A Project Report

On

MULTI FUNCTIONAL ROBOT FOR DEFENCE

Submitted in partial fulfilment of the Requirement for the award of the degree of

Bachelor of Technology

In

ELECTRONICS AND COMMUNICATION ENGINEERING

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Batch: 2021-2025

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CERTIFICATE

This is to certify that the major project report entitled "MULTI FUNCTIONAL ROBOT FOR DEFENCE" that is being submitted by N. GAYATHRI (21HN1A0427); P. BHAVANI(22HN5A0401);M.LAKSHMIPRIYA(21HN1A0423);SK.AYESHA(21HN1A0435) ;P.LIKHTHA(21HN1A0429) of Bachelor of Technology in Electronics and Communication Engineering to the Jawaharlal Nehru Technological University Anantapur, Anantapur is a record of bona fide work carried out for the academic year2021-2025.

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ABSTRACT

A modern approach for surveillance at remote and border areas using multifunctional robot based on IOT used in surveillance, defense and military applications. It is designed to replace human beings in various hazardous areas. The robotics and automation industry which is ruled the sectors from manufacturing to house-hold entertainments. It is widely used because of its simplicity and ability to modify to meet changes of needs. The project is designed to develop a robotic vehicle using android application for remote operation with multiple features like wireless camera for monitoring purpose, Metal Detector for land mines detection. sensor for detecting flues gases in surrounding areas, Object moving detection with automatic Notifications sending to ground station using IoT technology. A robot is a machine capable of carrying out a complex series of actions automatically, especially one programmable by a computer. A robot can be controlled by a human operator, sometimes from a great distance. In such type of applications wireless communication is more important. The control signal from transmitter is sent to the receiver which is connected to an object or device or vehicle that is to be remotely controlled. Similarly, this project mentions about a wirelessly controlled commando robot controlled using IOT.

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CHAPTER-1

INTRODUCTION

1.1 Introduction to embedded system

In today's world, robotics is fastest growing and very interesting field. ROBOT has various input and output to sense the environment and take appropriate action. With the development and research of technology, scientist has come up with invention of military robots. This makes soldier's life more secure on war field. Military robots are used to perform various risky task like monitor war field, diffuse live unexploded bombs, detect landmines and shoot enemies.

Nowadays, many countries take the helps of these robots to take dangerous jobs. These military robots appointed with the integrated systems like sensors, gripper, weapons, cameras and actuators. Based purpose of robot it comes in different shapes and features. Robotics has been a stable of advanced manufacturing for over half a century. A remote- controlled surveillance robot is defined that is remotely controlled to capture images/video for specific purposes.

The main aim of this project is to implement a wireless multifunctional defense robot which can be controlled through computer or laptop using WIFI module. These robots used in defense are usually employed with the integrated system, including video, screens, sensor and cameras. Presently we are watching in the borders terrorists have placed landmines in main in accessible areas we can use the robots.

The metal detector for detects the landmines, ultrasonic sensor to measure the distance of objects in front of the robot and buzzer use that data to alert them. We can also use these robots at night times for that we use night vision light cameras.

Using all these we can involve military person in any rescue operations in this robot use main WIFI modules, motor driver and battery supply for that use the smart IOT technology we can control and monitor all this data through smart mobile Using the smart app, we can control the robot anywhere and any place. Every direction we give this is specially designed robotic system to save human life and protect the country from enemies.

1.2 Purpose of the project

The purpose of the project is to enhance national security, reduce human casualties, and improve operational efficiency in defense and security missions. The robot can perform bomb disposal and border security tasks with high precision. Its mobility allows it to navigate rough terrains, urban environments, and hazardous zones. Integrated with cyber security measures, it ensures secure communication.

1.3 Objectives of the project

The objective of this project is to develop a multi-functional defense robot capable of performing various tasks to enhance security, surveillance. This robot is designed to operate in high-risk environments, reducing the need for direct human intervention and ensuring safety in critical missions. Uses facial recognition and target identification to improve defense strategies. Minimizes human exposure to combat zones and life- threatening situations. Increases the effectiveness of military operations with precision and automation.

1.4 Scope of the project

The project focuses on developing an advanced robotic system capable of performing multiple tasks in military, security and emergency response operations. The scope of this project includes the design, development and enhancement of a highly adaptable robotic system that can operate remote control in high-risk environments. The robot will be designed to detect, identify and dispose of explosive devices. The robot will be equipped with sensors and cameras to locate and retrieve personnel in distress. The robot will serve as a communicate relay to extend the range of communication networks.

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CHAPTER-2

METHODOLOGY

2.1 PROPOSED METHOD

This robot is controlled through WIFI module. It shares the location. It has ultrasonic sensor that calculates the distance of the target. has the camera to operate the area. There was microphone and speaker which we can use to communicate We are using BLYNKAPP to control. WIFI provide a longer range and better stability compared to Bluetooth. The is capable of sharing its real time location. This is useful for monitoring the robot remotely. This robot is controlled by using the Blynk app. It can control Hardware remotely. It can apply sensor data.

2.2 BLOCK DIAGRAM OF PROPOSED METHOD

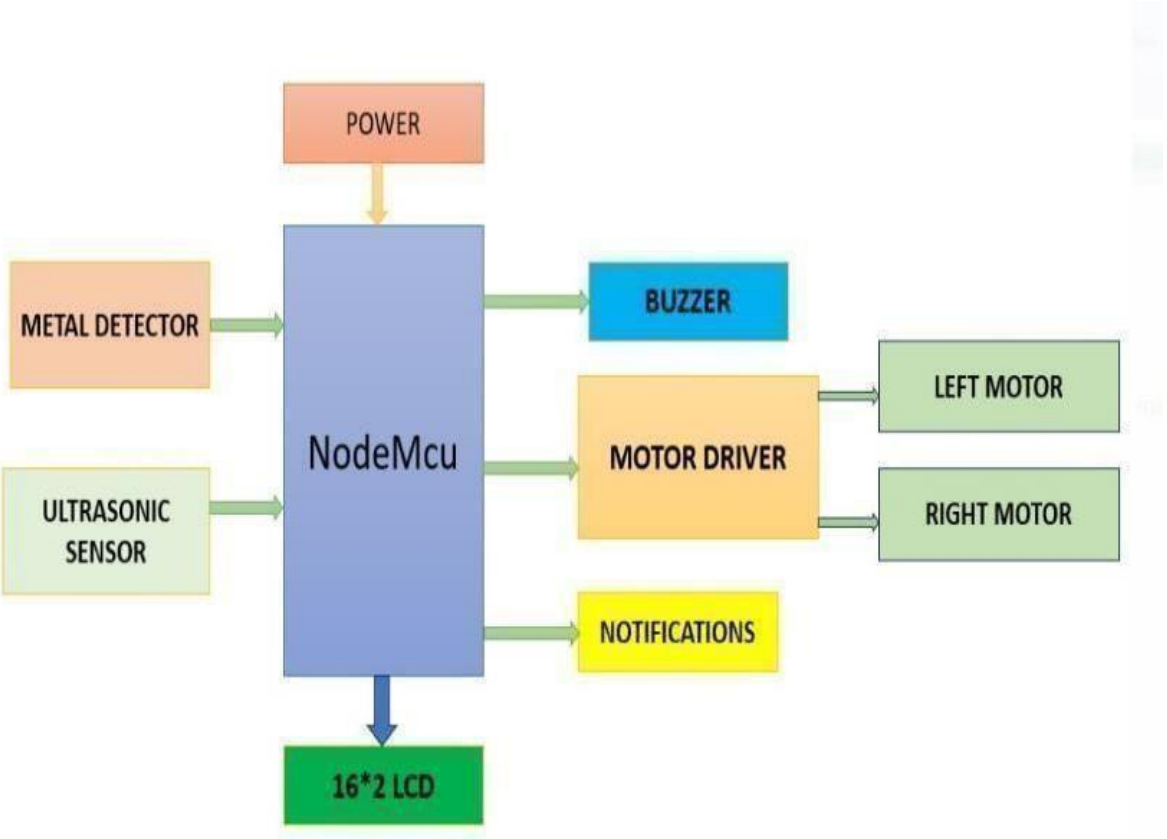


Fig.2.1: Block diagram

2.3 CIRCUIT DIAGRAM OF PROPOSED METHOD

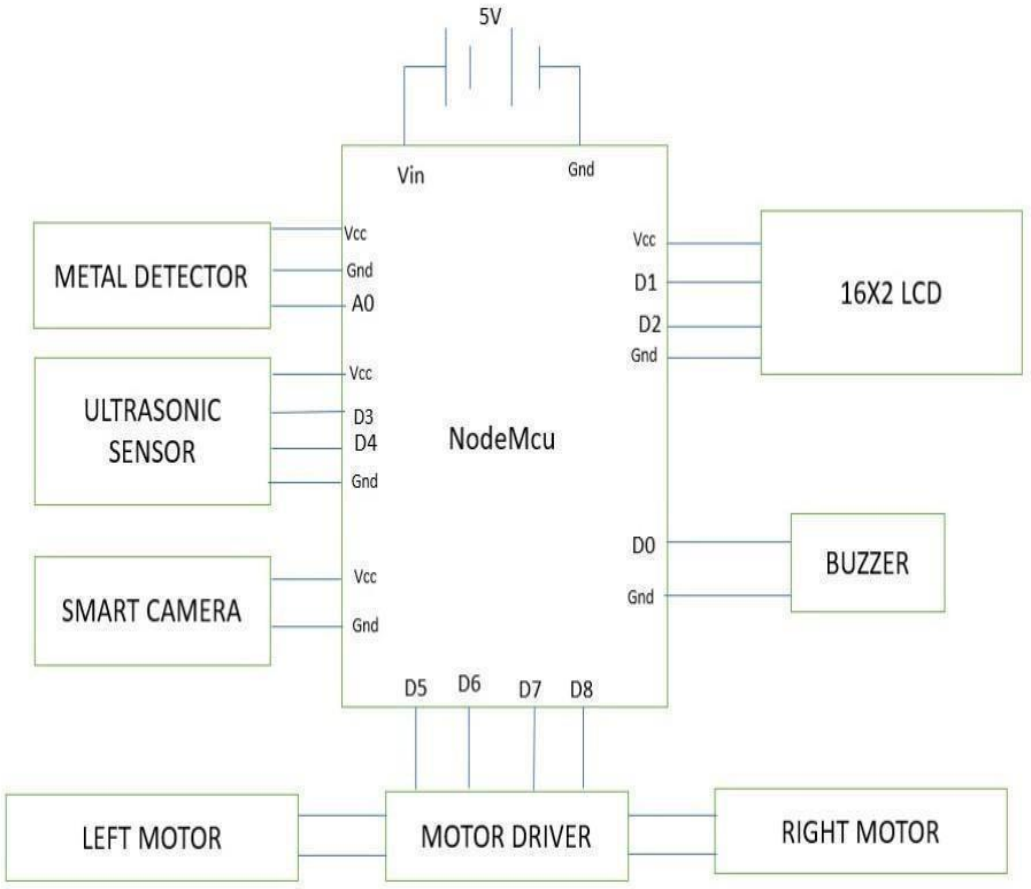


Fig.2.2: circuit diagram of proposed system

- This robot is mainly used for surveillance of the remote areas, enemy basses, etc and landmine detection.
- The ultrasonic sensor to measure the distance that was detected in front.

CHAPTER-3

HARDWARE TOOLS

3.1 NODEMCU (ESP-8266 12E) Wi-Fi-Module

ESP-8266 12E Wi-Fi module is developed by Ai-thinker Team. core processor ESP8266 in smaller sizes of the module encapsulates L106 integrates industry-leading ultralow power 32-bit MCU micro, with the 16-bit short mode, Clock speed support 80 MHz, 160 MHz, supports the RTOS, integrated Wi-Fi MAC/BB/RF/PA/LNA, on-board antenna. The module supports standard IEEE802.11 b/g/n agreement, complete TCP/IP protocol stack. Users can use the add modules to an existing device networking, or building a separate network controller. ESP8266 is high integration wireless SOCs, designed for space and power constrained mobile platform designers. It provides unsurpassed ability to embed Wi-Fi capabilities within other systems, or to function as a standalone application, with the lowest cost, and minimal space requirement.

ESP8266EX offers a complete and self-contained Wi-Fi networking solution; it can be used to host the application or to offload Wi-Fi networking functions from another application processor. When ESP8266EX hosts the application, it boots up directly from an external flash.

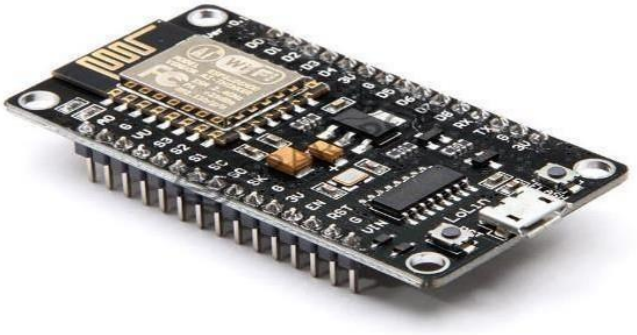


Fig3.1: NODE(ESP8266-12E)

3.1.1 Family of Breakout Boards (ESP-NN):

Quickly after launch, a variety of breakout boards for the **ESP8266** started becoming available. The most popular ones have been the **ESP-NN** series, which typically integrate the SOC along with Flash RAM, a crystal, and even an on-board antenna. The most salient

distinction between different **ESP-NN** models are the pins that are broken out from the **ESP8266.**

As the **ESP8266** was developed as a Serial to Wi-Fi adapter, its firmware implemented an interpreter for AT commands. Thus, initial usage of the IC was limited to using either a USB to Serial adapter, or a separate microcontroller (e.g., **ATmega328**) to issue AT commands over the **ESP8266**'s Serial UART interface. For this reason, the **ESP-01** board quickly became popular amongst the **ESP8266 c**ommunity because of its 2×4, 0.1in-pitch connector that can be easily wired to a USB to Serial adapter.

The connector gave access to the pins used for serial communication, namely **RX** and **TX**, as well as 4 control pins, **GPIO0**, **GPIO2**, **CH_PD** and **RST** (reset), along with **VCC** and **GND.**

3.1.2 *Features:*

• 802.11 b/g/n

• Integrated low power 32-bit MCU

·Integrated 10-bit ADC

• Integrated TCP/IP protocol stack

• Integrated TR switch, LNA, power amplifier and matching network

• Integrated PLL, regulators, and power management units

• Supports antenna diversity

• Wi-Fi 2.4 GHz, support WPA/WPA2

• Support STA/AP/STA+AP operation modes

• Support Smart Link Function for both Android and IOS devices

• Support Smart Link Function for both Android and devices

• SDIO 2.0, (H) SPI, UART, I2C, I2S, IRDA, PWM, GPIO

• STBC, 1x1 MIMO, 2x1 MIMO

3.1.3 Applications:

- Smart power plugs
- Home automation

- Mesh network
- Industrial wireless control
- Baby monitors

3.1.4 AT Commands:

Table3.1: AT Commands

Command	Description
AT	Test AT start up
AT+RST	Restart module
AT+GMR	View version Info
AT+GSLP	Enter deep sleep mode
ATE	AT commands echo or not
AT+RESTORE	Factory Reset
AT+UART	UART Configuration
AT+UART_CUR	UART current configuration
AT+UART_DEF	UART default configuration, save to flash
AT+SLEEP	Sleep mode
AT+RFPOWER	Set maximum value of RF TX power
AT+RFVVD	RF TX power according to VDD33

A few different firmware options are available for the ESP8266. These allow us to access the module in different ways, as you can see below.

3.1.5 *AT Command Processor (Default):*

The quickest way to get started with the **ESP8266** is to use its original firmware, which allows it to process any AT commands that it receives over its Serial UART interface. The biggest advantage of this option is that we need not be familiar with any specific language or framework to use the module. We can simply send it a series of commands to achieve our goal. The downside to this is that we need either an additional microcontroller involved or a USB to Serial adapter to send the necessary commands.

3.1.6 ESP-12E Pin design:

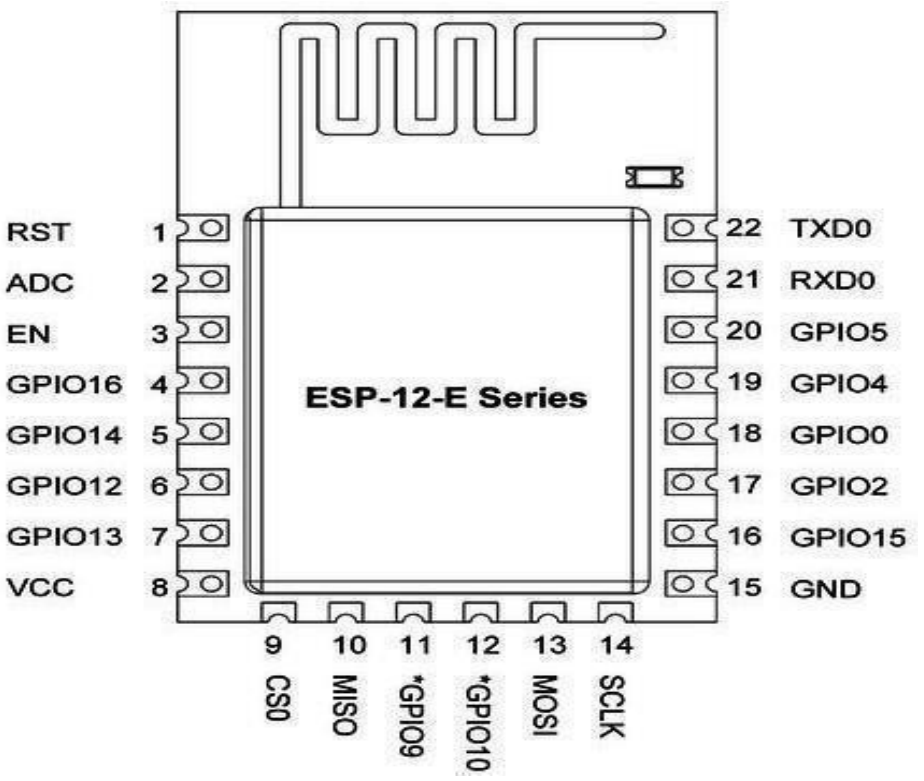


Fig.3.2: ESP-12E Pin design

3.1.7 Pin Descriptions:

Table 3.2: ESP-12E Pin Descriptions

NO.	Pin Name	Function
1	RST	Reset the module
2	ADC	A/D Conversion result. Input voltage range 0-1v, scope:0-1024
3	EN	Chip enable pin. Active high
4	IO16	GPIO16; can be used to wake up the chipset from deep sleep mode.
5	IO14	GPIO14; HSPI_CLK
6	IO12	GPIO12; HSPI_MISO
7	IO13	GPIO13; HSPI_MOSI; UART0_CTS
8	VCC	3.3V power supply (VDD)

9	CS0	Chip selection
10	MISO	Salve output Main input
11	IO9	GPIO9
12	IO10	GBIO10
13	MOSI	Main output slave input
14	SCLK	Clock
15	GND	GND
16	IO15	GPIO15; MTDO; HSPICS; UART0_RTS
17	IO2	GPIO2; UART1_TXD
18	IO0	GPIO0
19	IO4	GPIO4
20	IO5	GPIO5
21	RXD	UART0_RXD; GPIO3
22	TXD	UART0_TXD; GPIO1

Table 3.3: Pin mode

Mode	GPIO15	GPIO0	GPIO2
UART	Low	Low	High
Flash Boot	Low	High	High

Table 3.4: Dimension of ESP-12E Wi-Fi Module

Length	Width	Height	PADSize (Bottom)	Pin Pitch
16 mm	24mm	3 mm	0.9 mm x 1.7 mm	2mm

3.2 FUNCTIONAL DESCRIPTIONS:

3.2.1 MCU:

ESP8266EX is embedded with Ten silica L106 32-bit micro controller (MCU), which features extra low power consumption and 16-bit RSIC. The CPU clock speed is 80MHz. It can also reach a maximum value of 160MHz. ESP8266EX is often integrated with external sensors and other specific devices through its GPIOs; codes for such applications are provided in examples in the SDK.

3.3 MEMORY ORGANIZATION

3.3.1 Internal SRAM and ROM:

ESP8266EX Wi-Fi SOC is embedded with memory controller, including SRAM and ROM. MCU can visit the memory units through I Bus, debus, and AHB interfaces. All memory units can be visited upon request, while a memory arbiter will decide the running sequence according to the time when these requests are received by the processor. According to our current version of SDK provided, SRAM space that is available to users is assigned as below:

▪ RAM size < 36kB, that is to say, when ESP8266EX is working under the station mode and is connected to the router, programmable space accessible to user in heap and data section is around 36kB.)

▪ There is no programmable ROM in the SOC, therefore, user program must be stored in an external SPI flash.

3.3.2 External SPI Flash:

This module is mounted with a 4 MB external SPI flash to store user programs. If larger definable storage space is required, a SPI flash with larger memory size is preferred. Theoretically speaking, up to 16 MB memory capacity can be supported.

3.4 ULTRASONIC SENSOR

The ultrasonic sensor is a transducer which converts electrical energy into sound waves and vice versa. These sound waves fall above the normal range of human hearing and hence it is known as ultrasonic waves. These types of waves are above the frequency of about 18000 Hz.

An ultrasonic sensor transmits ultrasonic waves into the air and detects reflected waves from an object. There are many applications for ultrasonic sensors, such as in intrusion alarm systems, automatic door openers and backup sensors for automobiles. Accompanied by the rapid development of information processing technology, new fields of application, such as factory automation equipment and car electronics, are increasing and should continue to do so.

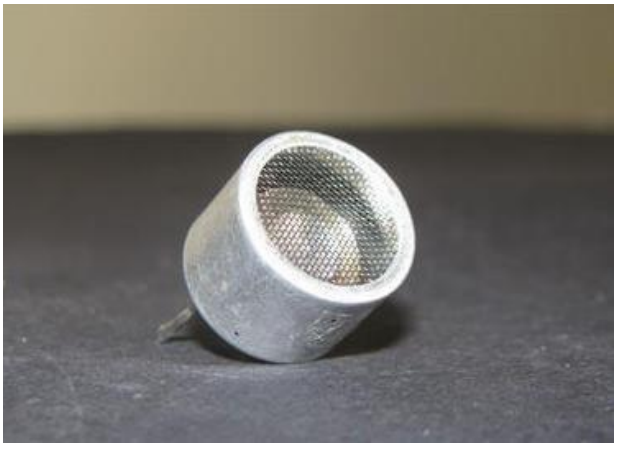


Fig.3.3: Ultrasonic Sensor

Ultrasonic waves are longitudinal mechanical waves which travel as a succession of compressions and rarefactions along the direction of wave propagation through the medium. Any sound wave above the human auditory range of 20,000 Hz is called ultrasound.

3.4.1 Features of Ultrasonic Sensor:

- Compact and light-weight
- High sensitivity and high sound pressure
- High reliability

3.4.2 Ultrasonic Distance Measurement:

Ultrasonic sensors are used for distance measuring applications. These gadgets regularly transmit a short burst of ultrasonic sound to a target, which reflects the sound back to the sensor. The system then measures the time for the echo to return to the sensor and computes the distance to the target using the speed of sound within the medium.

Fig.3.3.1: Ultrasonic Distance Sensor

The ultrasonic distance sensors measure distance using sonar; an ultrasonic (well above human hearing) beat is transmitted from the unit and distance-to-target is determined by measuring the time required for the echo return. Output from the ultrasonic sensor is a variable-width beat that compares to the distance to the target.

3.4.3 Construction and working:

There are two main parts in the sensor via. transmitter and receiver.

• The transmitter part converts electrical energy into sound and transmits it. The receiver part receives the echo and turn this received sound waves into electrical energy. This returned echo is measured and used for distance calculation by the ultrasonic sensor. Basically, this sensor calculates time interval between signal transmission and reception of echo and determines the distance of the object from the sensor. As this sensor is used for distance measurement it is known as distance sensor.

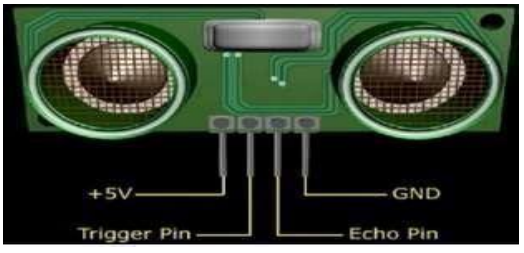


Fig3.3.2: Ultrasonic Sensor Construction

The figure-2 depicts pin diagram of ultrasonic sensor or distance sensor. As shown, there are four pins viz. +5V (VCC pin), GND, Trigger pin and Echo pin.

3.4.4 Specifications:

Following are the typical specifications of an ultrasonic sensor.

• Nominal Frequency output: 40KHz

• Coverage range: 0.2 to 6 meters

• Receiver sensitivity: -67 dB (minimum)

• Sound pressure level: 112 dB (minimum)

• Maximum voltage input: 20 V(rms)

3.4.5 Ultrasonic Obstacle Detection:

Ultrasonic sensors are used to detect the presence of targets and to measure the distance to targets in many robotized processing plants and process plants. Sensors with an ON or OFF digital output are available for detecting the presence of objects and sensors with an analogy output which changes relatively to the sensor to target separation distance are commercially available.

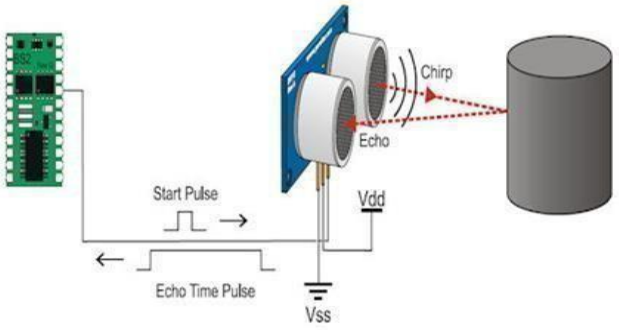


Fig3.3.3: Ultrasonic Obstacle Detection

Ultrasonic obstacle sensor consists of a set of ultrasonic receiver and transmitter which operate at the same frequency. The point when the something moves in the zone secured the circuit's fine offset is aggravated and the buzzer/alarm is triggered.

Fig 3.3.4: ***Ultrasonic Obstacle Sensor***

3.4.6 Features:

- Pulse in/out communication
- Power consumption 0f 20mA
- Narrow acceptance angle
- Provides exact, non-contact separation estimations within 2cm to 3m

3.4.7 Specifications:

- Power supply: 5V DC
- Quiescent current: <15mA
- Effectual angle: <15°
- Ranging distance: 2cm – 350 cm
- Resolution: 0.3 cm
- Output cycle: 50ms

3.5 METAL DETECTOR

A metal detects which detects the presence of metal nearby. Metal detectors are useful for finding metal inclusions hidden within objects, or metal objects buried underground. They often consist of a handheld unit with a sensor probe which can be swept over the ground or other objects. If the sensor comes near a piece of metal this is indicated by a changing tone in earphones, or a needle moving on an indicator

The simplest form of a metal detector consists of producing that passes through a coil producing an alternating current. If a piece of electrically conductive metal is close to the coil,

will be induced in the metal, and this produces a magnetic field of its own. If another coil is used to measure the magnetic field (acting as a magnetometer), the change in the magnetic field due to the metallic object can be detected.

Fig3.4: Metal Detector

3.5.4 *Metal Detector Circuit Diagram:*

The metal detector circuit built with an LC circuit, buzzer and simple proximity sensor. In LC circuit, capacitor and inductor are connected in parallel. When the circuit detects any metal near to it, then the circuit activates the proximity sensor and its glow the LED and makes a buzzer.

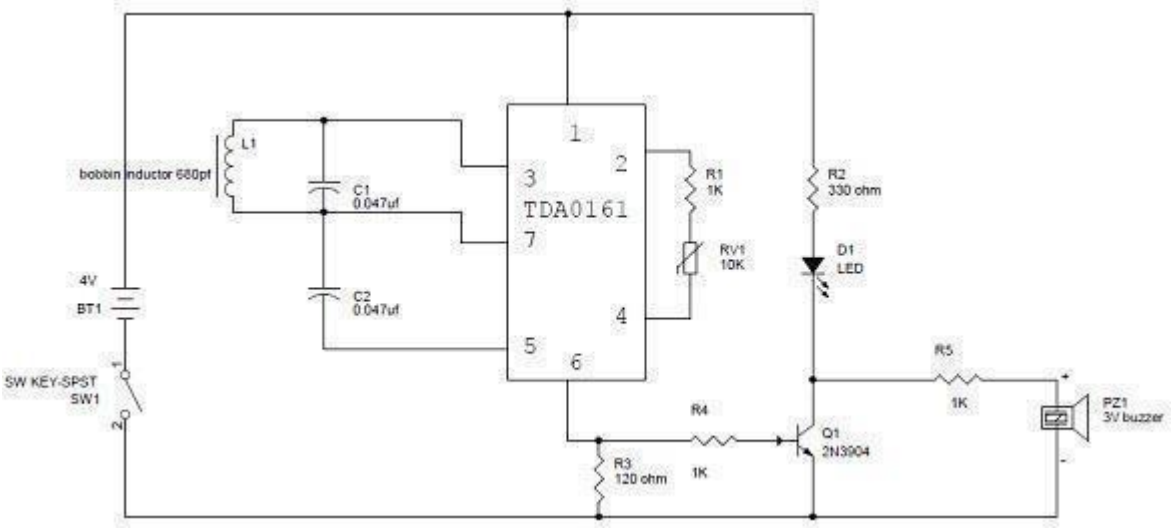


Fig3.4.1: Metal detector circuit

The value of the sensor can be changed by using a variable resistor that is equal to the LC circuit. When the metal is detected, the circuit will have new signal and respond accordingly. When the metal object is sensed by the coil, the sensor's o/p will be of 1mA. When the coil is close to the target, then the o/p of the sensor will be around 10mA.

3.5.5 A Metal Detector Circuit using IC 555:

This circuit uses an IC 555, which is used to detect the magnets and metals. When the magnet is near to the 10mH choke, then the output frequency varies. This circuit can be powered from a power supply, which can give an o/p DC voltage between 6-12 volts. When a metal object is near to the L1 coil, then it generates a change of output oscillation frequency and buzzer sound.

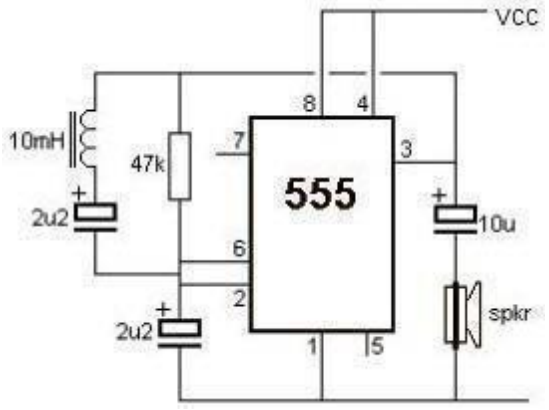


Fig3.4.2: Metal Detector Circuit using 555 IC

3.6 BUZZER

3.6.4 Electromechanical:

The electric buzzer was invented in 1831 by Joseph Henry. They were mainly used in early doorbells until they were phased out in the early 1930s in Favor of musical chimes, which had a softer tone.

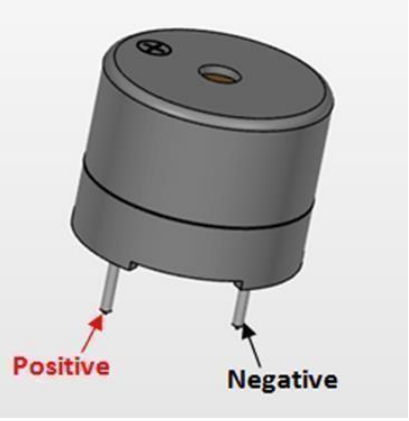


Fig3.5: Electric Buzzer

3.6.5 Piezoelectric:

Piezoelectric buzzers, or piezo buzzers, as they are sometimes called, were invented by Japanese manufacturers and fitted into a wide array of products during the 1970s to 1980s. This advancement mainly came about because of cooperative efforts by Japanese manufacturing companies.

3.6.6 Electromechanical:

Early devices were based on an electromechanical system identical to an electric bell without the metal gong. Similarly, a relay may be connected to interrupt its own actuating current, causing the contacts to buzz. Often these units were anchored to a wall or ceiling to use it as a sounding board. The word "buzzer" comes from the rasping noise that electromechanical buzzers made.

3.6.7 Mechanical

A joy buzzer is an example of a purely mechanical buzzer and they require drivers. Other examples of them are doorbells.

3.7 L293D MOTOR DRIVER IC

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC. The L293D is designed to provide bi directional drive currents of up to 1A at voltages from 4.4 to 36 V. The L293D is designed to provide bi directional drive currents of up to 600-m A at voltages from 4.5V to 36V.

3.7.4 Features:

- Wide Supply-Voltage Range: 4.5 V to 36 V
- Separate Input-Logic Supply
- Internal ESD Protection
- High-Noise-Immunity Inputs
- Output Current 1 A Per Channel (600 mA for L293D)
- Peak Output Current 2 A Per Channel (1.2 A for L293D)

3.7.5 Applications:

- Stepper Motor Drivers
- DC Motor Drivers
- Latching Relay Drivers

3.7.6 L293D Pin Diagram:

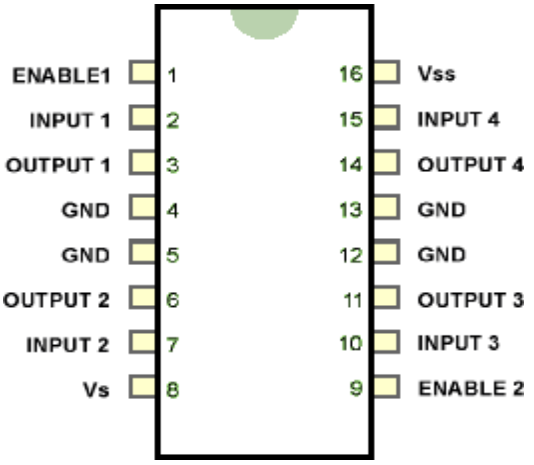


Fig3.6: L293D Pin Diagram

There are 4 input pins for l293d, pin 2, 7 on the left and pin 15, 10 on the right as shown on the pin diagram. Left input pins will regulate the rotation of motor connected across left side and right input for motor on the right-hand side. The motors are rotated on the basis of the inputs provided across the input pins as LOGIC 0 or LOGIC 1. In simple you need to provide Logic 0 or 1 across the input pins for rotating the motor.

3.7.6 L293D Logic Table:

Let's consider a Motor connected on left side output pins (pin 3, 6). For rotating the motor in clockwise direction, the input pins have to be provided with Logic 1 and Logic 0.

3.7.6.1 **Pin 2 = Logic 1** and **Pin 7 = Logic 0** | Clockwise Direction
3.7.6.2 **Pin 2 = Logic 0** and **Pin 7 = Logic 1** | Anticlockwise Direction
3.7.6.3 **Pin 2 = Logic 0** and **Pin 7 = Logic 0** | Idle [No rotation] [Hi-Impedance state]
3.7.6.4 **Pin 2 = Logic 1** and **Pin 7 = Logic 1** | Idle [No rotation]

In a very similar way, the motor can also operate across input pin 15, 10 for motor on the right-hand side.

3.8 LCD (Liquid Crystal Display)

A liquid crystal display or LCD draws its definition from its name itself. It is combination of two states of matter, the solid and the liquid. LCD uses a liquid crystal to produce a visible image. Liquid crystal displays are super-thin technology display screen that are generally used in laptop computer screen, TVs, cell phones and portable video games. LCD's technologies allow displays to be much thinner when compared to cathode ray tube (CRT) technology.

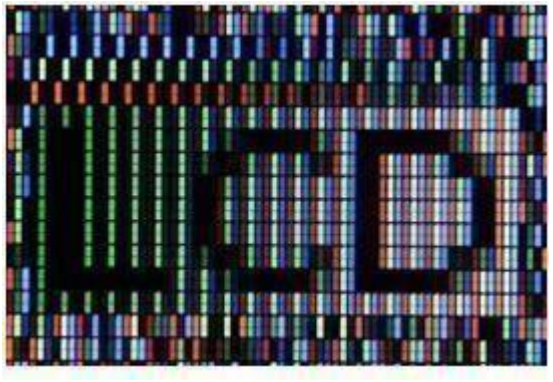


Fig3.7: Liquid Crystal Display

An LCD is either made up of an active matrix display grid or a passive display grid. Most of the Smartphone's with LCD display technology uses active-matrix display, but some of the older displays still make use of the passive display grid designs. LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. A **16x2 LCD** means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD.

3.8.1 LCD Pin Description:

Probably this very post should have come before the number of other posts related to 8051 LCD interfacing, but it's never too late. This post will describe you about the pins of LCD normally available in the market.

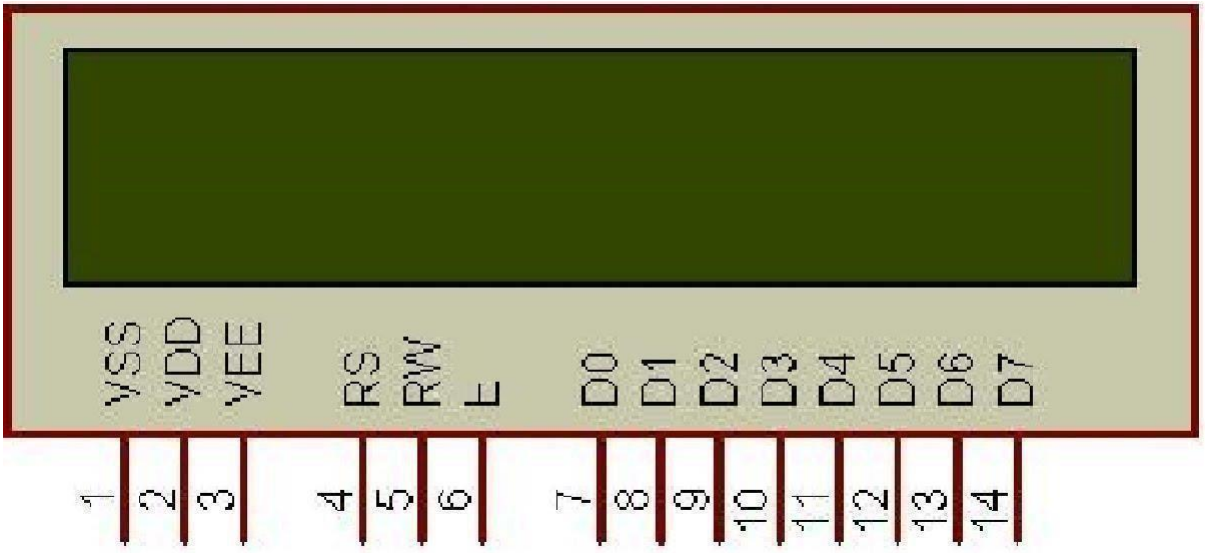


Fig3.7.1: Liquid Crystal Display Pin Descriptions

Table3.5: Liquid Crystal Display Pin Descriptions

Pin No	Function	Name
1	Ground (0V)	Ground
2	Supply voltage; 5V (4.7V – 5.3V)	VCC
3	Contrast adjustment; through a variable resistor	V_{EE}
4	Selects command register when low; and data register when high	Register Select
5	Low to write to the register; High to read from the register	Read/write
6	Sends data to data pins when a high to low pulse is given	Enable
7	8-bit data pins	DB0
8		DB1
9		DB2
10		DB3
11		DB4
12		DB5
13		DB6
14		DB7
15	Backlight V_{CC} (5V)	Led+
16	Backlight Ground (0V)	Led-

VSS, VDD and VEE:

Pin 1 (VSS) is a ground pin and it is certainly needed that this pin should be grounded for LCD to work properly. VEE and VDD are given +5 volts normally. However, VEE may have a potentiometer voltage divider network to get the contrast adjusted. But VDD is always at +5V.

RS, R/W and E:

These three pins are numbered 4, 5 and 6 as shown above. RS is used to make the selection between data and command register. For RS=0, command registers selected and for RS=1 data register is selected. R/W gives you the choice between writing and reading. If set (R/W=1) reading is enabled. R/W=0 when writing.

D0-D7:

The 8-bit data pins, D0-D7, are used to send information to the LCD or read the contents of LCD's internal register. "To display letters and numbers, we send ASCII code for the letters A-Z, a-z and numbers 0-9 while making RS=1. We also use RS=0 to check the busy flag bit to see if the LCD is ready to receive information.

The busy flag is D-7 and can be read when R/W=1 and RS=0, as follows: if R/W=1, RS=0. When D7=1 (busy flag=1), the LCD is busy taking care of internal operations and will not accept any new information. When D7=0, the LCD is ready to receive new information. It is recommended to check the busy flag before writing any data to LCD".

3.8.4 Applications:

- Liquid crystal thermometer
- Optical imaging
- The liquid crystal display technique is also applicable in visualization of the radio frequency waves in the waveguide
- Used in the medical application

3.9 12C MODULE

The two wires, or lines are called Serial Clock (or SCL) and Serial Data (or SDA). The SCL line is the clock signal which synchronize the data transfer between the devices on the I2C bus and it's generated by the master device. The other line is the SDA line which carries the data.

The two lines are "open-drain" which means that pull up resistors needs to be attached to them so that the lines are high because the devices on the I2C bus are active low. Commonly used values for the resistors are from 2K for higher speeds at about 400 kbps, to 10K for lower speed at about 100 kbps.

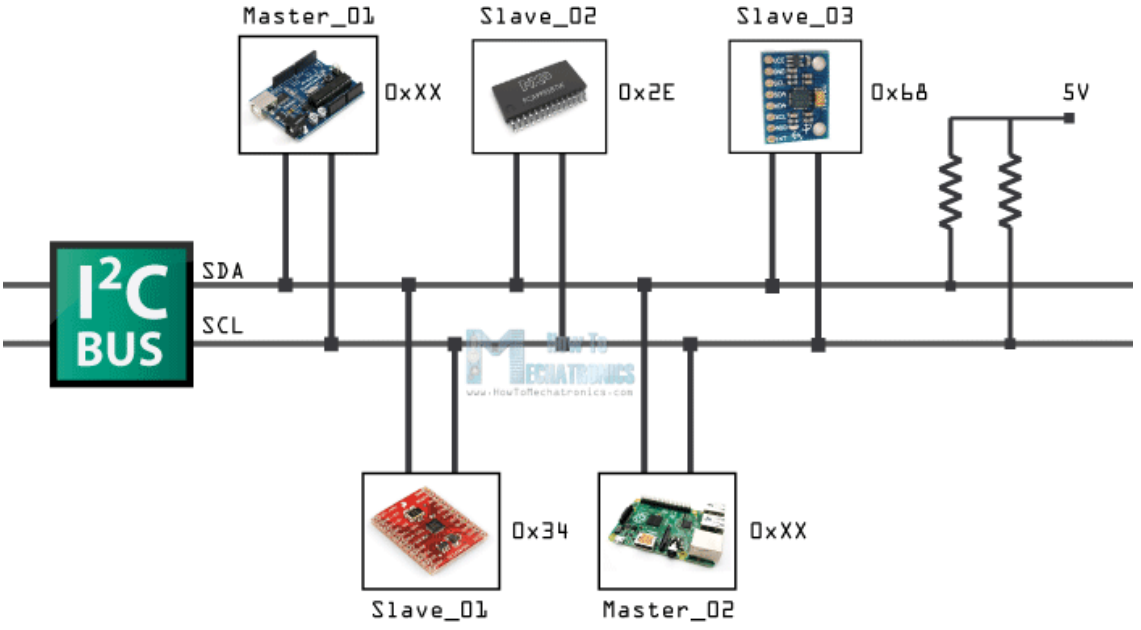


Fig 3.8 12C Module

3.10 POWER SUPPLY

Almost all basic household electronic circuits need an unregulated AC to be converted to constant DC, in order to operate the electronic device. All devices will have a certain power supply limit and the electronic circuits inside these devices must be able to supply a constant DC voltage within this limit. That is, all the active and passive electronic devices will have a certain DC operating point (Q-point or Quiescent point), and this point must be achieved by the source of DC power.

The DC power supply is practically converted to each and every stage in an electronic system. All low power system can be run with a battery. But, for long time operating devices, batteries could prove to be costly and complicated. The best method used is in the form of an unregulated power supply –a combination of a transformer, rectifier and a filter. The diagram is shown below.

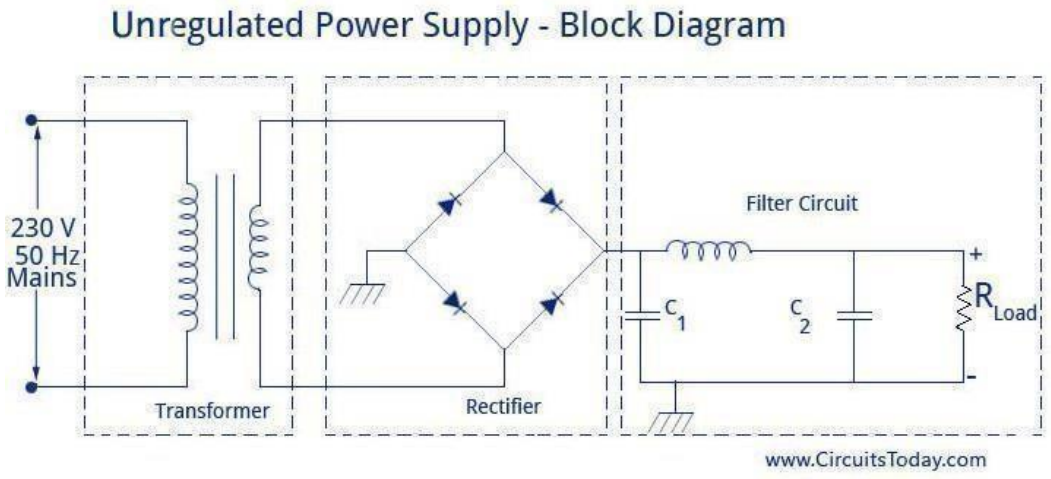


Fig3.9: Block Diagram of Power Supply

As shown in the figure above, a small step-down transformer is used to reduce the voltage level to the devices needs. In India, a 1 Ø supply is available at 230 volts. The output of the transformer is a pulsating sinusoidal AC voltage, which is converted to pulsating DC with the help of a rectifier. This output is given to a filter circuit which reduces the AC ripples, and passes the DC components. But here are certain disadvantages in using an unregulated power supply.

Poor Regulation:

When the load varies, the output does not appear constant. The output voltage changes by a great value due to the huge change in current drawn from the supply. This is mainly due to the high internal resistance of the power supply (>30 Ohms).

AC Supply Main Variations:

The maximum variations in AC supply mains are give or take 6% of its rated value. But this value may go higher in some countries (180-280 volts). When the value is higher it's DC voltage output will differ largely.

Temperature Variation:

The use of semiconductor devices in electronic devices may cause variation in temperature. These variations in dc output voltage may cause inaccurate or erratic operation or even malfunctioning of many electronic circuits. For instance, in oscillators the frequency will shift, in transmitters output will get distorted, and in amplifiers the operating point will shift causing bias instability.

3.10.4 Power Supply Characteristics:

The quality of the power supply is determined by various characteristics like load voltage, load current, voltage regulation, source regulation, output impedance, ripple rejection, and so on. Some of the characteristics are briefly explained below.

Load Regulation:

The load regulation or load effect is the change in regulated output voltage when the load current changes from minimum to maximum value.

Load regulation = Vino-load – V full-load

Vino-load – Load Voltage at no load

V full-load – Load voltage at full load.

From the above equation we can understand that when vino-load occurs the load resistance is infinite, that is, the out terminals are open circuited. V full-load occurs when the load resistance is of the minimum value where voltage regulation is lost.

% Load Regulation = [(Vino-load – v full-load)/Full-load] * 100

Minimum Load Resistance:

The value of I full-load, full load current should never increase than that mentioned in the data sheet of the power supply.

Source/Line Regulation:

In the block diagram, the input line voltage has a nominal value of 230 Volts but in practice, there are considerable variations in ac supply mains voltage. Since this ac supply mains voltage is the input to the ordinary power supply, the filtered output of the bridge rectifier is almost directly proportional to the ac mains voltage. The source regulation is defined as the change in regulated output voltage for a specified rage of line voltage.

Output Impedance:

A regulated power supply is a very stiff dc voltage source. This means that the output resistance is very small. Even though the external load resistance is varied, almost no change is seen in the load voltage. An ideal voltage source has an output impedance of zero.

3.10.5 Dc power supply:

An AC powered unregulated power supply usually uses a transformer to convert the voltage from the wall outlet (mains) to a different, nowadays usually lower, voltage. If it is used to produce DC, a rectifier is used to convert alternating voltage to a pulsating direct voltage, followed by a filter, comprising one or more capacitors, resistors, and sometimes inductors, to filter out (smooth) most of the pulsation. A small remaining unwanted alternating voltage component at mains or twice mains power frequency (depending upon whether half- or full-wave rectification is used)—ripple—is unavoidably superimposed on the direct output voltage.

3.11 WIRELESS CAMERA

We have introduced most advanced technology for V380 Indoor Security IP Camera, integrated with various features of HD 1080P 60fps, POE(Power Over Ethernet), P2P and Auto HD IR-CUT and so on, which bring you a very clear and vivid image and also offers a immersive illusion. Besides, with 360-degree globe panoramic IP Camera, viewing what is in range of the camera, you can also have a video surveillance in every corner of your house as well. Built-in microphone and speaker, there is no problem for talking with someone wherever the IP Camera is set up directly from your mobile device.

V380 Camera also will be provided with cloud service, all of you will not worry about the loss of video and you can record all playback what you want. Moreover, V380 IP camera is for surveillance and monitoring, truly achieves family's protection, it can be regard as a baby

monitor when you are on business, also can use for pets in the daily life, which you can enjoy the happiness even when you are abroad. Never lose such a household artefact.

Fig3.10: Wireless cameras

3.11.4 Features:

- Uses Wi-Fi network to transmit video without cables
- Provides HD, Full HD for clear footage
- Triggers recording or alerts when movement is detected
- Allows live streaming and playback via smartphone app

3.11.5 Applications:

- Military and Defense
- Environmental Monitoring
- Commercial
- Industrial Security
- Personal and Home Security
- Education and Research

CHAPTER-4

SOFTWARE TOOLS

4.1 Arduino IDE:

Adriano is an open-source electronics platform based on easy-to-use hardware and software. Adriano are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board.

Arduino was born at the Vireo Interaction Design Institute as an easy tool for fast prototyping, aimed at students without a background in electronics and programming. As soon as it reached a wider community, the Arduino board started changing to adapt to new needs and challenges, differentiating its offer from simple 8-bit boards to products for IOT applications, wearable, 3D printing, and embedded environments. All Arduino boards are completely open-source, empowering users to build them independently and eventually adapt them to their particular needs. The software, too, is open-source, and it is growing through the contributions of users worldwide.

4.1.1 Specifications:

- Flash Memory: 32 KB (ATmega328)
- SRAM: 2 KB (ATmega328)
- EEPROM: 1 KB (ATmega328)
- Clock Speed: 16 MHz

4.1.2 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 programmed 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.

Table4.1: Arduino boards based on ATMEGA328 microcontroller

Board Name	Operating Volt	Clock Speed	Digital i/o	Analog Inputs	PWM	UART	Programming Interface
Arduino Uno R3	5V	16MHz	14	6	6	1	USB via ATMega16U2
Arduino Uno R3 SMD	5V	16MHz	14	6	6	1	USB via ATMega16U2
Red Board	5V	16MHz	14	6	6	1	USB via FTDI
Arduino Pro 3.3v/8 MHz	3.3V 8	8 MHz	14	6	6	1	FTDI Compatible Header
Arduino Pro 5V/16MHz	5V	16MHz	14	6	6	1	FTDI Compatible Header
Arduino mini-05	5V	16MHz	14	8	6	1	FTDI Compatible Header

Arduino Pro mini-3.3v/8mhz	3.3V	8MHz	14	8	6	1	FTDI Compatible Header
Arduino Pro mini 5v/16mhz	5V	16MHz	14	8	6	1	FTDI Compatible Header
Arduino Ethernet	5V	16MHz	14	6	6	1	FTDI Compatible Header
Arduino Fio	3.3V	8MHz	14	8	6	1	FTDI Compatible Header
Lily Pad Arduino 328 main board	3.3V	8MHz	14	6	6	1	FTDI Compatible Header
Lily Pa Arduino simply board	3.3V	8MHz	9	4	5	0	FTDI Compatible Header

4.1.3 Arduino board Description:

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.

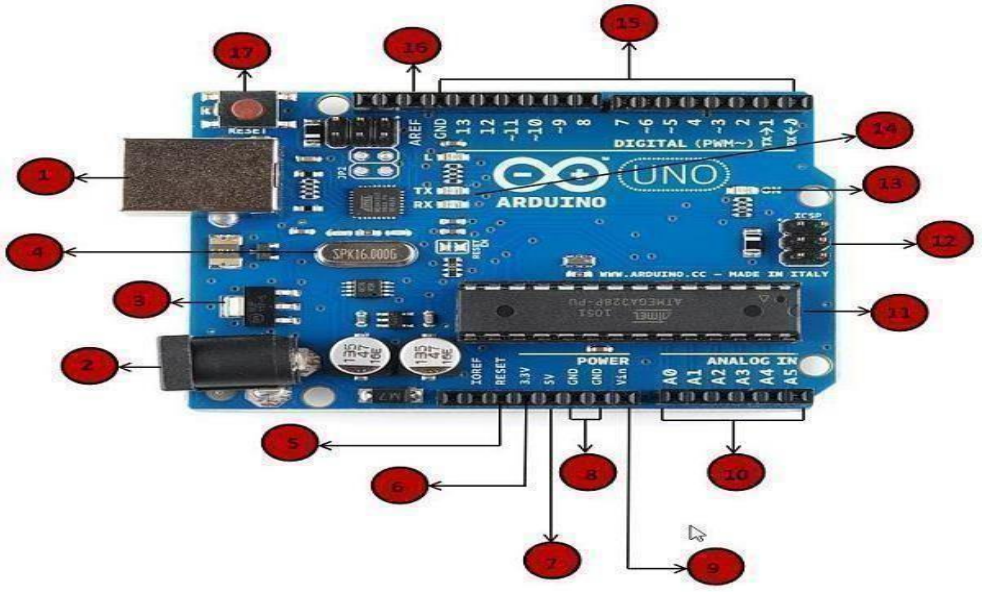


Fig4.1: Arduino Board Description

1. Power USB:

Arduino board can be powered by using the USB cable from your computer. All you need to do is connect the USB cable to the USB connection.

2. Power (Barrel Jack):

Arduino boards can be powered directly from the AC mains power supply by connecting it to the Barrel Jack.

3. Voltage Regulator:

The function of the voltage regulator is to control the voltage given to the Arduino board and stabilize the DC voltages used by the processor and other elements.

4. Crystal Oscillator:

The crystal oscillator helps Arduino in dealing with time issues. How does Arduino calculate time? The answer is, by using the crystal oscillator. The number printed on top of the Arduino crystal is 16.000H9H. It tells us that the frequency is 16,000,000 Hertz or 16 MHZ.

5, 17. Arduino Reset:

You can reset your Arduino board, i.e., start your program from the beginning. You can reset the UNO board in two ways. First, by using the reset button (17) on the board. Second, you can connect an external reset button to the Arduino pin labelled RESET (5).

6, 7, 8, 9. Pins (3.3, 5, GND, Vin):

- 3.3V (6): Supply 3.3 output volt
- 5V (7): Supply 5 output volt
- Most of the components used with Arduino board works fine with 3.3 volt and 5 volt.
- GND (8) (Ground): There are several GND pins on the Arduino, any of which can be used to ground your circuit.
- Vin (9): This pin also can be used to power the Arduino board from an external power source, like AC mains power supply.

10. ***Analog pins:***

The Arduino UNO board has five analogy input pins A0 through A5. These pins can read the signal from an analogy sensor like the humidity sensor or temperature sensor and convert it into a digital value that can be read by the microprocessor.

11. ***Main microcontroller:***

Each Arduino board has its own microcontroller (11). You can assume it as the brain of your board. The main IC (integrated circuit) on the Arduino is slightly different from board to board. The microcontrollers are usually of the ATMEL Company. You must know what IC your board has before loading up a new program from the Arduino IDE.

12. ***ICSP pin*****:**

Mostly, ICSP (12) is an AVR, a tiny programming header for the Arduino consisting of MOSI, MISO, SCK, RESET, VCC, and GND. It is often referred to as an SPI (Serial Peripheral Interface), which could be considered as an "expansion" of the output. Actually, you are slaving the output device to the master of the SPI bus.

13. Power LED indicator:

This LED should light up when you plug your Arduino into a power source to indicate that your board is powered up correctly. If this light does not turn on, then there is something wrong with the connection.

14. TX and RX LEDs:

On your board, you will find two labels: TX (transmit) and RX (receive). They appear in two places on the Arduino UNO board. First, at the digital pins 0 and 1, to indicate the pins responsible for serial communication. Second, the TX and RX led (13). The TX led flashes with different speed while sending the serial data. The speed of flashing depends on the baud rate used by the board. RX flashes during the receiving process.

15. Digital I / O:

The Arduino UNO board has 14 digital I/O pins (15) (of which 6 provide PWM (Pulse Width Modulation) output. These pins can be configured to work as input digital pins to read logic values (0 or 1) or as digital output pins to drive different modules like LEDs, relays, etc. The pins labelled "~" can be used to generate PWM.

16. AREF:

AREF stands for Analog Reference. It is sometimes, used to set an external reference voltage (between 0 and 5 Volts) as the upper limit for the analogy input pins.

4.2 Arduino Installation:

After learning about the main parts of the Arduino UNO board, we are ready to learn how to set up the Arduino IDE. Once we learn this, we will be ready to upload our program on the Arduino board. In this section, we will learn in easy steps, how to set up the Arduino IDE on our computer and prepare the board to receive the program via USB cable.

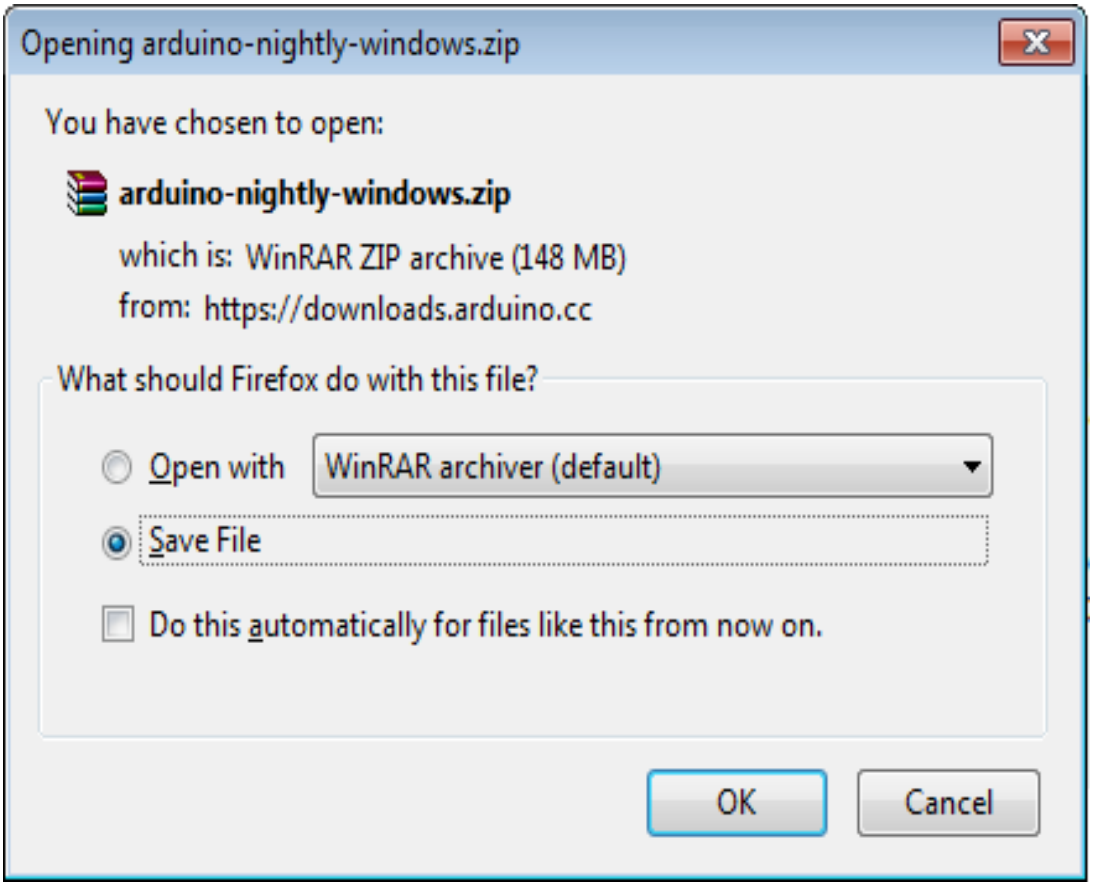
4.2.1 Step 1: Set up the Arduino IDE:

First you must have your Arduino board (you can choose your Favorite board) and a USB cable. In case you use Arduino UNO, Arduino Demilune, Neon, Arduino Mega 2560, or Decimals, you will need a standard USB cable (A plug to B plug), the kind you would connect to a USB printer as shown in the following image.

Fig4.2: USB cable

4.2.2 Step 2: Download Arduino IDE Software:

You can get different versions of Arduino IDE from the Download page on the Arduino Official website. You must select your software, which is compatible with your operating system (Windows, IOS, or Linux). After your file download is complete, unzip the file.

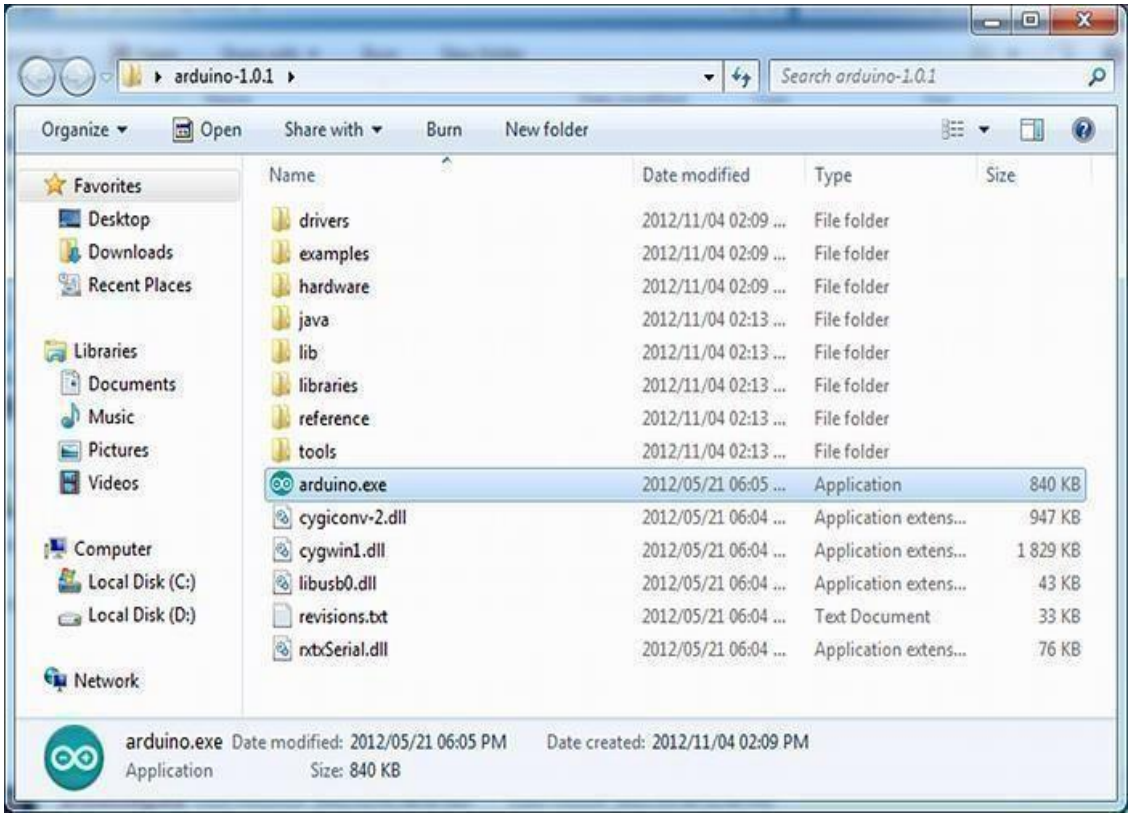


4.2.3 Step 3: Power up your board:

The Arduino Uno, Mega, Demilune and Arduino Nano automatically draw power from either, the USB connection to the computer or an external power supply. If you are using an Arduino Decimals, you have to make sure that the board is configured to draw power from the USB connection. The power source is selected with a jumper, a small piece of plastic that fits onto two of the three pins between the USB and power jacks. Check that it is on the two pins closest to the USB port. Connect the Arduino board to your computer using the USB cable. The green power LED (labelled PWR) should glow.

4.2.4 Step 4: Launch Arduino IDE:

After your Arduino IDE software is downloaded, you need to unzip the folder. Inside the folder, you can find the application icon with an infinity label (application.exe). Double-click the icon to start the IDE.

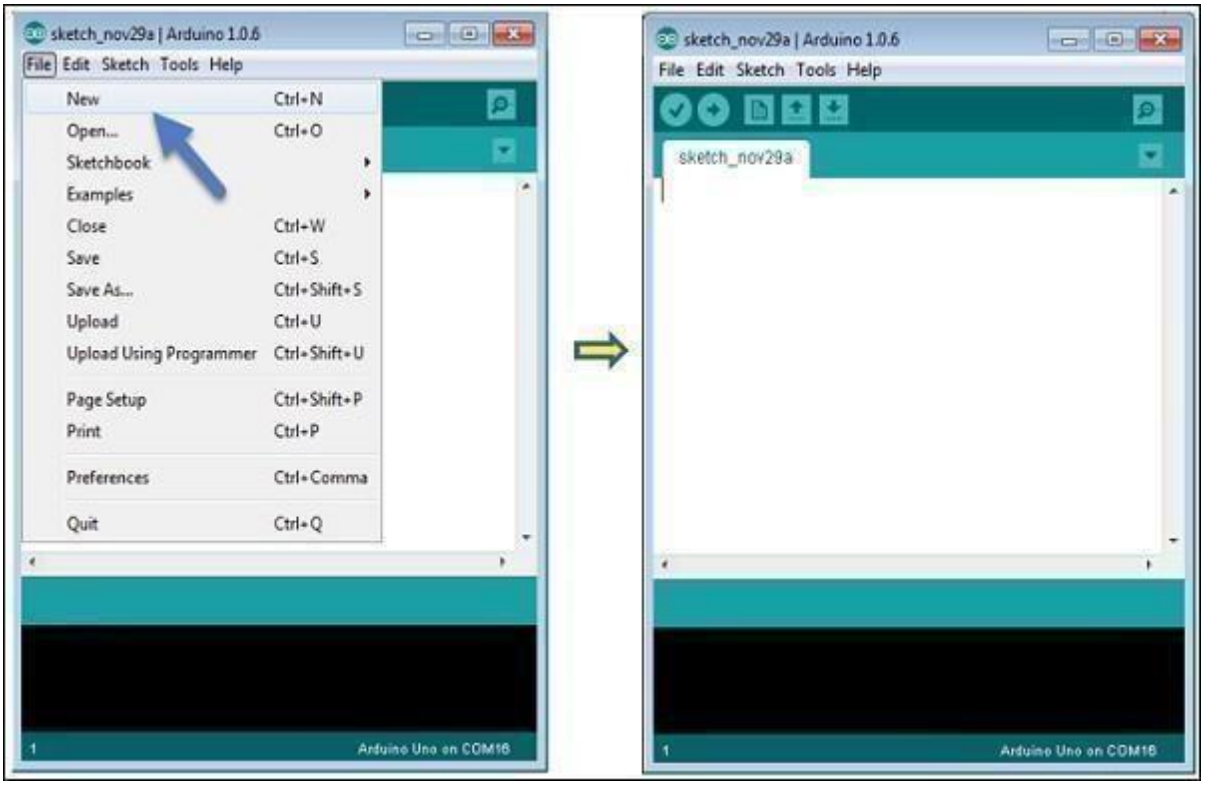


4.2.5 Step 5: Open your first project:

Once the software starts, you have two options:

- Create a new project.
- Open an existing project example.

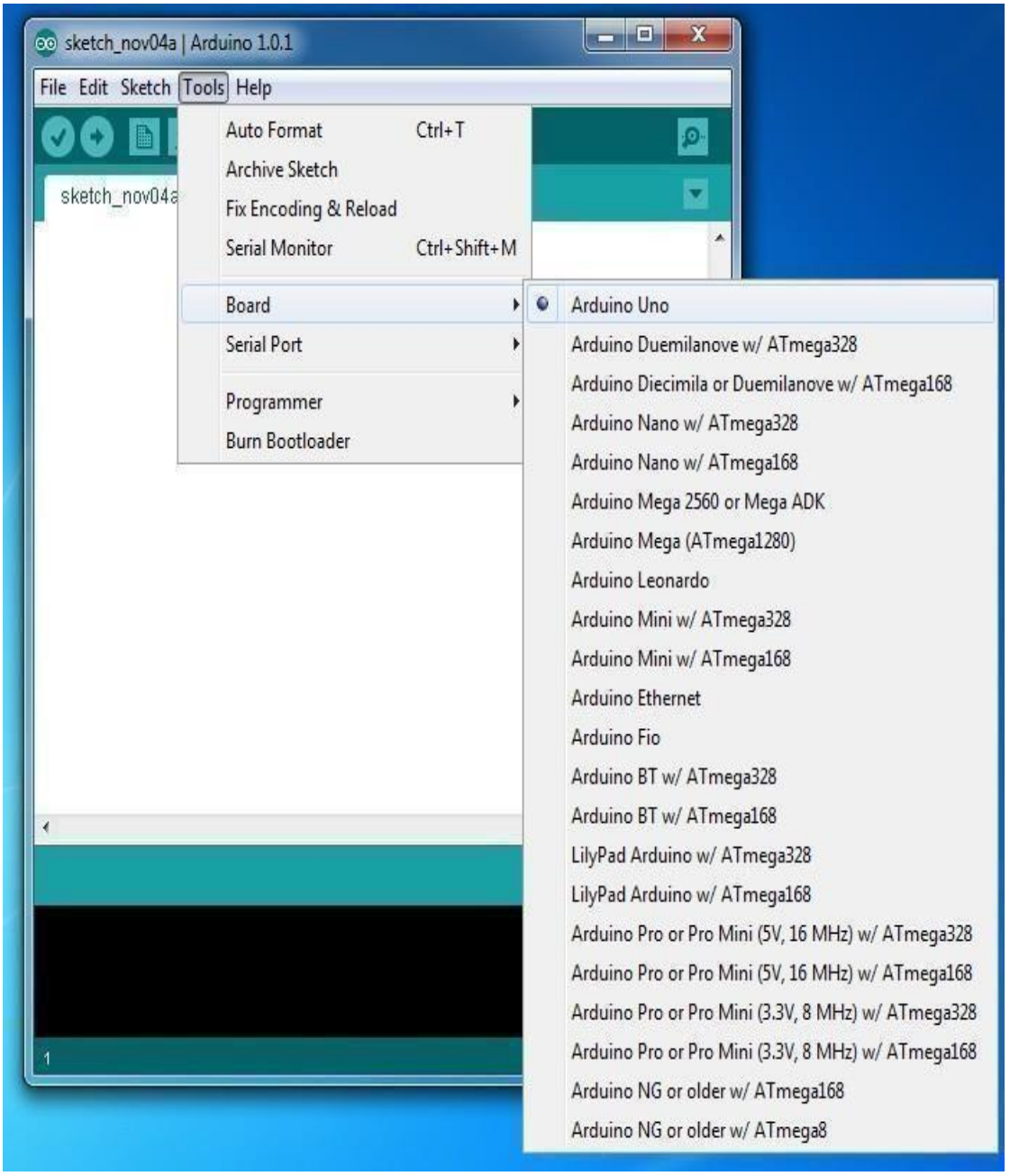
To create a new project, select File --> New.



To open an existing project example, select File -> Example -> Basics -> Blink.

4.2.6 Step 6: Select your Arduino board:

To avoid any error while uploading your program to the board, you must select the correct Arduino board name, which matches with the board connected to your computer. Go to Tools -> Board and select your board

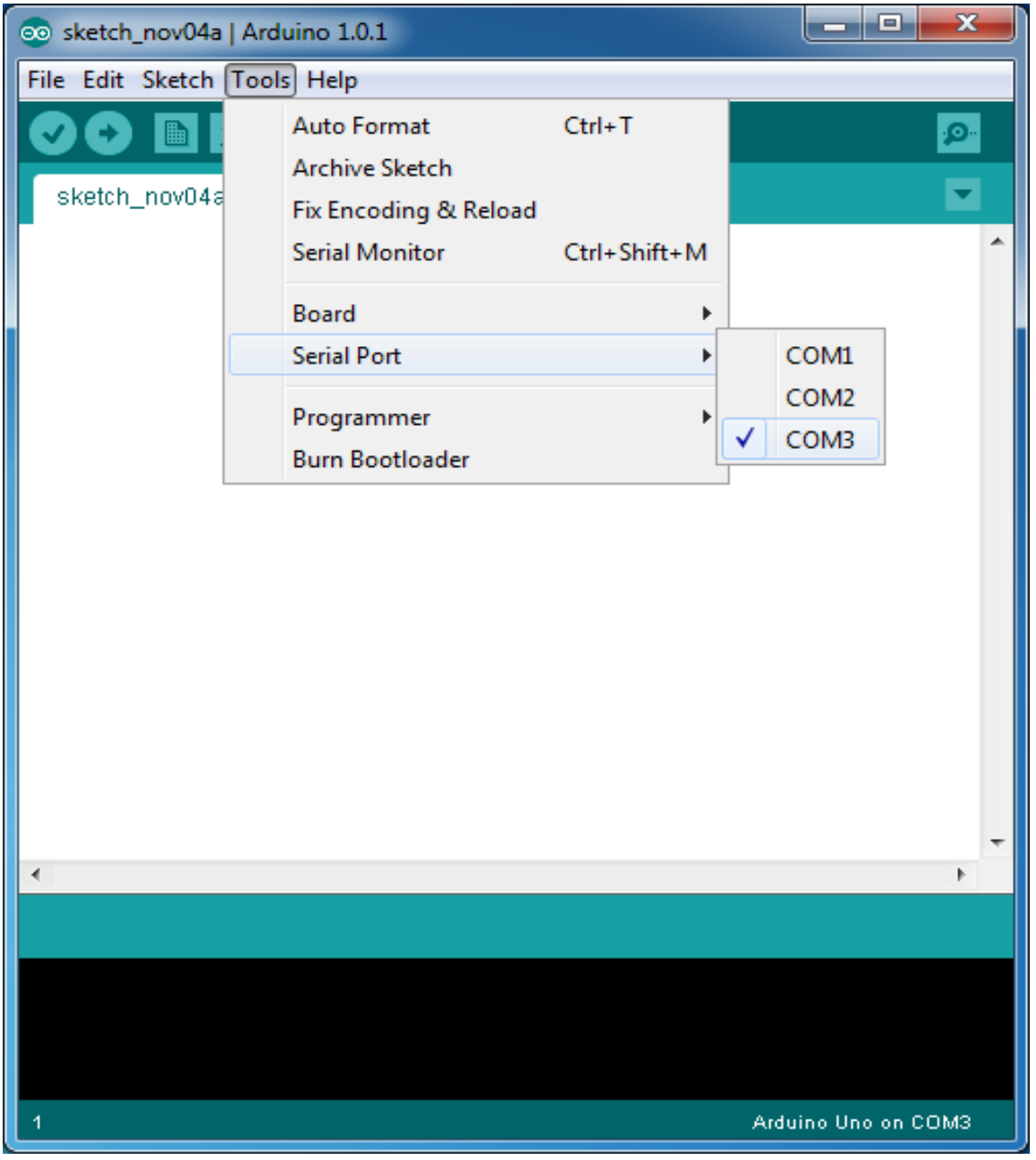


Here, we have selected Arduino Uno board according to our tutorial, but you must select the name matching the board that you are using.

4.2.7 Step 7: Select your serial port:

Select the serial device of the Arduino board. Go to Tools -> Serial Port menu. This is likely to be COM3 or higher (COM1 and COM2 are usually reserved for hardware serial ports).

To find out, you can disconnect your Arduino board and re-open the menu, the entry that disappears should be of the Arduino board. Reconnect the board and select that serial port.



4.2.8 Step 8: Upload the program to your board:

Before explaining how we can upload our program to the board, we must demonstrate the function of each symbol appearing in the Arduino IDE toolbar.

Now, simply click the "Upload" button in the environment. Wait a few seconds; you will see the RX and TX LEDs on the board, flashing. If the upload is successful, the message "Done uploading" will appear in the status bar.

Note: If you have an Arduino Mini, NG, or other board, you need to press the reset button physically on the board, immediately before clicking the upload button on the Arduino Software.

4.3 BLYNK:

Blynk was designed for the Internet of Things. It can control hardware remotely, it can display sensor data, it can store data, visualize it and do many other cool things. Blynk is a platform with IOT and Android apps to control Arduino, Raspberry Pi and the likes over the Internet. It's a digital dashboard where you can build a graphic interface for your project by simply dragging and dropping widgets. It's really simple to set everything up and you'll start tinkering

in less than 5mins. Blynk is not tied to some specific board or shield. Instead, it's supporting hardware of your choice. Whether your Arduino or Raspberry Pi is linked to the Internet over Wi-Fi, Ethernet or this new ESP8266 chip, Blynk will get you online and ready for the Internet of Your Things.

Fig4.3: Blynk app Overview

4.3.1 components:

There are three major components in the platform:

- Blynk App - allows to you create amazing interfaces for your projects using various widgets we provide.
- Blynk Server - responsible for all the communications between the Smartphone and hardware. You can use our Blynk Cloud or run your private Blynk server locally. It’s open-source, could easily handle thousands of devices and can even be launched on a Raspberry Pi.
- Blynk Libraries - for all the popular hardware platforms - enable communication with the server and process all the incoming and out coming commands.

Now imagine: every time you press a Button in the Blynk app, the message travels to the Blynk Cloud, where it magically finds its way to your hardware. It works the same in the opposite direction and everything happens in a blink of an eye.

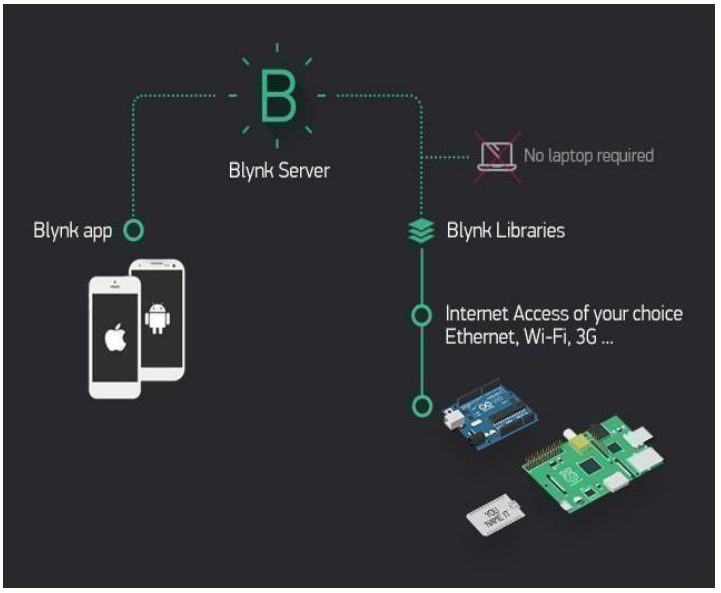


Fig4.3.1: Blynk app platform

4.3.2 Features:

- Similar API & UI for all supported hardware & devices
- Connection to the cloud using:
  - Bluetooth and BLE
  - Ethernet
  - USB (Serial)
  - GSM
  - Set of easy-to-use Widgets
  - Direct pin manipulation with no code writing
  - Easy to integrate and add new functionality using virtual pins
- History data monitoring via History Graph widget
- Device-to-Device communication using Bridge Wedge

4.3.3 Characteristics of Blynk:

Similar API & UI for all supported hardware & devices Connection to the cloud can be done using Ethernet, Wi-Fi, Bluetooth, BLE and USB (Serial) Set of easy-to-use Widgets Direct pin manipulation with no code writing Easy to integrate and add new functionality using virtual pins History data monitoring via History Graph widget Device-to-Device communication using Bridge Widget Sending emails, tweets, push notifications, etc.

4.3.4 Advantages:

- Perform more amount of work
- Very low human efforts
- Time saving
- No need to pay high amount
- We can easily monitor and control the robot

4.3.5 Disadvantages:

- Initial cost is high
- Need skilled person to operate

4.3.6 Applications:

- Used in agriculture lands
- Surveillance purpose
- Advanced Robotics in agriculture

CHAPTER-5

RESULT AND DISCUSSION

The development and testing of the multi-functional robot for defense have demonstrated. Its effectiveness in various military applications. The project successfully integrated various functionalities such as surveillance, target detection, bomb disposal. The robot was stested in multi environments, proving its efficiency in real-time detection. Its ability to operate for remotely in hazardous conditions such as disaster-struck areas, ensures enhanced safety for defense.

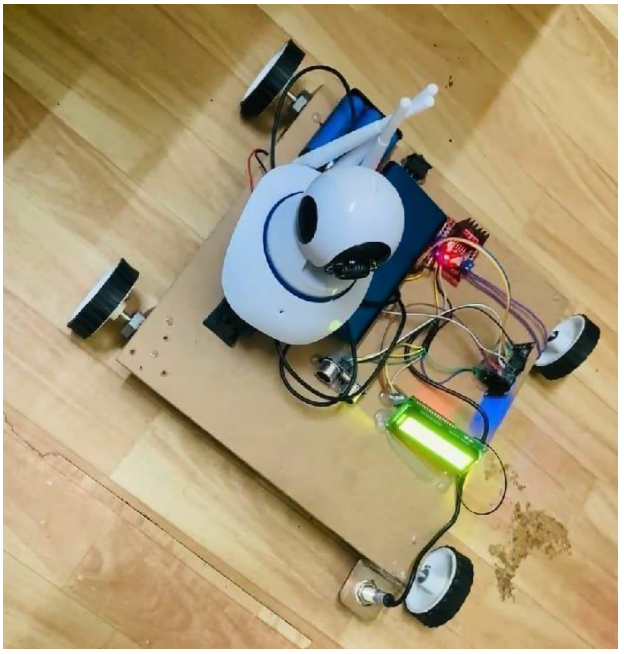


Fig5.1: Output Result

The result indicates that the multi-functional robot for defense is a reliable and effective for contributing to national security by minimizing risks to human soldiers and improving operational efficiency. This is specially designed robotic system to save human life and protect the country from enemies.

CHAPTER-6

CONCLUSION AND REFERENCES

6.1 Conclusion

This defense robot successfully integrates multiple technologies to enhance security operations. Equipped with a camera, metal detector, ultrasonic sensor and an alarm system, it can detect obstacles, identify metal objects and monitor surroundings in real-time. node MCU for wireless control, lcd display for status updates and motorized mobility allows for remote operation, making it an effective tool for surveillance and security applications. This robot can operate remotely reducing the risk to human personnel in hazardous areas. Wireless communication systems such as those utilizing IOT technologies allow for remote control of these robot reducing the need for direct human involvement in dangerous situations. This is specially designed robotic system to save human life and protect the country from enemies.

6.2 References

[1]. Janelle, N. Bui, A. Castellan, L. Evangelista and M. Zorille, "Internet of Things for Smart Cities, "in IEEE Internet of Things Journal, vol. 1, no. 1, pp. 22-32, Feb. 2014.

[2]. the Internet of Things: Key Applications and Protocols Paperback – 25 Aug 2015 by David Bosworth, Omar Elemi Olivier Harsens (Author).

[3]. Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications (WSE) Paperback – 6 Oct 2015 by Daniel Mimili.

[4]. Getting Started with the Internet of Things Paperback – 17 May 2011 by Canoe Pfizer.

[5]. Raspberry pi Foundation, https://www.raspberrypi.org/

[6]. MQTTORG, http://mqtt.org/

[7]. Python software Foundation: https://pypi.python.org/pypi/paho-mqtt/1.1

[8]. Hive - Enterprise MQTT Broker, https://www.hivemq.com/