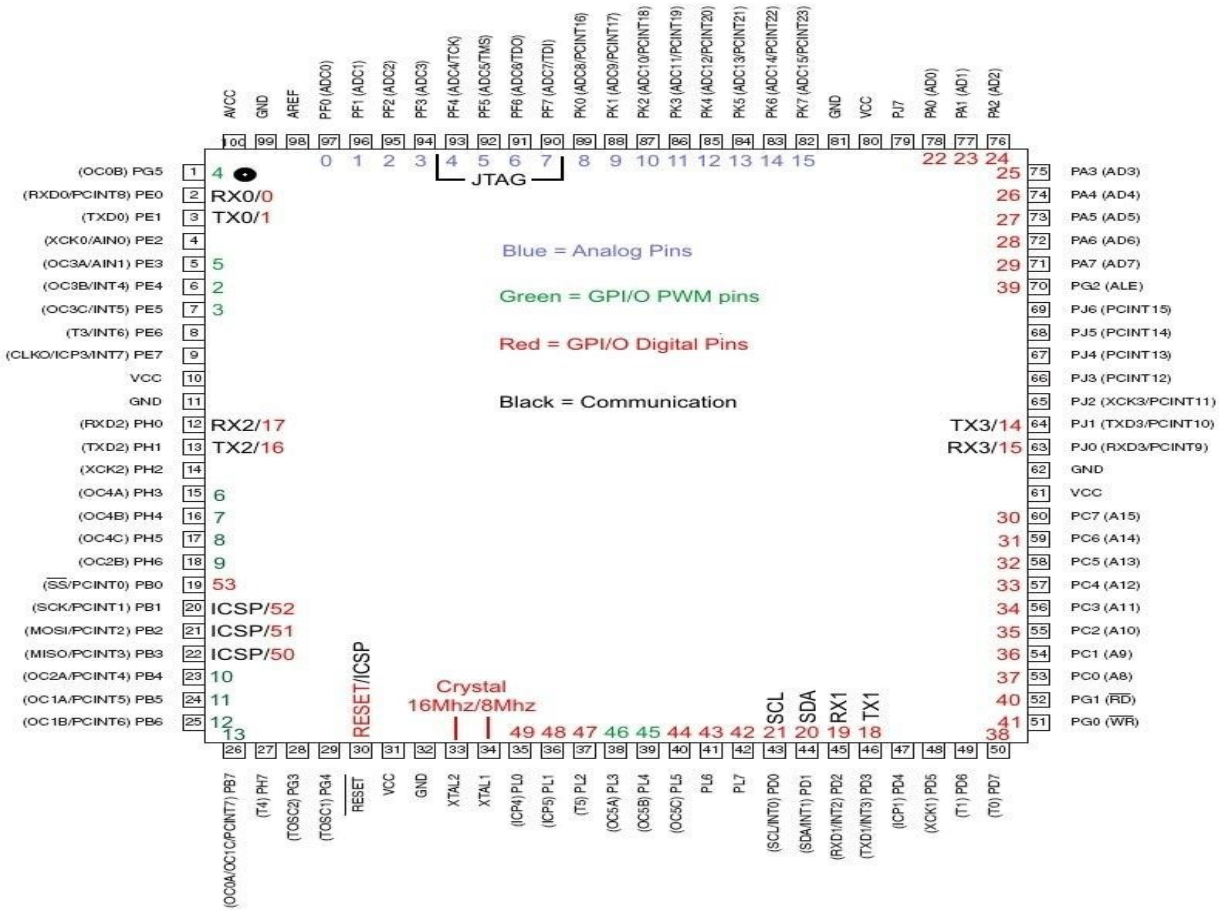
We've developed the system that can control traffic for a given time interval. It works based on the input signal microcontroller operate traffic light. Here we have used two modes. Automatic mode and Manual switching mode. For an example when road traffic is normal then controller operate the light with same time interval and it will work on Auto mode. If any road has high traffic and others are less, then microcontroller allow to clear that road firstly. For high traffic we can use Manual switching mode to clear up the traffic firstly. For Emergency purpose like Ambulances, fire services, VIP cars we use another speedy lane.

2.3: Arduino ATmega2560

The **Arduino ATmega2560** is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Mega 2560 board is compatible with most shields designed for the Uno and the former boards Duemilanove or Diecimila.

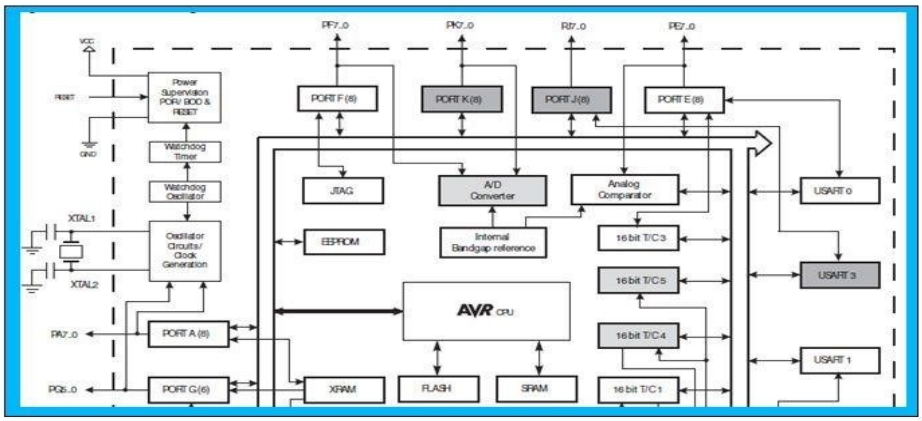
The Mega 2560 is an update to the Arduino Mega, which it replaces.

ATMEGA2560 IC Pin Diagram:



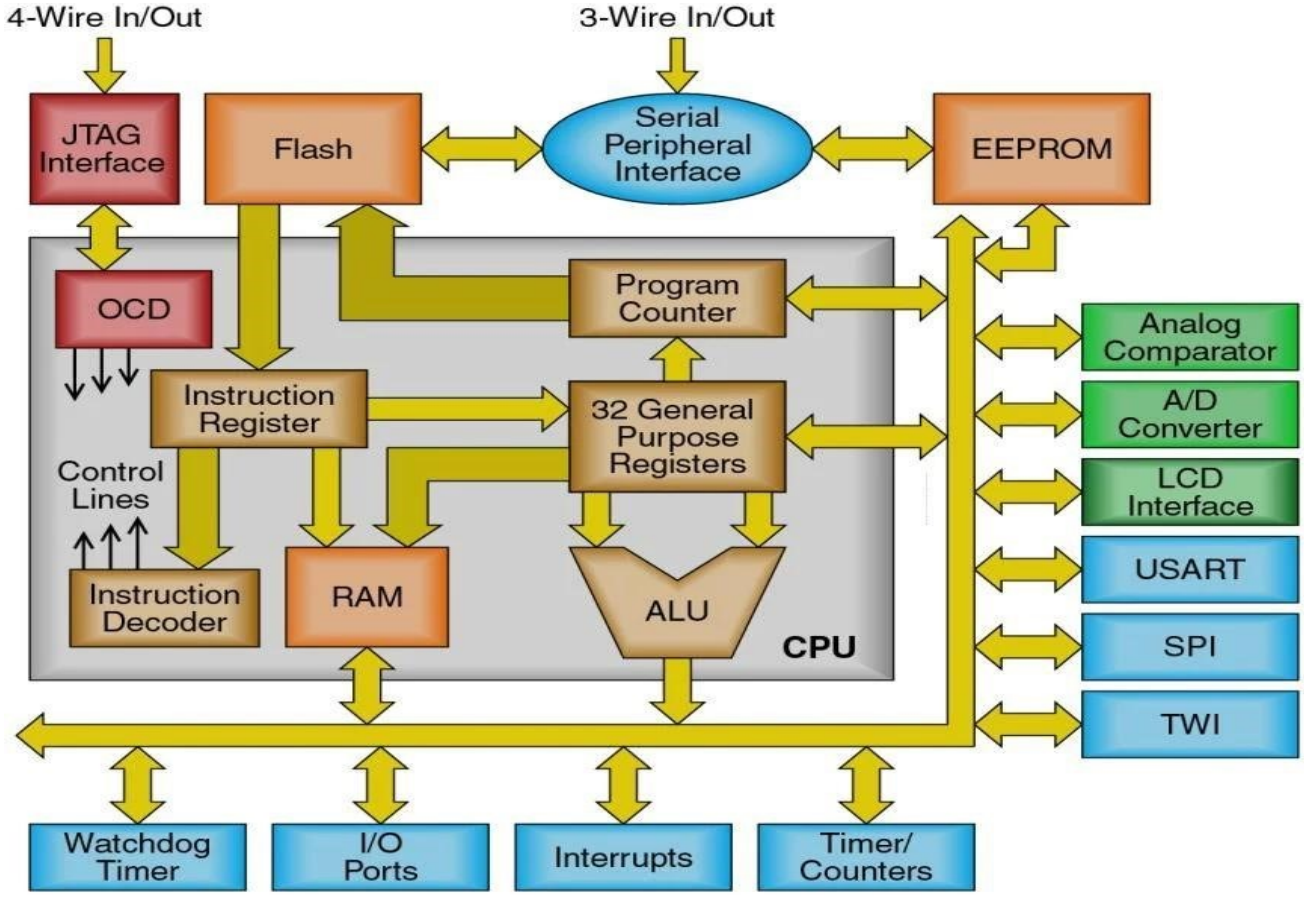
ATMEGA2560 architecture:

ATmega 2560 Architecture

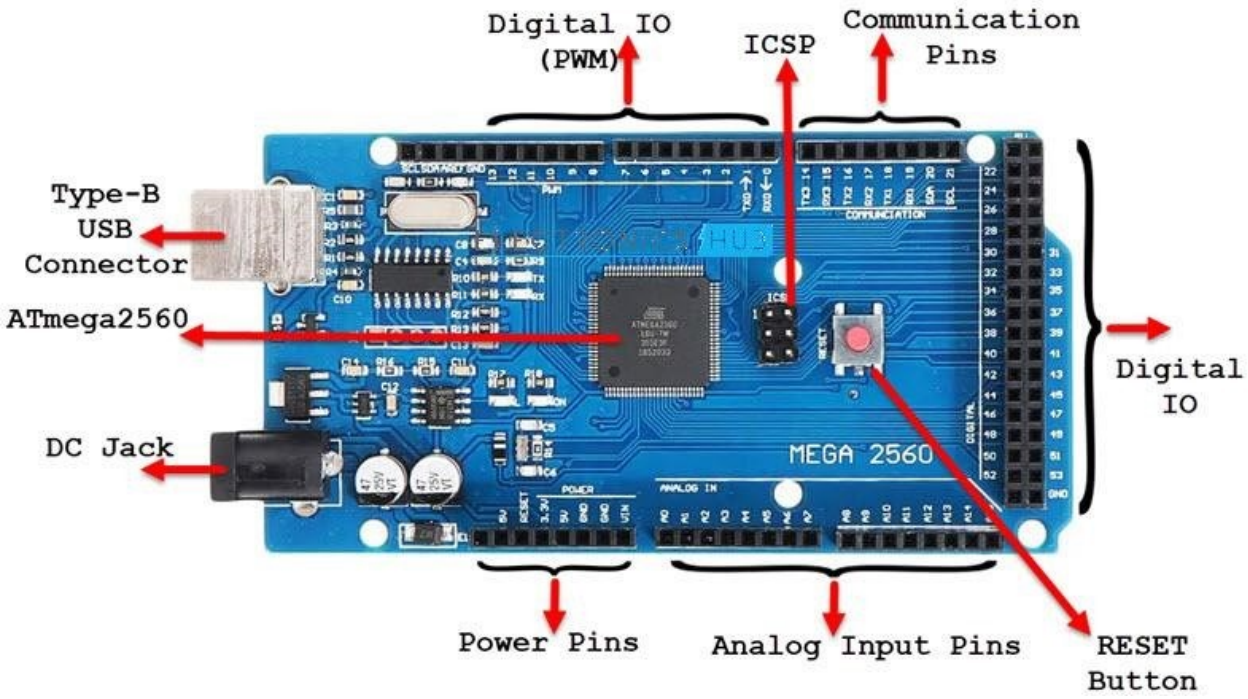


- Shows connectivity between peripherals, memory, I/O, bus
- CPU core is in the center, executes instructions

Slides created by:
Professor Ian G. Harris



Arduino ATMEGA2560 Picture:



Technical specifications:

Microcontroller	ATmega2560
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	54 (of which 14 provide PWM output)
Analog Input Pins	16
DC Current per I/O Pin	40 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	256 KB of which 8 KB used by bootloader
SRAM	8 KB
EEPROM	4 KB
Clock Speed	16 MHz

Table 2.3.1: Technical specifications of Arduino Atmega2560

1: Power supply, inputs and outputs:

The Arduino Mega can be powered via the USB connection or with an external power supply. The power source is selected automatically.

External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector. The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts. The Mega2560 differs from all preceding boards in that it does not use the FTDI USB-to serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter.

PIN Specifications:

- **VIN:** it is the input power supply that will have the same voltage that we are supplying the Arduino with the external power supply
- **5V:** power supply of 5V, this voltage may come from VIN pin and a voltage regulator or from the USB connection.
- **3.3V:** power supply that will provide 3.3V generated by an internal regulator, with a maximum current of 50mA.
- **GND:** The Arduino mega board includes 5-GND pins where one of these pins can be used whenever the project requires.

- **Memory:**
  The ATmega2560 has 256 KB of flash memory for storing code (of which 8 KB is used for the boot loader), 8 KB of SRAM and 4 KB of EEPROM (which can be read and written with the EEPROM library).

- **Input and Output:**

  Each of the 54 digital pins on the Mega can be used as an input or output, usingpinMode() , digitalWrite(), and digitalRead() functions.They operate at 5 volts. Each pin can provide or receive a maximum of 40 mA and has an internal pull-up resistor (disconnected by default) of 20-50 kilo Ohms. In addition, some pins have specialized functions.

- **Serial Communication**

The serial pins of this board like TXD and RXD are used to transmit & receive the serial data. Tx indicates the transmission of information whereas the RX indicates receive data. The serial pins of this board have four combinations. For serial 0, it includes Tx(1) and Rx (0), for serial 1, it includes Tx(18) & Rx(19), for serial 2 it includes Tx(16) & Rx(17), and finally for serial 3, it includes Tx(14) & Rx(15).

- **AREF:** The term AREF stands for Analog Reference Voltage which is a reference voltage for analog inputs

- **Reset:** Bring this line LOW to reset the microcontroller. Typically used to add a reset button to shields which block the one on the board.

- **External Interrupts:**

  The external interrupts can be formed by using 6-pins like interrupt 0(0), interrupt 1(3), interrupt 2(21), interrupt 3(20), interrupt 4(19), interrupt 5(18). These pins produce interrupts by a number of ways i.e. Providing LOW value, rising or falling edge or changing the value to the interrupt pins.

- **Analog Pins:**

There are 16-analog pins included on the board which is marked as A0-A15. It is very important to know that all the analog pins on this board can be utilized like digital I/O pins. Every analog pin is accessible with the 10-bit resolution which can gauge from GND to 5 volts. But, the higher value can be altered using AREF pin as well as the function of analog Reference ().

- **I2C:**

The I2C communication can be supported by two pins namely 20 & 21. Where 20-pin signifies Serial Data Line (SDA). Which is used for holding the data and 21-pin signifies Serial Clock Line (SCL). Mostly utilized for offering data synchronization among the devices.

- **SPI Communication:**

The term SPI is a serial peripheral interface which is used to transmit the data among the controller & other components. Four pins like MISO (50), MOSI (51), SCK (52), and SS (53) are utilized for the communication of SPI.

- **LED:**

This Arduino board includes a LED and that is allied to pin-13 which is named as digital pin 13. This LED can be operated based on the high and low values of the pin. This will give you to modify the programming skills in real time.

2: Dimensions:

The dimension of Arduino Mega 2560 board mainly includes the length as well as widths like 101.6mm or 4-inch X 53.34 mm or 2.1 inches. It is comparatively superior to other types of boards which are accessible in the marketplace. But, the power jack and USB port are somewhat expanded from the specified measurements.

3: Shield Compatibility:

Arduino Mega is well-suited for most of the guards used in other Arduino boards. Before you propose to utilize a guard, confirm the operating voltage of the guard is well-suited with the voltage of the board. The operating voltage of most of the guards will be 3.3V otherwise 5V. But, guards with high operating voltage can injure the board.

In addition, the distribution header of the shield should vibrate with the distribution pin of the Arduino board. For that, one can connect the shield simply with the Arduino board & make it within a running state.

4: Programming:

The programming of an Arduino Mega 2560 can be done with the help of an IDE (Arduino Software), and it supports C-programming language. Here the sketch is the code in the software which is burned within the software and then moved to the Arduino board using a USB cable.

An Arduino mega board includes a boot loader which eliminates an external burner utilization to burn the program code into the Arduino board. Here, the communication of the boot loader can be done using an STK500 protocol.

When we compile as well as burn the Arduino program, then we can detach the USB cable to remove the power supply from the Arduino board. Whenever you propose to use the Arduino board for your project, the power supply can be provided by a power jack otherwise Vin pin of the board.

Another feature of this is multitasking wherever Arduino mega board comes handy. But,

Arduino IDE Software doesn't support multi-tasking however one can utilize additional operating systems namely RTX & FreeRTOS to write C-program for this reason. This is flexible to use in your personal custom build program with the help of an ISP connector.

Thus, this is all about an **Arduino Mega 2560 datasheet**. It is a substitution of the older Arduino Mega board. Because of the number of pins, usually, it is not utilized for general projects however we can discover them in complex projects such as temperature sensing, 3D printers, IOT applications, radon detectors, monitoring of real-time data applications, etc.

2.4: Power Adapter (220V AC to 12V DC)

12V power supplies (or 12VDC power supplies) are one of the most common power supplies in use today. In general, a 12VDC output is obtained from a 120VAC or 240VAC input using a combination of transformers, diodes and transistors. 12V power supplies can be of two types: 12V regulated power supplies, and 12V unregulated power supplies.12V regulated power supplies come in three styles: Switching regulated AC to DC, Linear regulated AC to DC, and Switching regulated DC to DC.

Figure: 12-volt power adapter

Switching regulated 12VDC power supplies, sometimes referred to as SMPS power supplies, switchers, or switched mode power supplies, regulate the 12VDC output voltage using a complex high frequency switching technique that employs pulse width modulation and feedback. Acopian switching regulated power supplies also employ extensive EMI filtering and shielding to attenuate both common and differential mode noise conducted to the line and load. Acopian switching regulated power supplies are highly efficient, small and lightweight, and are available in both AC-DC single and wide-adjust output and DCDC configurations. Our Low Profile wide adjust output switchers can be voltage or current regulated and are externally programmable.

Linear regulated 12VDC power supplies regulate the output using a dissipative regulating circuit. They are extremely stable, have very low ripple, and have no switching frequencies to produce EMI.
Unregulated 12VDC power supplies are basic power supplies with an AC input and an unregulated 12VDC output. The output voltage changes with the input voltage and load. These power supplies are inexpensive and extremely reliable.

1. SG-90

Micro Servo Motor SG90 is a tiny and lightweight server motor with high output power. Servo can rotate approximately 180 degrees (90 in each direction), and works just like the standard kinds but smaller. You can use any servo code, hardware or library to control these servos. Good for beginners who want to make stuff move without building a motor controller with feedback & gear box, especially since it will fit in small places. It comes with a 3 horns (arms) and hardware.

Features:

- Weight: 9 g
- Dimension: 22.2 x 11.8 x 31 mm approx.
- Stall torque: 1.8 kgf·cm
- Operating speed: 0.1 s/60 degree
- Operating voltage: 4.8 V (~5V)
- Dead band width: 10 µs
- Temperature range: 0 ºC – 55 ºC

Bread Board

A breadboard is used to build and test circuits quickly before finalizing any circuit design. The breadboard has many holes in to which circuit components like ICs and resistors can be inserted. A typical breadboard is shown below:
The bread board has strips of metal which run underneath the board and connect the holes on the top of the board. The metal strips are laid out as shown below. Note that the top and bottom rows of holes are connected horizontally while the remaining holes are connected vertically.
To use the bread board, the legs of components are placed in the holes. Each set of holes connected by a metal strip underneath forms a node. A node is a point in a circuit where two components are connected. Connections between different components are formed by putting their legs in a common node.
The long top and bottom row of holes are usually used for power supply connections. The
rest of the circuit is built by placing components and connecting them together with jumper wires. ICs are placed in the middle of the board so that half of the legs are on one

side of the middle line and half on the other.

Bread boarding tips:
It is important to breadboard a circuit neatly and systematically, so that one can debug it and get it running easily and quickly. It also helps when someone else needs to understand and inspect the circuit. Here are some tips:

1. Always use the side-lines for power supply connections. Power the chip s from the side-lines and not directly from the power supply.
2. Use black wires for ground connections (0V), and red for other power connections.
3. Keep the jumper wires on the board flat, so that the board does not look cluttered.
4. Route jumper wires around the chips and not over the chips. This makes changing the chips when needed easier.
5. You could trim the legs of components like resistors, transistors and LED s, so that they fit in snugly and do not get pulled out by accident.

1. Soldering iron

A soldering iron is a hand tool used in soldering. It supplies heat to melt the solder so that it can flow into the joint between two workpieces. A soldering iron is composed of a heated metal tip and an insulated handle. Heating is often achieved electrically, by passing an electric current through a resistive heating element. Cordless irons can be heated by combustion of gas stored in a small tank, often using a catalytic heater rather than a flame. Simple irons less commonly used than in the past were simply a large copper bit on a handle, heated in a flame. Soldering irons are most often used for installation, repairs, and limited production work in electronics assembly. High-volume production lines use other soldering methods. Large irons may be used for soldering joints in sheet metal objects. Less common uses include pyrography and plastic welding.

Figure: Soldering Iron

Soldering Wire

Soldering wire is a fusible metal alloy used to create a permanent bond between metal work pieces. Solder is melted in order to adhere to and connect the pieces after cooling, which requires that an alloy suitable for use as solder have a lower melting point than the pieces being joined. The solder should also be resistant to oxidative and corrosive effects that would degrade the joint over time. Solder used in making electrical connections also needs to have favorable electrical characteristics.

Soft solder typically has a melting point range of 90 to 450 °C and is commonly used in electronics, plumbing, and sheet metal work. Alloys that melt between 180 and 190 °C are the most commonly used. Soldering performed using alloys with a melting point above 450 °C is called "hard soldering", "silver soldering", or brazing.

Figure: Soldering wire

In specific proportions, some alloys are eutectic — that is, the alloy's melting point is the lowest possible for a mixture of those components, and coincides with the freezing point. Non-eutectic alloys can have markedly different solidus and liquid us temperatures, as they have distinct liquid and solid transitions. Non-eutectic mixtures often exist as a paste of solid particles in a melted matrix of the lower-melting phase as they approach high enough temperatures.

For electrical and electronics work, soldering wire is available in a range of thicknesses for hand-soldering and with cores containing flux. It is also available as a room temperature paste, as a preformed foil shaped to match the work piece which may be more suited for mechanized.

Rosin

Rosin is a sticky cannabis concentrate made by applying heat and pressure to plant material. As a solvent-free form of concentrate, it differs from its cousin resin, which is made by passing a chemical solvent through harvested cannabis. Cannabis can be pressed into rosin by a professional with an industrial press, or by a Dyer at home with a hair straightener. The technique can also be used to turn a lower-grade hash into a concentrate that can be dabbed.

Figure: Rosin

2.5 Jumper Wire

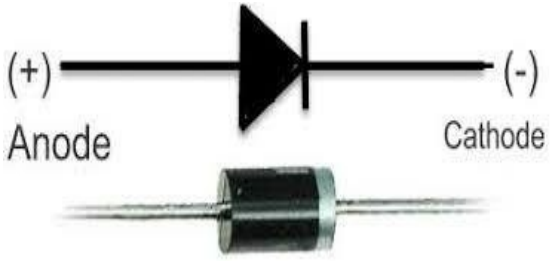
A jump wire (also known as jumper wire, or jumper) is an electrical wire, or group of them in a cable, with a connector or pin at each end (or sometimes without them – simply "tinned"), which is normally used to interconnect the components of a bread board or other prototype or test circuit, internally or with other equipment or components, without soldering.

Fig 2.10: Jumper wire

Individual jump wires are fitted by inserting their "end connectors" into the slots provided in a breadboard, the header connector of a circuit board, or a piece of test equipment.

2.6: Diode

A diode is a specialized electronic component with two electrodes called the anode and the cathode. Most diodes are made with semiconductor materials such as silicon, germanium, or selenium. Some diodes are comprised of metal electrodes in a chamber evacuated or filled with a pure elemental gas at low pressure. Here we used converted AC into DC using a bridge-wave rectifier that consists of four diodes



2.7: Full wave rectifier

A Full wave rectifier is a circuit arrangement which makes use of both half cycles of input alternating current (AC) and converts them to direct current (DC). This arrangement is known as a Bridge Rectifier. It uses the entire AC wave (Both positive and negative sections). Each diode uses 0.7v when conducting and there are always two diodes conducting.

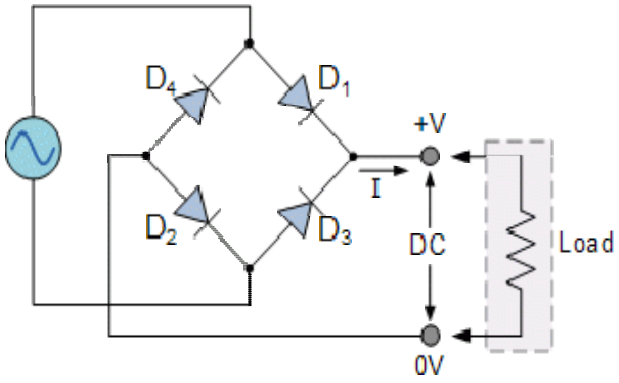


Fig 2.8: Circuit diagram of a full wave rectifier

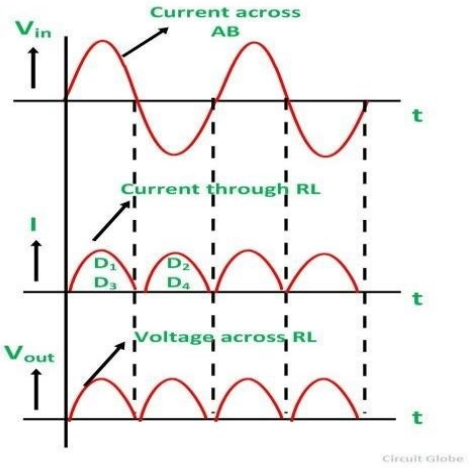


Figure: Wave form of a full wave rectifier

2.8: LCD Display

A liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals combined with polarizers. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in color or monochrome. LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images with low information content, which can be displayed or hidden, such as preset words, digits, and sevensegment displays, as in a digital clock. They use the same basic technology, except that arbitrary images are made from a matrix of small pixels, while other displays have larger elements. LCDs can either be normally on (positive) or off (negative), depending on the polarizer arrangement. For example, a character positive LCD with a backlight will have black lettering on a background that is the color of the backlight, and a character negative LCD will have a black background with the letters being of the same color as the backlight. Optical filters are added to white on blue LCDs to give them their characteristic appearance.

CHAPTER III
DESIGN & FEBRICATION

3.1: Introduction

The implementation of the project is done after simulating the schematic circuit properly. In this chapter, the function of every section in the circuit is investigated with coding and also with physical outlook. To give a proper and clear concept about the operation the entire system is separated into different parts. In this chapter also discusses the working process of the circuits used in various parts with following chart, block diagram and corresponding designed diagram.

3.2: Idea and Methodology

As we all know that traffic congestion is a major problem from a long time and traffic administration is also trying overcome this serious from a long time. So as a result one solution has been deducted which is controlling the traffic on time delay. The basic idea of this paper has been taken from the foresaid concept.
According to that idea the traffic signal switches after a certain interval of time.
The time interval is controlled by any microcontroller.

Methodology:

- The method is based on microcontroller.
- We use here Arduino Atmega2560 and it will work as a microcontroller.
- We use here four servo motor to block the road.
- We use here Liquid Cristal display to monitor the traffic states
- We also use here mobile app to see which road is open and which are closed.
- We use here IOT Technology for overall see and control the system.

3.3: Block Diagram

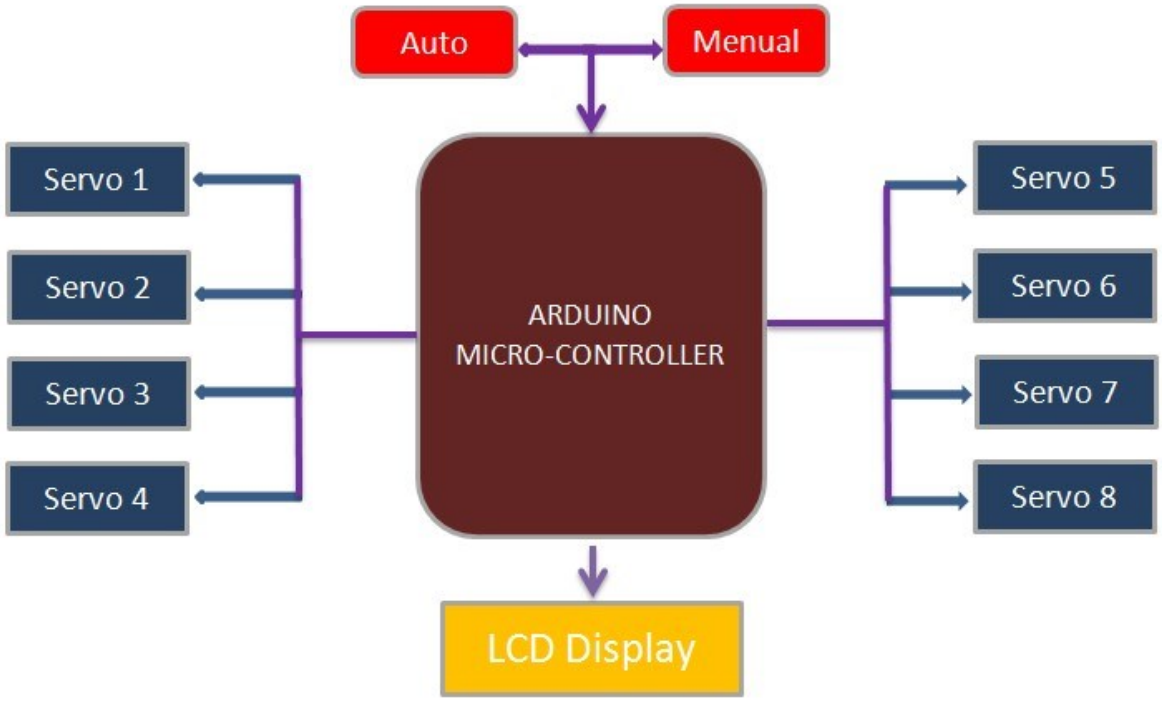


Figure: Block Diagram of our Project

This project is basically based on both the Arduino ATmega2560 and input is time. In this project we control our microcontroller by time to the input. The input of microcontroller is given a certain period and traffic light and servo motor are the output of the microcontroller.

3.4:Circuit Diagram

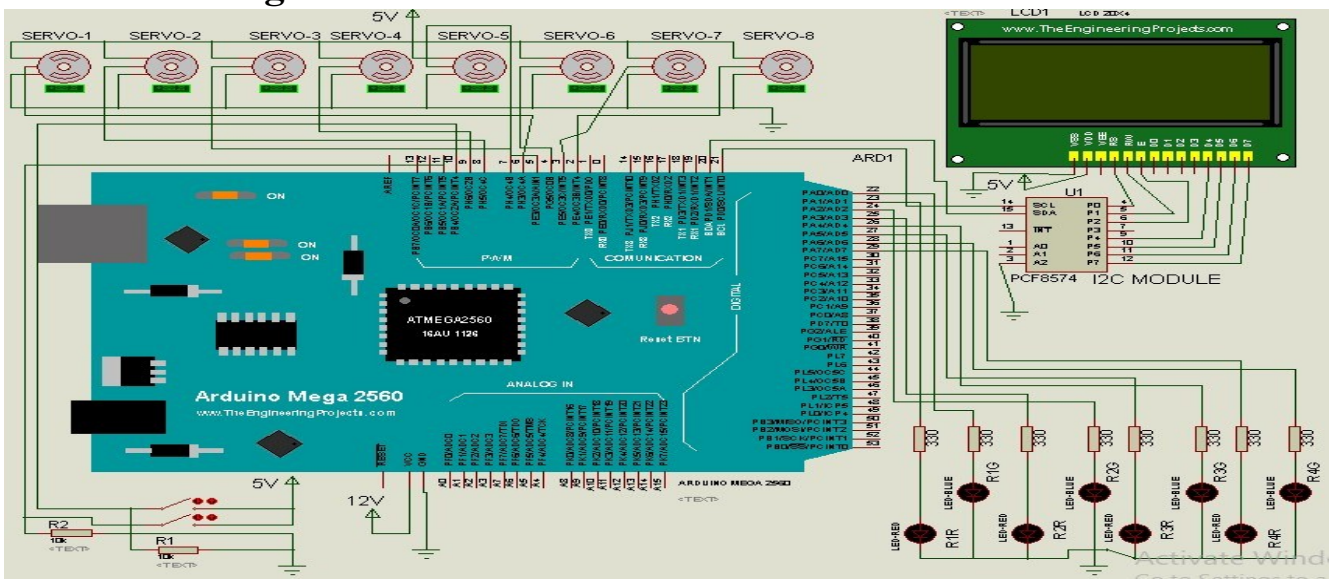


Figure: Circuit Diagram

Our project is basically Arduino microcontroller based. There was a power adapter, full wave rectifier, LCD Display and diode to ensure power source of the project.

This is the circuit diagram for the traffic light controller by using Arduino.

- Connect LEDs on the breadboard as Red, Green, respectively.
- Connect the negative terminal of the LED and connect the 220 Ohm resistor in series.
- Connect these negative terminals to the ground.
- Connect the positive terminal of the LEDs to the pins 2 to 10, respectively.
- Power the breadboard by using 5V and GND on the Arduino

3.5: Hardware Design

The project will help peoples who want to do something or make something with the help of Arduino. The project is designed in two parts, these are the software part and another one is the hardware designing. In this project we use a Microcontroller, servo motor, LED transformer, power adapter etc.

As a microcontroller we have used Arduino ATmega2560 board here, which is perfect for building a new project or doing anything in the field of robotics or something that is smart to use. To use an Arduino we have to use the Arduino Software which free for all users and can be downloaded from http://www.arduino.cc. The Arduino program is based on C/C++ Programming language. And a huge collection of example is provided in their websites which are also free for all. And the software is one of the easiest software to use.

The hardware design of this project is very simple and efficient also.

Traffic congestion is a problem that wastes a lot of time in people's daily lives. To avoid this problem, a system can be created to control traffic through legislation through which traffic congestion can be controlled. In

this project we have dedicated two roads for slow and two roads for speedy vehicles. Before reaching the inter station a bridge has been arranged so that the vehicles can be easily moved from one road to another. We are setting up a barricade with servo motors to prevent the traffic from moving on the road at the same time. It will turn the servo motors on and off at regular intervals. We will show the whole process through an LCD display.

3.6: Working with Arduino Software

First download and install the Arduino IDE for Mac, Linux or Windows to arduino.cc. (Version 1.8.19). Windows users also necessity to install a driver. Gather your plank via USB, start the Arduino application and elect Arduino Uno to the tools to plank menu. Bare the design table. Examples: 01. Basics: Blink. Click the toolbar button to upload it to your plank.

The Integrated Development Environment (IDE):

Microcontroller needs software for programming. The Arduino plank has its own integrated development environment (IDE). It is gratis and anybody can download it from its official. That gives Arduino Plank to reach much users and it also helps it to get.

IDE Parts:

a) **Compile**: Before program ―code‖ can be sent to the board, it needs to be converted into instructions that the board understands. This process is called Compiling.

b) **Stop**: This stops the compilation process.

c) **Create new Sketch**: This opens a new window to create new sketch.

d) **Open Existing Sketch**: This loads a sketch from a file on our computer.

e) **Save Sketch**: This saves the changes to the sketch.

f) **Upload to Board**: This compiles and then transmits over the USB cable to our board.

g) **Serial Monitor**: Until this point when our programs (sketches) didn't work, we just pulled out our hair and tried harder.

h) **Tab Button**: This lets you create multiple files in your sketch. This is for more advanced programming than we will do in this class.

i) **Sketch Editor**: This is where write or edit sketches

j) **Text Console**: This shows you what the IDE is currently doing and is also where error messages display if make a mistake in typing program.

k) **Line Number**: This shows what line number your cursor is on.

The smart microcontroller unit named as Arduino Atmega2560 can be programmed with the Arduino software. There is no any requirement for installing other software rather than Arduino. Firstly, Select "Arduino Uno from the Tools Board menu (according to the microcontroller on your board). The IC used named as ATmega2560 on the Arduino Uno comes pre burned with a boot loader that allows you to upload new code to it without the use of an external hardware programmer.

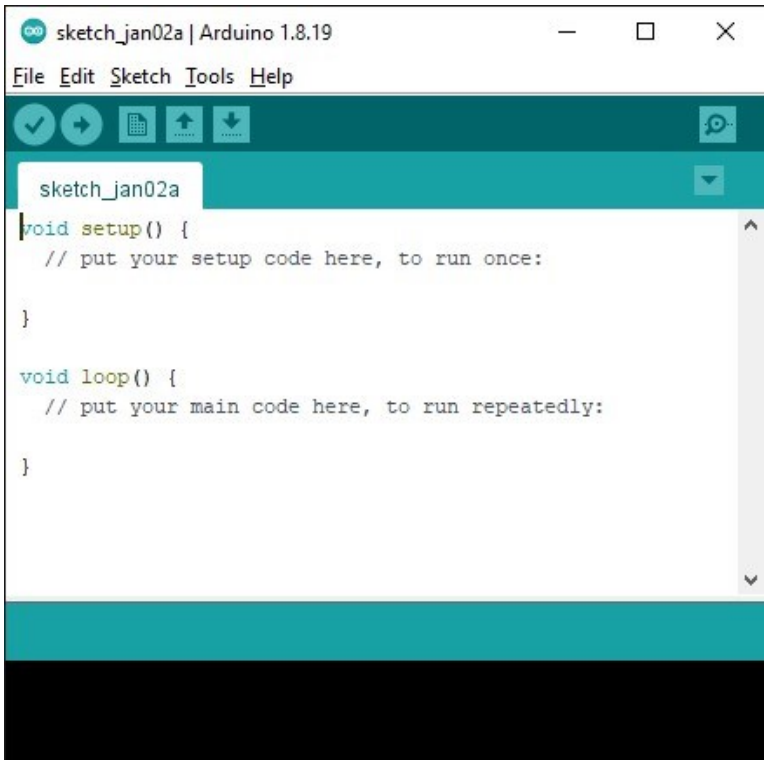


Fig 3.5.1: Programming platform for ARDUINO

Programming software of this line follower is known as ARDUINO-1.8.19
This is an open source programming platform**.** The open-source ARDUINO environment makes it easy to write code and upload it to the input/output board.

Here we use ARDUINO-1.8.19platform.

To configure software, we have to use ARDUINO -1.8.19 named arduino.exe To configure this programmer with computer we need a USB cable then check serial port and select the programmer from Aruino-1.8.19 platform such as,

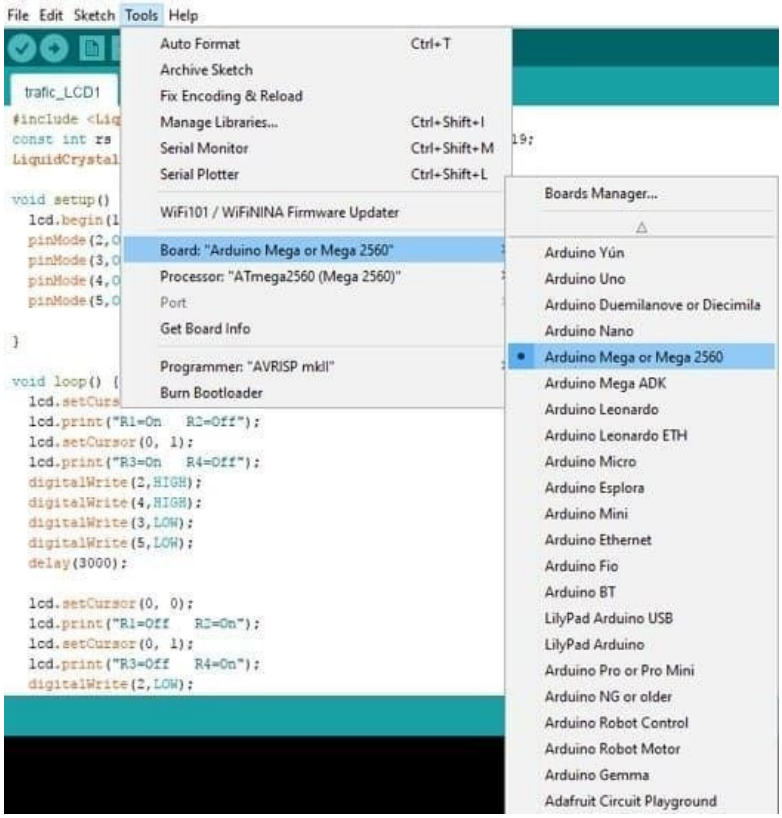


Figure 3.5.2: IDE configuration for ARDUINO Mega or Mega2560 Programmer.

- **Serial communication:**

It is used for the communication between Arduino and a computer or other devices. Every Arduino board has at least one serial port. This ports communicates thanks to the digital pins 0 (RX) and 1 (TX), and with the computer thanks to the USB connection.

Serial.begin(speed)

It establishes the speed of data in bits per second (bauds) for the transmission of data in serial communication.

Serial.read()

It reads the data from the serial port.

Serial.print(val,[format]) It prints the data to the serial port as ASCII text

Serial.println(val,[format])

It prints the data to the serial port as ASCII text but it jumps to a new line.

Serial.available() It gives back the number of available bytes to be read by the serial port.

It refers to data that has already been received and is available in the buffer of the port.

3.7 Project Picture

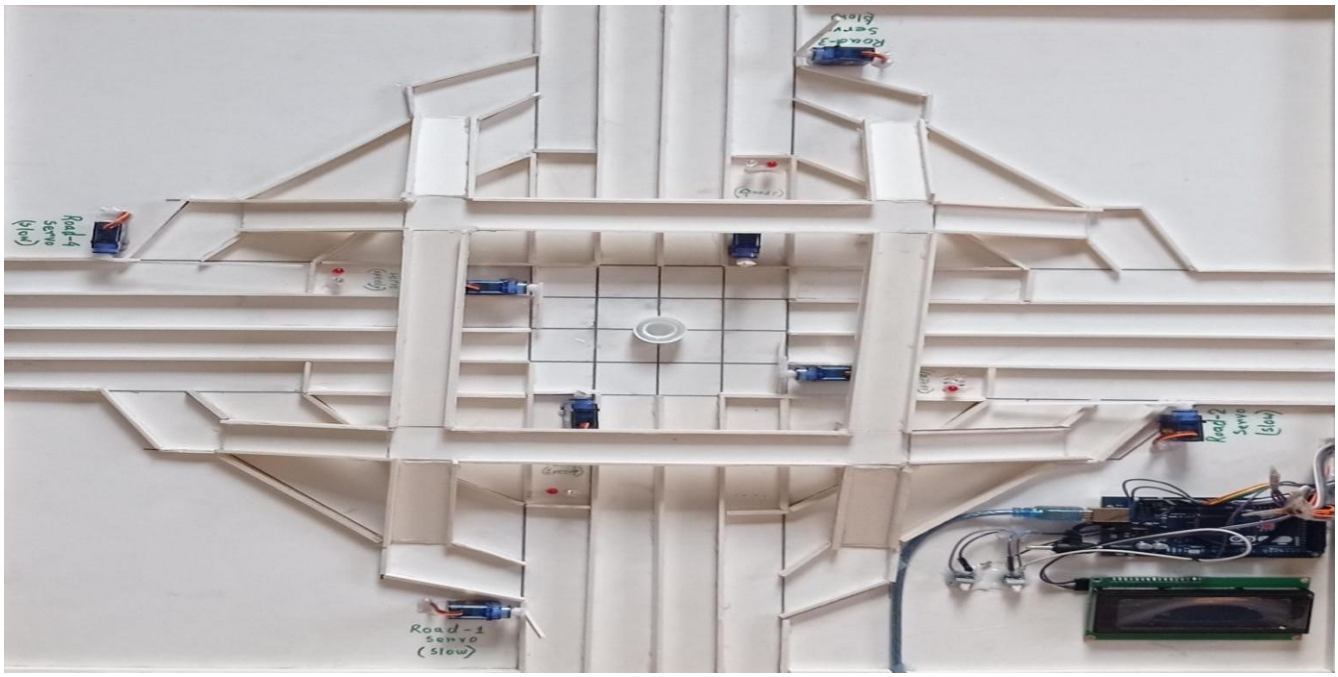


Figure 3.7: Project picture

3.8 Summary

This chapter mainly focused on implementation and the design of the system with a block diagram. In this chapter simulation is divided into some parts and operation of each part is discussed briefly. The output of our project shown in that chapter. We also discussed about the research and methodology of our whole project.

CHAPTER IV

RESULT &DISCUSSION

4.1 Introduction

In this chapter, we will discuss the outputs and the advantages of our project.

There is a variation of coding and variation of using the software in this project.

We will also discuss the time delay and efficiency and limitations of this project.

4.2 Results

In the count testing unit we have found that it works properly. After testing all the components, we have combined all the components together as like as the circuit design diagram and found that the application works correctly. When a vast number of vehicle passes through the road, some road become automatically blocked by the servomotor after a certain period then other roads are free to move forward.

After a certain period blocking the blocked road began free to move forward the vehicles and the free road will be blocked.

After knowing about the above said hardware and using appropriate programming for the Arduino ATmega2560 microcontroller, the following things have been obtained. The figure:(3.7) shows when there is normal traffic at the junction the traffic light continues as time delay. The figure:(3.7) shows that where there is more vehicle in any lane as compared to the other lane is given priority and the signal is green as soon as the lane is not cleared.

4.3 Advantages

In our project, there are many benefits over existing traffic monitoring method for the vehicle blockage limiting. Our project increases the validity of the traffic monitoring method with proper direction and monitoring of the vehicle density in a cost useful way and makes it much more owner in a friendly way.

4.1 Limitations of This Project

- ✓This project can control up to four devices, but cannot control more than that.
- ✓Microcontroller need to program differently if it need to us more appliance.

4.2 Costing

Costing is always a vital issue to make any project. Price of electronics is not stable for a developing country like Bangladesh, because Bangladesh never produces electronics parts but import from other developed country and during import price depends upon the stock of foreign currency. Average price of parts used in this project is given bellow.

Component price list:

Sl:	Name	Unite price (BDT)	Quantity(pcs)	Subtotal (BDT)
01	Arduino Mega	1200	1	1200
02	12V, 2A Power Adapter	350	1	350
03	SG-90	200	8	1600
04	Soldering Iron	400	1	400
05	Soldering Lead	100	1 set	100
06	Rosin	50	1 set	50
07	Jumper wire	80	3 set	240
08	PVC board	500	2 set	1000
09	Hot glue gun	400	1	400
10	Glue stick	15	4	60
11	20*4 LCD display with I2C	480	1	480
12	Node MCU	450	1	450
13	5V, 5A SMPS	380	1	380
14	Switch	5	2	10
15	Resistor	1	2	2
16	Insulated electric wire	20	1 meter	20
17	2 pin plug	30	1	30
18	Anti-cutter	100	1	100
19	Wire cutter	160	1	160
			Total=	7,032

4.5 Discussion

The proposed work was compared to the other researcher works, and it was far better in term of low cost, and programming time. For example, some authors used VHDL code, and ALTERA kit to achieve four lane intersections which are more complex and expensive compared to the proposed method which the design is based on microcontroller, and easier to implement on Arduino platform. The proposed controlling technique was compared with other techniques that used different methods to achieve their various results but none of the authors ever thought of incorporating LED adverting display with traffic light system or taking the advantage of using Red light wait time to disseminate useful information. This showed a good performance in term of optimizing Green time amount as needed, Incorporated LED advertising displays by utilizing Red light wait time to disseminate useful information, also maintained a good, and standard stability at all level of demand.

CHAPTER V

CONCLUSION AND FUTURE WORKS

Conclusion

The Smart Traffic Control System was designed and developed to decrease traffic congestions or traffic jam and accident that is occurred by the traffic control system. We have used 5v from Arduino ATmega2560 Board.

Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced IC's with the help of growing technology, the project has been successfully implemented. Thus the project has been successfully designed and tested.

In this project we are succeeded to minimize the traffic congestions created by the fixed traffic light system with the help of Arduino and improved algorithm. That is dependent on real time rather than a fixed time. We have noticed that our smart traffic control system is much efficient and the cost of production is very low. As a result, ―Density Based Traffic Control System‖ is suitable enough to use commercially. This model could be implemented with few modifications as a source of revenue; as charging station for battery operated vehicles. The project may be very well used in where the traffic signals is kept and in many other places where we need to full fill the need of the automation. In the future we implement the project's idea in the industries. By using this density based traffic signal system in future we can know traffic density in the city and so that remedies can be made according to that.

In this paper we have studied the optimization of traffic light controller in a city using Arduino. A traffic light system has been designed and developed with proper integration of both the hardware and the software. This interface is synchronized with the whole process of the traffic system. Automatically, this project could be programmed in any way to control the traffic light model and will be useful for planning proper road system.

At the end we have designed and developed an Arduino based Intelligent Traffic Control System, and fixed the problem that we had before. Finally, we have reached our goal successfully.

5.1 Future works

With the help of this project there is an opportunity of doing a big project in future. The applications those are stated above are some demo applications. But there is a huge possibility of developing this project. Because both the number of vehicles will increase and the roads will decrease proportionally with respect to time. Initially for the limitation

of funding and time we have developed an intelligent traffic control system for two ways road. Here we can see a big future work scope in this sector. We have faith that we will be able to complete all the features needed for the ultimate application in near future.

We will implement this system for traffic controlling in a 2 lane junction.

We will update this system with when a pedestrian tries to cross the road during green signal it will turn on an alarm and warn the pedestrian and traffic police.

We will update this system with when a vehicle tries to move even during red signal it will turn on an alarm to warn the driver of the vehicle and the traffic.
We can use GSM module to track location of car.

We can use camera for security purpose.

We can use image processing technique.

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.

This project can bring Bangladesh's digital revolution. Building an intelligent traffic city with automatic transmission is possible because vehicles can communicate wirelessly with the traffic system and make decisions on their own, making the autopilot more a reality. This project can replace the current traffic system and open more avenues for a world ready for the future. Moving with the new & renewable energy sources, this system can be upgraded by replacing ordinary LED modules with the solar based LED modules. With utilizing the latest technology and advance sensors, we could serve the same purpose of automatically controlling the street lights much more effectively both by cost and manpower. That’s why, we took this proposed system as a challenge for development of our country as a digital Bangladesh.

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PROGRAM CODE:

```
#include <Wire.h>
#include <LiquidCrystal_I2C.h>
#include <Servo.h>

Servo servo1;
Servo servo2;
Servo servo3;
Servo servo4;

Servo servo5;
Servo servo6;
Servo servo7;
Servo servo8;

const int R1G=22;
const int R1R=23;
const int R2G=24;
const int R2R=25;
const int R3G=26;
const int R3R=27;
const int R4G=28;
const int R4R=29;

LiquidCrystal_I2C lcd = LiquidCrystal_I2C(0x27, 20, 4);

 const int inputAutomanual=10;
 const int inputState=11;

void setup() {
  lcd.init();
  lcd.backlight();

  Serial.begin(9600);

  pinMode(inputAutomanual,INPUT);
```

```
  pinMode(inputState,INPUT);

  servo1.attach(2);
  servo2.attach(3);
  servo3.attach(4);
  servo4.attach(5);

  servo5.attach(9);
  servo6.attach(7);
  servo7.attach(8);
  servo8.attach(6);

  servo1.write(100);
  servo2.write(100);
  servo3.write(10);
  servo4.write(10);

  servo5.write(10);
  servo6.write(10);
  servo7.write(100);
  servo8.write(100);


  pinMode(R1G,OUTPUT);
  pinMode(R1R,OUTPUT);
  pinMode(R2G,OUTPUT);
  pinMode(R2R,OUTPUT);
  pinMode(R3G,OUTPUT);
  pinMode(R3R,OUTPUT);
  pinMode(R4G,OUTPUT);
  pinMode(R4R,OUTPUT);

  delay(100);
}

void loop() {
```

```
int manualMood=digitalRead(inputAutomanual);
int stateChange=digitalRead(inputState);

Serial.print("manualMood=");
Serial.println(manualMood);
Serial.print("stateChange=");
Serial.println(stateChange);
Serial.println(".........");


if(manualMood==0)
{
servo1.write(100);
servo2.write(100);
servo3.write(10);
servo4.write(10);

servo5.write(10);
servo6.write(10);
servo7.write(100);
servo8.write(100);

lcd.setCursor(0, 0);
lcd.print("Road-1=ON ");
lcd.setCursor(0, 1);
lcd.print("Road-3=ON ");

lcd.setCursor(0, 2);
lcd.print("Road-2=OFF");
lcd.setCursor(0, 3);
lcd.print("Road-4=OFF");

lcd.setCursor(12, 0);
lcd.print(": Auto  ");

//////////////////////////////////////
digitalWrite(R1G,HIGH);
```

```
digitalWrite(R1R,LOW);
digitalWrite(R3G,HIGH);
digitalWrite(R3R,LOW);

digitalWrite(R2G,LOW);
digitalWrite(R2R,HIGH);
digitalWrite(R4G,LOW);
digitalWrite(R4R,HIGH);
delay(5000);

servo1.write(10);
servo2.write(10);
servo3.write(100);
servo4.write(100);

servo5.write(100);
servo6.write(100);
servo7.write(10);
servo8.write(10);

lcd.setCursor(0, 0);
lcd.print("Road-1=OFF");
lcd.setCursor(0, 1);
lcd.print("Road-3=OFF");

lcd.setCursor(0, 2);
lcd.print("Road-2=ON ");
lcd.setCursor(0, 3);
lcd.print("Road-4=ON ");
lcd.setCursor(12, 0);
lcd.print(": Auto  ");
////////////////////////////////
digitalWrite(R1G,LOW);
digitalWrite(R1R,HIGH);
digitalWrite(R3G,LOW);
digitalWrite(R3R,HIGH);
```

```
digitalWrite(R2G,HIGH);
digitalWrite(R2R,LOW);
digitalWrite(R4G,HIGH);
digitalWrite(R4R,LOW);
delay(5000);
}

else if(manualMood==1)
{
  if(stateChange==0)
  {
servo1.write(100);
servo2.write(100);
servo3.write(10);
servo4.write(10);

servo5.write(10);
servo6.write(10);
servo7.write(100);
servo8.write(100);

lcd.setCursor(0, 0);
lcd.print("Road-1=ON ");
lcd.setCursor(0, 1);
lcd.print("Road-3=ON ");

lcd.setCursor(0, 2);
lcd.print("Road-2=OFF");
lcd.setCursor(0, 3);
lcd.print("Road-4=OFF");

lcd.setCursor(12, 0);
lcd.print(": Manual");
////////////////////////////////////
digitalWrite(R1G,HIGH);
digitalWrite(R1R,LOW);
digitalWrite(R3G,HIGH);
```

```
digitalWrite(R3R,LOW);

digitalWrite(R2G,LOW);
digitalWrite(R2R,HIGH);
digitalWrite(R4G,LOW);
digitalWrite(R4R,HIGH);
  }

  else if(stateChange==1)
  {
servo1.write(10);
servo2.write(10);
servo3.write(100);
servo4.write(100);

servo5.write(100);
servo6.write(100);
servo7.write(10);
servo8.write(10);

lcd.setCursor(0, 0);
lcd.print("Road-1=OFF");
lcd.setCursor(0, 1);
lcd.print("Road-3=OFF");

lcd.setCursor(0, 2);
lcd.print("Road-2=ON ");
lcd.setCursor(0, 3);
lcd.print("Road-4=ON ");

lcd.setCursor(12, 0);
lcd.print(": Manual");
////////////////////////////////////
digitalWrite(R1G,LOW);
digitalWrite(R1R,HIGH);
digitalWrite(R3G,LOW);
digitalWrite(R3R,HIGH);
```

```
  digitalWrite(R2G,HIGH);
  digitalWrite(R2R,LOW);
  digitalWrite(R4G,HIGH);
  digitalWrite(R4R,LOW);
    }
  }

}
```