

PROFESSIONAL TRAINING REPORT

at

Sathyabama Institute of Science and Technology
(deemed to be university)

Submitted in partial fulfillment of the requirements

the award Bachelor of Engineering Degree in

Electrical and Electronics Engineering

BY

PAVITHRA.P (39140036)



DEPARTMENT OF ELECTRICAL AND ELECTRONICS

SCHOOL OF ELECTRICAL AND ELECTRONICS

SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY

JEPPIAAR NAGAR, RAJIV GANDHI SALAI,
CHENNAI – 600119. TAMILNADU

August 2021

ACKNOWLEDGEMENT

The satisfaction and elation that accompany the successful completion of any task would be incomplete without the mention of the people who have made it possible. It is our great privilege to express our gratitude and respect to all those who have guided me during the course of my Professional Training.

First and foremost, we would express our sincere gratitude to our beloved Founder Chancellor **Col. Dr. JEPPIAAR, M.A., B.L., Ph.D.**, and Chancellor **Dr. Mariazeena Johnson, B.E., M.B.A., M.Phil., Ph.D.**, I extend mysincere thanks to our President **Dr. Marie Johnson, B.E., M.B.A., M.Phil., Ph.D.**, and for providing me the necessary facilities for the completion of the professional training. I also acknowledge our Vice Chancellor **Dr. T. Sasipraba, M.E., Ph.D**, and the Pro Vice Chancellor **Dr. E.Logashanmugam, M.E ,Ph.D**, the Pro Vice Chancellor **Dr.WilsonAruni Ph.D., FAMPV**, for their constant support and endorsement

I like to express our gratitude to **Dr. V.Sivachidambaranathan M.E.,Ph.D.**, Head of the Department of Electrical and Electronics Engineering, Sathyabama Institute of Science and Technology for having been a constant source of support and encouragement for the completion of the professional training.

HANDS ON TRAINING IN ARDUINO INTERFACE USING TINKERCARD AND PROTEUS FOR REAL TIME APPLICATIONS



ABSTRACT

Gaining knowledge about Arduino boards and basic components of Arduino. By using this components and knowledge, implementing the smart system applications and solving real world problems, with the help of Tinker cad and Proteus software.

Table of contents

SL.NO.	Title	pg
1.	Introduction - Arduino	5
2.	Arduino components and connections	5
3.	Arduino pins	6
4.	Parameters of Arduino	7
5.	Pin details of Arduino	7
6.	Introduction to I2c on Arduino	9
7.	How to do programs for Arduino	9

8.	Arduino with tricolor LED and Push button	10
9.	Tricolor LED	11
10.	Push button	11
11.	Bread Board	12
12.	Program for tricolor LED and push button	12
13.	Seven segment Display	14
14..	Sensor types	15
15.	How do sensors Works in Arduino	17
16.	DHTH - Temperature and Humidity sensor	17
17.	Real time applications using Arduino	18
18.	Covid-19 Human detector using gas sensor	19
19	Gas leakage detection using gas sensor	20
20	Obstacle detection using IR sensor	21
21	Fire alarm system	22
22	Traffic light system	23
23	Password based door locking system	25

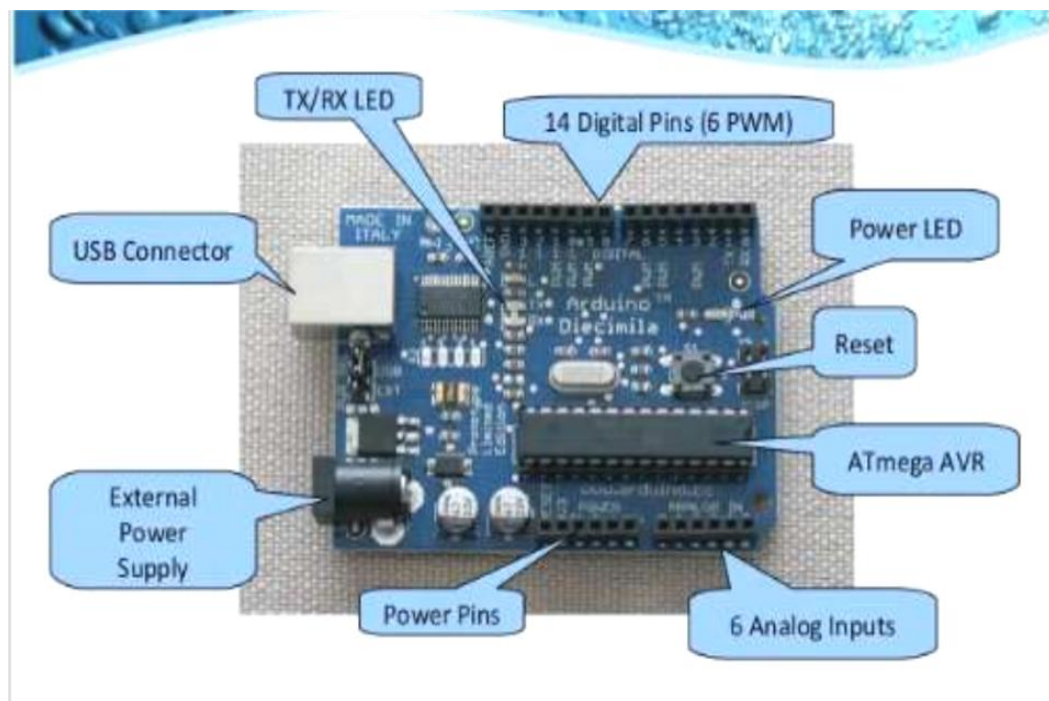
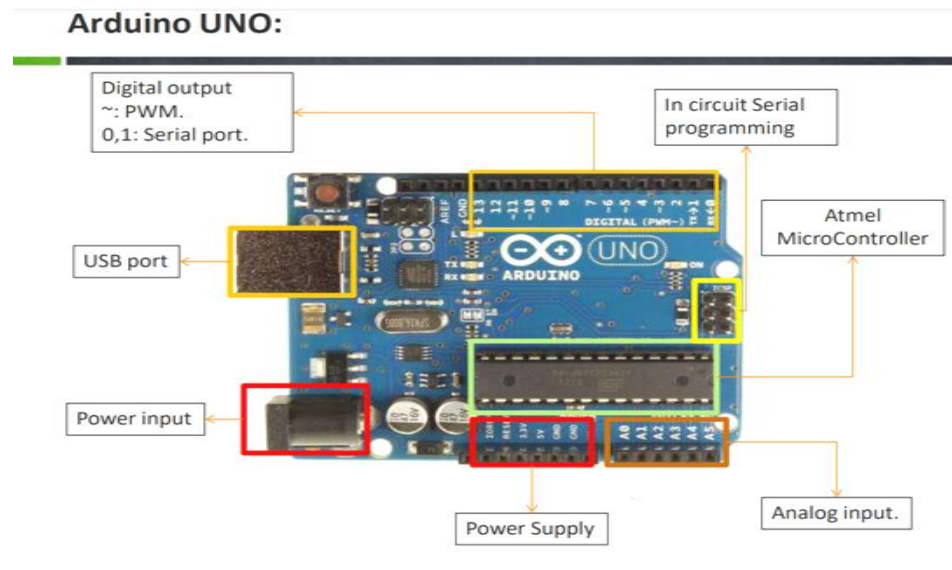
24	Conclusion	27
----	------------	----

INTRODUCTION - ARDUINO

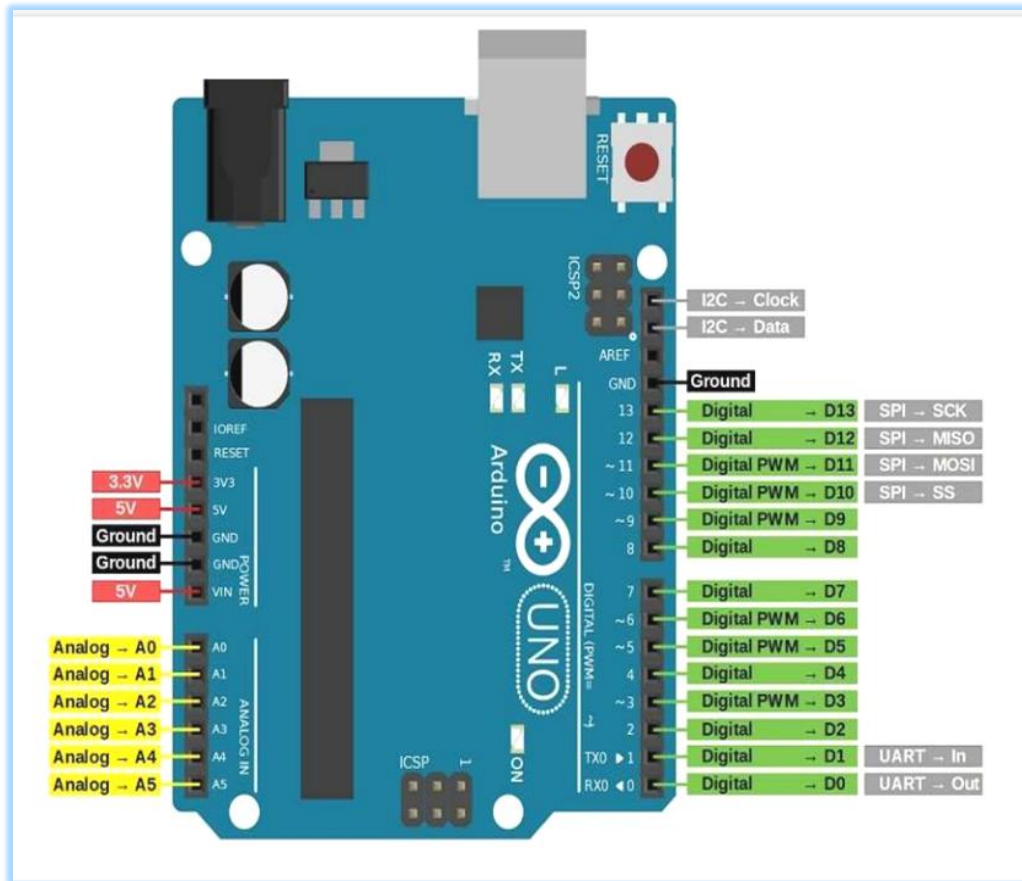


- A microcontroller board, contains on-board power supply, USB port to communicate with PC, and an Atmel microcontroller chip.
- It simplify the process of creating any control system by providing the standard board that can be programmed and connected to the system without the need to any sophisticated PCB design and implementation.
- It is an open source hardware, any one can get the details of its design and modify it or make his own one himself

ARDUINO COMPONENTS AND CONNECTIONS



ARDUINO PINS



PARAMETRICS

Max ADC Resolution (bits)	10
Program Memory Size (KB)	32
Capture/Compare/PWM (CCP)	1
Number of Comparators	1
CPU Speed (MIPS/DMIPS)	20
Data EEPROM (bytes)	1024
DigitalTimerQty_16bit	1
Max 8 Bit Digital Timers	2
Ethernet	None

I2C	1
Program Memory Type	Flash
mtrlcntlinputcapture	1
ADC Channels	8
Low Power	No
Operating Voltage	1.8 - 5.5
outputcomparatorPWM	6
Pin Count	32
SPI	2
Temp Range (°C)	-40 - 85
USART	1

Parameter	Value
CPU type	8-bit AVR
Maximum CPU speed	20 MHz
Performance	20 MIPS at 20 MHz ^[3]
Flash memory	32 KB
SRAM	2 KB
EEPROM	1 KB
Package pin count	28 or 32
Capacitive touch sensing channels	16
Maximum I/O pins	23
External interrupts	2
USB interface	No

PIN DETAILS :

- Vin: This is the input voltage pin of the Arduino board used to provide input supply from an external power source.
- 5V: This pin of the Arduino board is used as a regulated power supply voltage and it is used to give supply to the board as well as onboard components.
- 3.3V: This pin of the board is used to provide a supply of 3.3V which is generated from a voltage regulator on the board
- GND: This pin of the board is used to ground the Arduino board.
- Reset: This pin of the board is used to reset the microcontroller It is used to Resets the microcontroller
- Analog Pins: The pins A0 to A15 are used as an analog input and it is in the range of 0-5V. The analog pins on this board can be used as a digital Input or Output pins.
- Serial pins: It is used for communication between the Arduino board and a computer or other devices.
- The TXD and RXD are used to transmit & receive the serial data resp. It includes serial 0, Serial 1, serial 2, Serial 3 as follows:
- Serial 0: It consists of Transmitter pin number 1 and receiver pin number 0
- Serial 1: It consists of Transmitter pin number 18 and receiver pin number 19

- serial 2: It consists of Transmitter pin number 16 and receiver pin number 17
- Serial 3: It consists of Transmitter pin number 14 and receiver pin number 15
- External Interrupts pins: This pin of the Arduino board is used to produce the External interrupt and it is done by the pin numbers 0,3,21,20,19,18. I2C: This pin of the board is used for I2C communication.
- •Pin number 20 signifies Serial Data Line (SDA)and it is used for holding the data.
- •Pin number 21 signifies Serial Clock Line (SCL) and it is used for offering data synchronization among the devices.
- SPI Pins: This is the Serial Peripheral Interface pin, it is used to maintainSPI communication with the help of the SPI library. SPI pins include: •MISO:
- Pin number 50 is used as a Master In Slave Out •
- MOSI: Pin number 51 is used as a Master Out Slave In
- •SCK:Pin number 52 is used as a Serial Clock
- •SS: Pin number 53 is used as a Slave Select LED Pin: The board has an inbuilt LED using digital pin-13.
- The LED glows only when the digital pin becomes high.
- AREF Pin: This is an analog reference pin of the Arduino board. It is used to provide a reference voltage from an external power supply.
- AREF means Analog reference.
- It allows us to feed the Arduino a reference voltage from an external power supply in order to configure the reference voltage used for analog input (i.e. the value used as the top of the input range).
- For example, if we want to measure voltages with a maximum range of 3.3V, we would feed a nice smooth 3.3V into the AREF pin – perhaps from a voltage regulator IC.
- Then the each step of the ADC would represent 3.22 millivolts

Introduction to I2C on Arduino

- I²C, which stands for inter-integrated-circuit, is a serial communication interface designed for microcontrollers.
- Compared to UART, it is similar but I2C is not used for PC – Device communication but are used with your modules and sensors.
- It is a simple, bidirectional two-wire synchronous serial bus and only 2 wires (SDA and SCL) to transmit information between devices connected to the bus.
- With I2C, they are useful for Arduino projects as they would sometimes require many different parts (eg. sensors, expansions, drivers) working together and with I2C, you can connect up to 128 devices on the mainboard while maintaining a clear communication pathway between the master (Arduino) and slave (Modules and sensors) devices!

HOW TO DO PROGRAMS FOR ARDUINO

Arduino Programming Language		
Control Statements	Operators	Functions
if		pinMode()
if..else	+, -, *, /,	digitalWrite()
for	<, >, <=,	digitalRead()
while	>=, <>,	delay()
do..while	&&, , !	analogRead()
switch..case		analogWrite()

- Operators
 - Arithmetic
 - Logical
 - Boolean

Arduino programs can be divided into 3 parts .They are structure, variables and functions.

Structure	Variables	Functions
- setup() - loop()	Constants - HIGH LOW - INPUT OUTPUT INPUT_PULLUP - LED_BUILTIN - true false - integer constants - floating point constants	Digital I/O - pinMode() - digitalWrite() - digitalRead()
Control Structures - if - if...else - for - switch case - while - do... while - break - continue - return - goto	Data Types - void - boolean - char - unsigned char	Analog I/O - analogReference() - analogRead() - analogWrite() - PWM
		Due & Zero only - analogReadResolution() - analogWriteResolution()

ARDUINO WITH TRICOLOR LED AND PUSH BUTTON

TRICOLOR LED

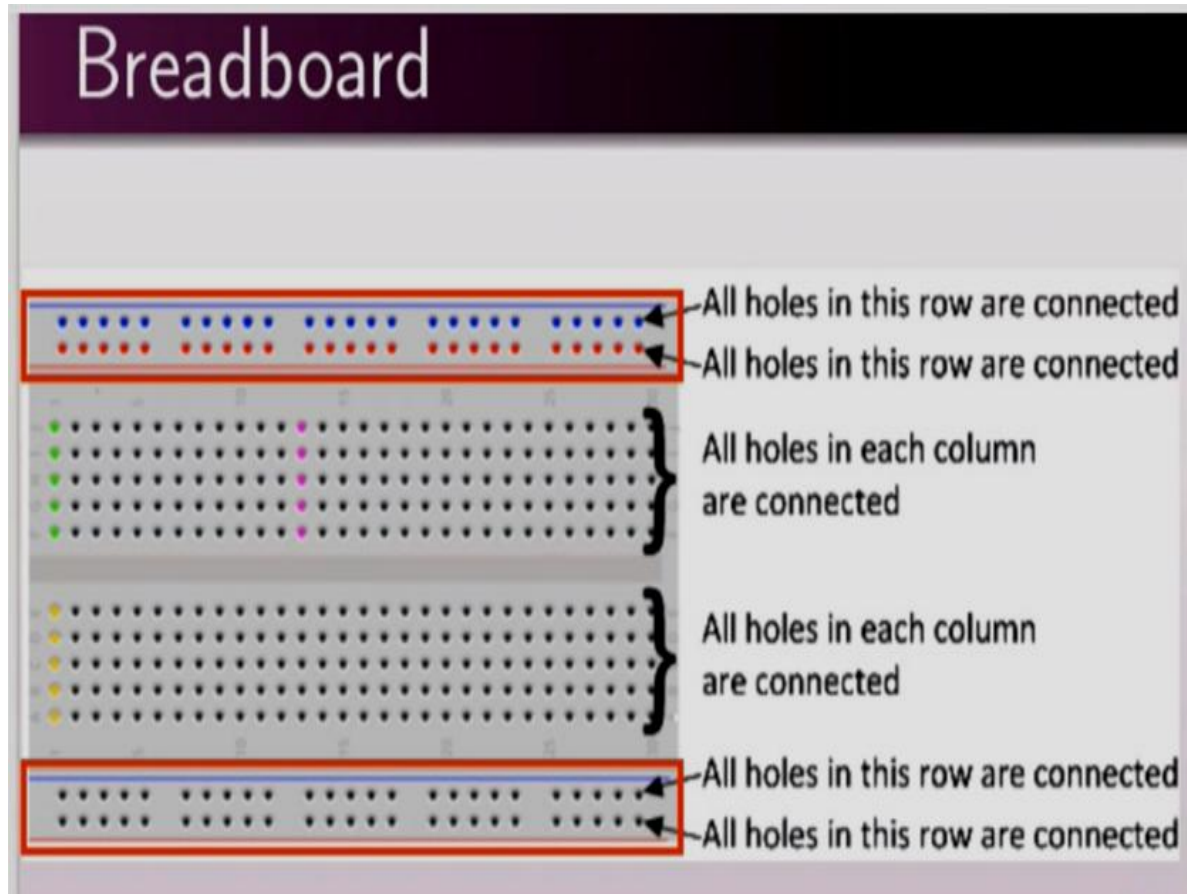


The three LEDs are **red, green and blue**, so any of these colors can appear at a specific time simply by passing a current through one LED. Passing a current through two LEDs at a time produces the relevant combined color, specifically yellow, cyan or magenta.

PUSH BUTTTON



A push-button (also spelled pushbutton) or simply button is a simple **switch** mechanism to control some aspect of a **machine** or a **process**. Buttons are typically made out of hard material, usually **plastic** or **metal**.^[1] The surface is usually flat or shaped to accommodate the human finger or hand, so as to be easily depressed or pushed. Buttons are most often **biased switches**, although many unbiased buttons (due to their physical nature) still require a **spring** to return to their un-pushed state. Terms for the "pushing" of a button include pressing, depressing, mashing, slapping, hitting, and punching.



The breadboard is a white rectangular board with small embedded holes to insert electronic components. It is commonly used in electronics projects. We can also say that breadboard is a prototype that acts as a construction base of electronics.

PROGRAM FOR TRICOLOR LED AND PUSH BUTTON

TO CONTROL TRICOLOUR LED USING PUSH BUTTON

When Pushbutton is pressed Tricolour LED should blink

```
void setup()
{
  pinMode(7, OUTPUT);
  pinMode(6, OUTPUT);
  pinMode(5, OUTPUT);
  pinMode(4, INPUT);
}
```

```

}

void loop()
{
  if (digitalRead(4)==HIGH)           // if pushbutton is
  pressed
  {
    digitalWrite(7, HIGH);
    delay(1000); // Wait for 1000 millisecond(s)
    digitalWrite(7, LOW);
    delay(1000); // Wait for 1000 millisecond(s)

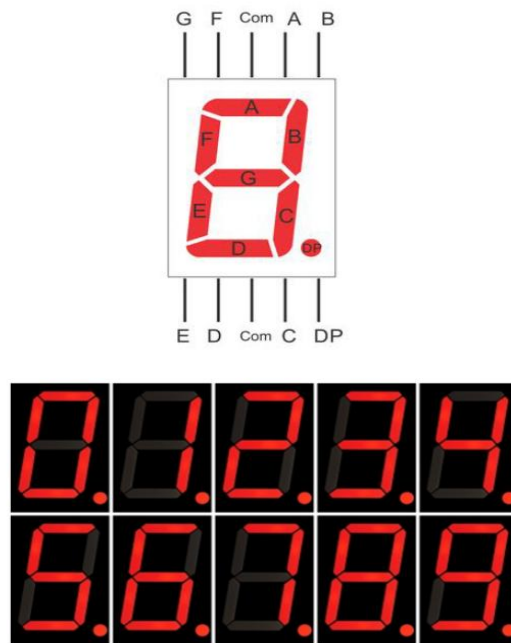
    digitalWrite(6, HIGH);
    delay(1000); // Wait for 1000 millisecond(s)
    digitalWrite(6, LOW);
    delay(1000); // Wait for 1000 millisecond(s)

    digitalWrite(5, HIGH);
    delay(1000); // Wait for 1000 millisecond(s)
    digitalWrite(5, LOW);
    delay(1000); // Wait for 1000 millisecond(s)

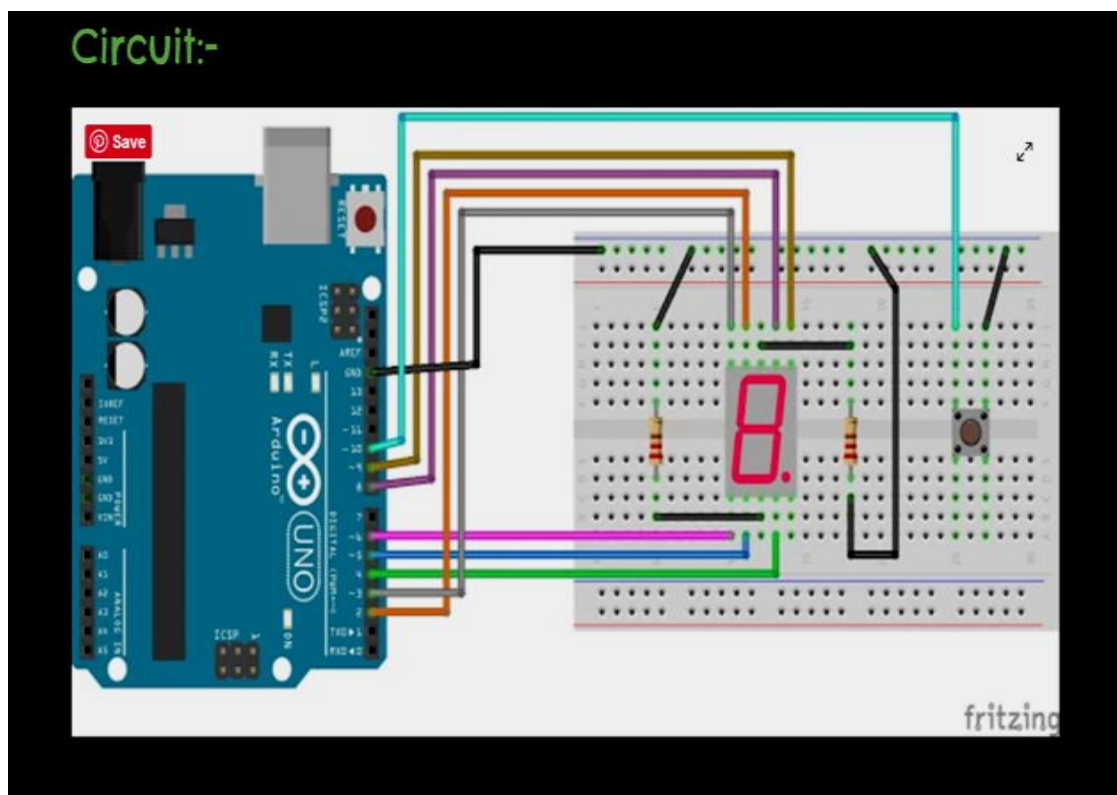
  }
}

```

SEVEN SEGMENT DISPLAY COUNTER USING ARDUINO



CONNECTION USING TINKERCAD SOFTWARE



PROGRAM

```
//Viral Science www.youtube.com/c/viralscience
//SevenSegment push button counter
const int a = 8; //For displaying segment "a"
const int b = 9; //For displaying segment "b"
const int c = 4; //For displaying segment "c"
const int d = 5; //For displaying segment "d"
const int e = 6; //For displaying segment "e"
const int f = 2; //For displaying segment "f"
const int g = 3; //For displaying segment "g"

bool bPress = false;
const int buttonPin = 10;

// Variables will change:
int buttonPushCounter = 0; // counter for the number of button presses
int buttonState = 0;       // current state of the button
int lastButtonState = 0;   // previous state of the button

void setup() {
  // put your setup code here, to run once:
  pinMode(a, OUTPUT); //A
  pinMode(b, OUTPUT); //B
  pinMode(c, OUTPUT); //C
  pinMode(d, OUTPUT); //D
  pinMode(e, OUTPUT); //E
  pinMode(f, OUTPUT); //F
  pinMode(g, OUTPUT); //G

  pinMode( buttonPin , INPUT_PULLUP );
  Serial.begin(9600);
  displayDigit(buttonPushCounter);
}
```

SENSORS - USED

● Light sensor.

A light sensor is a photoelectric device that converts light energy (photons) detected to electrical energy (electrons). Seems simple? There is more to a light sensor than just its definition. It comes in different types, used in various applications and more! Hence, in today's light sensor guide, we'll be exploring all you need to know about light sensors:

● Motion sensor.

A motion sensor (or motion detector) is an electronic device that is designed to detect and measure movement. Motion sensors are used primarily in home and business security systems, but they can also be found in phones, paper towel dispensers, game consoles, and virtual reality systems. Unlike many other types of sensors (which can be handheld and isolated), motion sensors are typically embedded systems with three major components: a **sensor** unit, an **embedded computer**, and hardware (or the mechanical

- **Temperature sensor.**

A temperature sensor measures the temperature of an object either by coming into contact with the object or by remotely detecting infrared energy emitted by the object.

- **Magnetic fields sensor.**

The Magnetic Field Sensor can be used to study the field around permanent magnets, coils, and electrical devices. It features a rotating sensor tip to measure both transverse and longitudinal magnetic fields.

- **Gravity sensor**

.The G-Sensor, or commonly referred to as a G sensor, an accelerometer, or a gravity sensor, is used for detecting and sensing sudden acceleration or deceleration. A common G sensor application is the smart phone

- **Gas sensor**

Gas sensors (also known as gas detectors) are electronic devices that detect and identify different types of gasses. They are commonly used to detect toxic or explosive gasses and measure gas concentration. ... Most home based smoke detection systems are oxide based sensors.

- **IR Sensor**

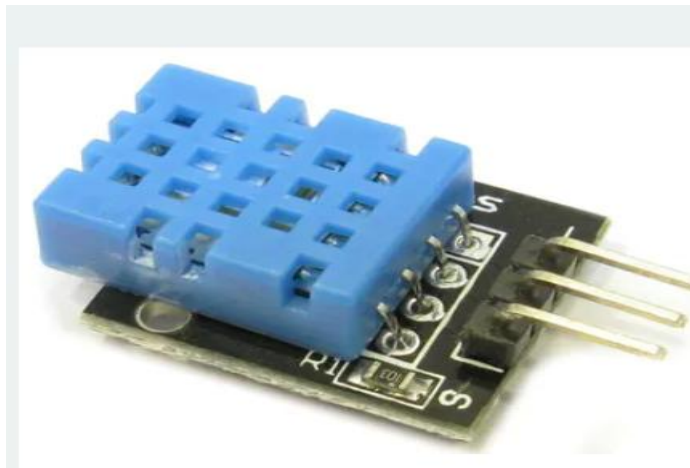
An infrared sensor (IR sensor) is a radiation-sensitive optoelectronic component with a spectral sensitivity in the infrared wavelength range 780 nm ... 50 μ m. IR sensors are now widely used in motion detectors, which are used in building services to switch on lamps or in alarm systems to detect unwelcome guests.

HOW DO SENSORS WORKS IN ARDUINO ?

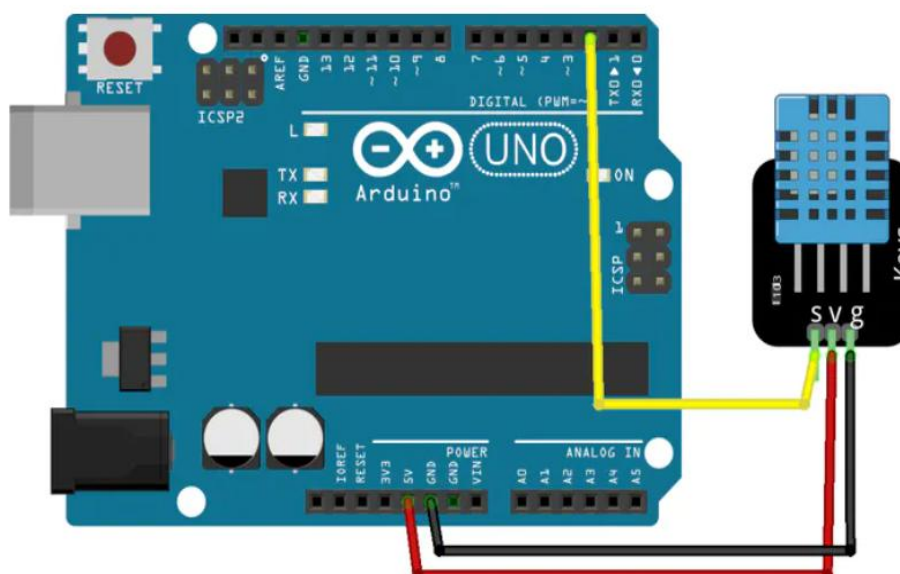
We have to Plug the three pins of our sensor into three different rows on our breadboard. And then we have to **Connect a wire from the 5v on our Arduino** to row containing the 5v pin on oursensor.And Connect a wire from A0 on our breadboard to breadboard row containing the pin marked with an S.

DHT11 Temperature and Humidity Sensor

The DHT11 is a basic, ultra low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin (no analog input pins needed).



CONNECTION IN TINKERCAD :



REAL TIME APPLICATIONS USING ARDUINO

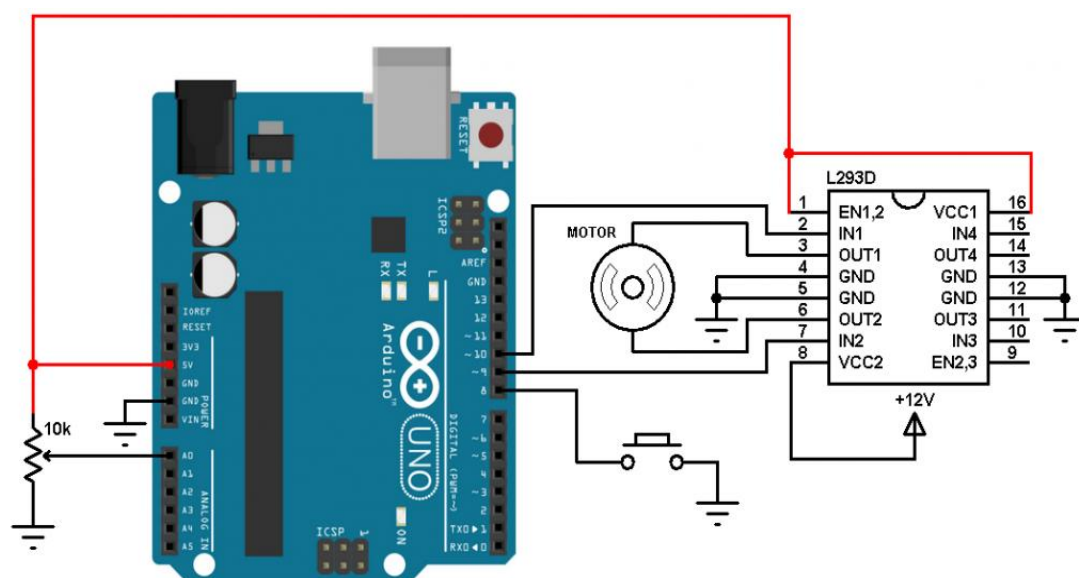
CONTROLLING THE SPEED AND DIRECTION OF DC MOTOR USING ARDUINO

Arduino Motor Control Setup

1. Connect 5V and ground of the IC to 5V and ground of Arduino.
2. Connect the motor to pins 2 and 3 of the IC.
3. Connect IN1 of the IC to pin 8 of Arduino.
4. Connect IN2 of the IC to pin 9 of Arduino.
5. Connect EN1 of IC to pin 2 of Arduino.
6. Connect SENS A pin of IC to the ground.
7. Connect the Arduino using Arduino USB cable and upload the program to the Arduino using Arduino IDE software
8. Provide power to the Arduino board using power supply, battery or USB cable.

The motor should now run first in the clockwise (CW) direction for 3 seconds and then counter-clockwise (CCW) for 3 seconds.

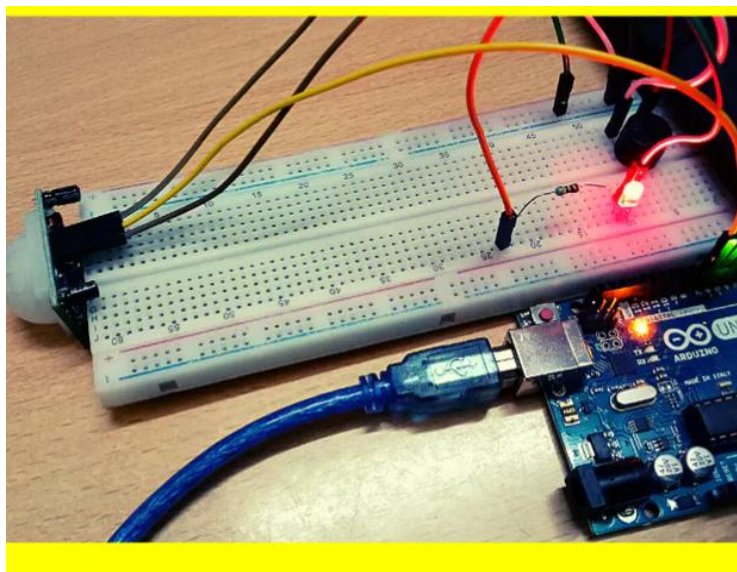
CONNECTION :



The speed of the DC motor (both directions) is controlled with the 10k potentiometer which is connected to analog channel 0 (A0) and the direction of rotation is controlled with the push button which is connected to pin 8 of the Arduino UNO board. If the button is pressed the motor will change its direction directly.

APPLICATIONS USING SENSORS IN ARDUINO

COVID -19 HUMAN DETECTION - USING GAS SENSOR:



We made a Arduino Based Social Distancing Alarm System in tinkercad using PIR Sensor.

Here, We connect PIR Sensor, Buzzer & led with Arduino Uno. and when the connection is ready, It will alert us when someone comes closer to sensor by making a sound from Buzzer and by blinking of LED.

CODE

```
int ledPin = 5; //LED PIN.int buzzerPin = 6; //BUZZER INPUT PIN.int pirPin = 7;
//MOTION SENSOR INPUT PIN.int sensorValue = LOW; //DEFAULT SENSOR STATE.void setup()
{
  //INITIAL SETTINGS/ASSIGNMETN.pinMode(buzzerPin, OUTPUT); //SET
  BUZZER AS OUTPUT.pinMode(ledPin, OUTPUT); //SET LED AS OUTPUT.pinMode(pirPin, INPUT);
  //SET PIR AS INPUT.}void loop() {
  //COMMAND TO BE REPEATED.sensorValue =
  digitalRead(pirPin); //READ PIR INPUT PIN.if( sensorValue == HIGH) { //IF MOTION IS
  DETECTED.tone(buzzerPin, 1200); //BUZZ THE BUZZER.digitalWrite(ledPin, HIGH); //ON
  LED.delay(100); //TIME DIFFERENCE BETWEEN HIGH(ON)&
  LOW(OFF).digitalWrite(ledPin, LOW); //OFF LED.delay(100); //TIME
  DIFFERENCE BETWEEN HIGH(ON)& LOW(OFF). } else{ noTone(buzzerPin); //SILENT THE
  BUZZER.digitalWrite(ledPin, LOW); //OFF
```

LED. }}

And the other Arduino applications are,

● Gas leakage detection - using gas sensor

WORKING PRINCIPLE

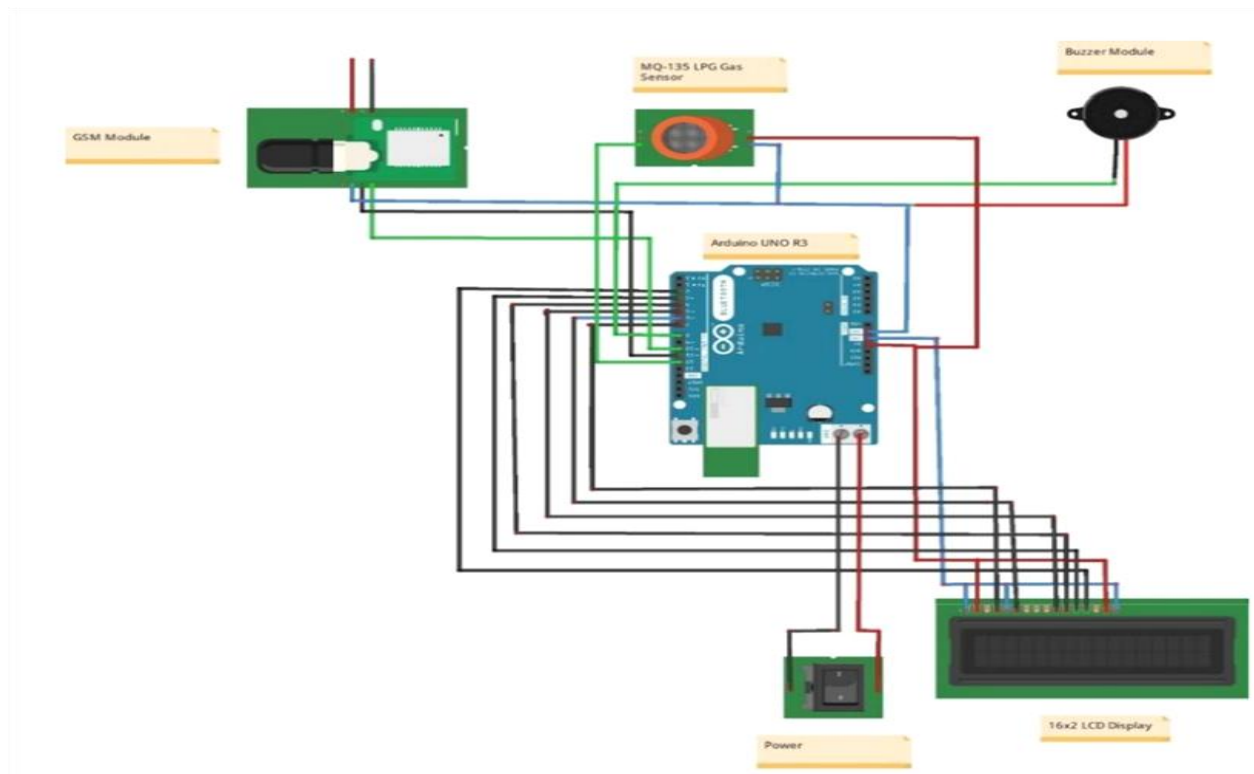
Arduino will be active with 5 volts" power supply. The sensor will detect gas leakage once the system is launched, if there is no gas leakage, it will display "Normal Condition Air Cleaning" on the display. If the gas is leaked otherwise, the following three steps will follow

Step 1: A signal from the microcontroller will go to the display and show gas leakage message there.

Step 2: The signal from Buzzer will signal when the first step is completed.

Step 3: Lastly, through GSM, there will be a signal message that the gas has been leaked to a specific number or multiple

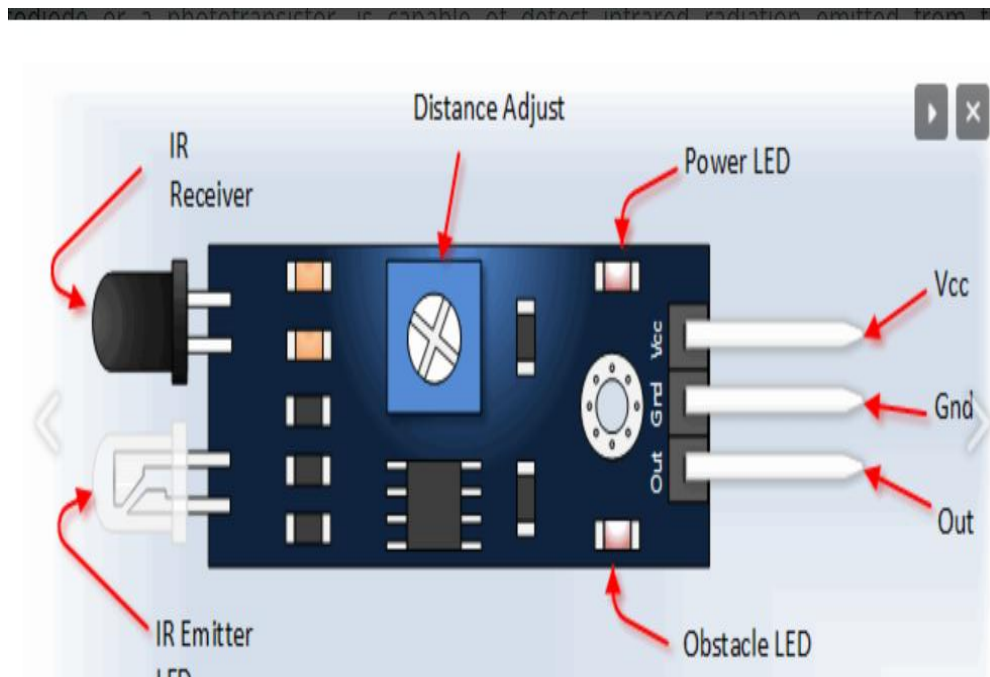
CONNECTION.



OBSTACLE DETECTION USING IR SENSOR

The IR transmitter sends an infrared signal that, in case of a reflecting surface (e.g. white color), bounces off in some directions including that of the IR receiver that captures the signal detecting the object.

When the surface is absorbent (e.g. black color) the IR signal isn't reflected and the object cannot be detected by the sensor. This result would occur even if the object is absent.



FIRE ALARM SYSTEM

generally a smoke sensor and temperature and humidity sensor.

The sensor input data is connected with Arduino controlled LCD display, Buzzer and GSM module also is connected with Arduino for output result

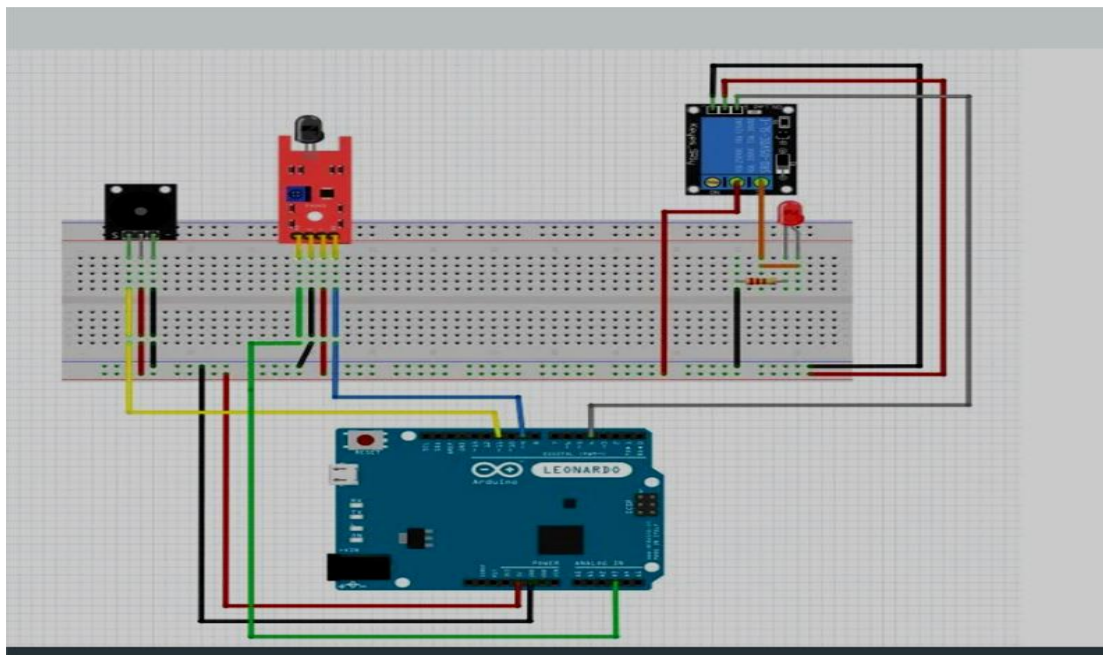
Buzzer is notified for fire alarm and LCD displays the fire detection status.

GSM module can be informed to specific user to know or prevent their home, office or building.

This system can be applied in residential places, offices and hotels.
With this system safety is assured.

The system can perform different parameter measurements for early detection of building fires.

CONNECTION



TRAFFIC LIGHT SYSTEM



NEED OF TRAFFIC LIGHTS

ROBU.IN

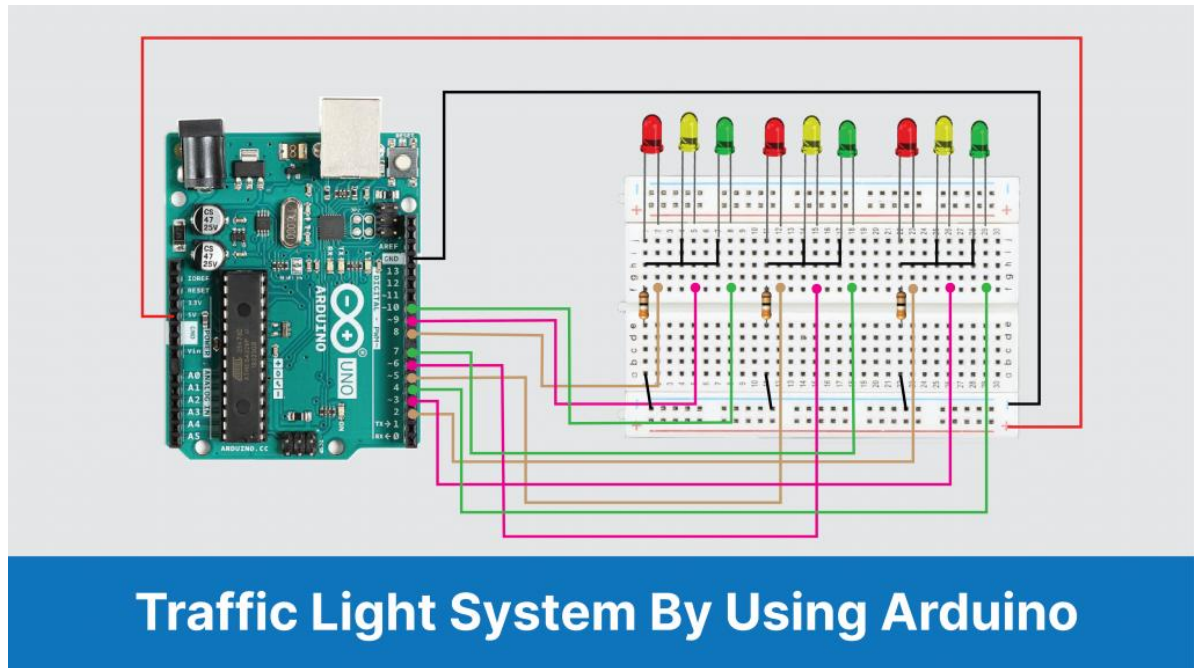
Traffic lights allow everyone to cross the intersection point one by one, reducing conflicts between vehicles entering intersection points from different directions. It provides road safety, also helps to solve traffic in simple manners.

There are different colours in traffic lights. Each light has a meaning, and these lights tell drivers what to do.

- Red light ON- A driver should stop.
- Yellow light ON- A driver has to slow down and be ready to stop.
- Greenlight ON- A driver can start driving or keep driving.

Components Required

- **Arduino Uno**
- **Breadboard**
- **LEDs (Red, Yellow, Green)**
- **Resistor(220 Ohm)**
- **Dupont cable**



Traffic Light System By Using Arduino

The logic of This Traffic Light System Using Arduino Code

- The code for this traffic light controller is simple and easy to understand. We have exhibited traffic lights for a three-way road. The LEDs will be glowing in a particular sequence to form an actual traffic light controller system.
- At a time, two red LEDs will glow, and one Green LED will be ON. Also, two yellow LEDs will be ON for one second. Yellow LED will Glow on each transition between RED to GREEN. In short first RED LED will glow for 5 Seconds, theELLOW for 1 second, and then Green LED will ON for 5 seconds.
- In the void setup of the code, we have defined the pins for the LEDs as outputs from 2 to 10. In the void loop section, we have defined the functions to turn LEDs ON and OFF.

Advantages

- The traffic light controller in this system can be implemented practically, and it could be expanded further by you.
- This traffic light controller includes a crosswalk signalling system.

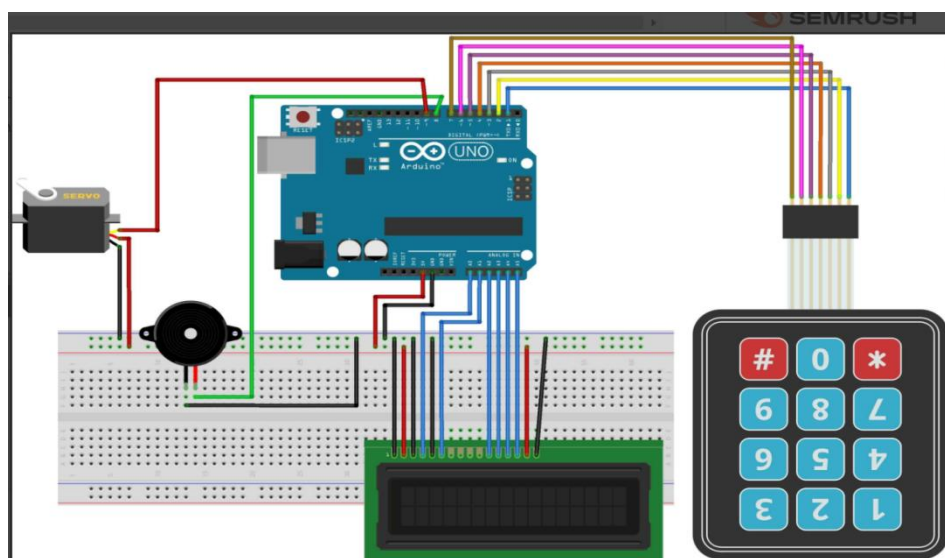
- External memory can be interface with the central controller so that the timings are not fixed during its programming but instead can be programmed during operation.

ANOTHER APPLICATION IS,

PASSWORD BASED DOOR LOCKING SYSTEM

- As thefts are increasing day by day security is becoming a major concern nowadays. So a digital code lock can secure your home or locker easily. It will open your door only when the right password is entered.
- The circuit of this application is very simple which contains Arduino, keypad module, buzzer, Servo Motor, and LCD.
- Arduino controls the complete processes like taking a password from the keypad module, comparing passwords, driving buzzer, rotating servo motor, and sending status to the LCD display.
- The keypad is used for taking the password. The buzzer is used for indications. Servo motor is used for opening the gate while rotating and LCD is used for displaying status or messages on it.

connection using tinkercad



First of all, we will make a connection to the 4×3 Keypad. For connecting the keypad with the Arduino we are using digital pins D1 to D7. Connect all seven pins of the keypad to analog pins D1 ~ D7 of Arduino.

To connect the servo motor with the Arduino, use digital pin D9 of Arduino to output the PWM pin of the servo motor. Now connect the positive wire of the buzzer to the pin D10 of Arduino and the negative wire to the ground.

Now we will connect the 16×2 LCD to the Arduino.

1. Connect pin 1,3,5,16 of LCD to the GND.
2. Connect pin 2,15 of LCD to the VCC (5V).
3. Connect pin 4 of LCD to pin A0 of Arduino.
3. Connect pin 6 of LCD to pin A1 of Arduino.
3. Connect pin 11 of LCD to pin A2 of Arduino.
3. Connect pin 12 of LCD to pin A3 of Arduino.
3. Connect pin 13 of LCD to pin A4 of Arduino.
3. Connect pin 14 of LCD to pin A5 of Arduino.

ADVANTAGE

“Password based Door Lock System” can be provided maximum security by the above enhancements in order to completely satisfy user’s needs. Hence, a common man can afford to buy such locking system in minimal cost to keep his valuables safely without any worries.

CONCLUSION:

- From this hands on training we can gain knowledge about various electronic components
- And we could able write basic programming of arduino.
- By using this arduino we could able to transform physical input to digital input.
- And we can able to develop real life applications using this arduino

- **Arduino UNO is a low-cost, flexible, and easy-to-use programmable open-source microcontroller board that can be integrated into a variety of electronic projects.**
- **This board can be interfaced with other Arduino boards, Arduino shields, Raspberry Pi boards and can control relays, LEDs, servos, and motors as an output.**