CENTRE FOR PROFESSIONAL AND ADVANCED STUDIES

SCHOOL OF TECHNOLOGY AND APPLIED SCIENCE

EDAPPALLY

PROJECT REPORT

FIRE FIGHTING ROBOT

Submitted in partial fulfillment of the requirement for the award of degree of

BACHELOR OF ELECTRONICS

Submitted by

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CERTIFICATE

This is to certify that is a bonafide record of the project work entitled

"FIRE FIGHTING ROBOT" done by **ARJUN A.U (Reg. No: 180021033120), JYOTHISH T.Y (Reg. No: 180021033126), MILAN WILLIAM (Reg. No: 180021033129), ANWAR SADATH V.A (180021033119)** in partial fulfillment of the requirement for the award of the degree of Bachelor of electronics of Mahatma Gandhi University.

Internal Guide Course-Coordinator

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ACKNOWLEDGEMENT

I would like to take this opportunity to express my sincere gratitude to all those who helped and encouraged me to make this project success. First' of all I' humbly give all the glory and honour of the almighty god for his love and protection throughout this project work.

I would like to express my deep sense of gratitude to **Dr BINDHU. K,** Principal, School of Technology and Applied Science, Edappally for providing necessary resource for the completion of this project.

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At the time of submitting this project report, I would like to use his opportunity to express heartfelt thanks **Mrs POOJA K.DAS,** for their valuable suggestion and guidance in the project.

DECLARATION

I hereby declare that project report entitled **"CNC LASER ENGRAVER"** is submitted in partial fulfillment of the degree of **Bachelor of Electronics** and it is a report of the original work done during the period of 2018 to 2021 in Mahatma Gandhi University, School of Technology and Applied sciences, Regional Centre Edappally.

Place: Edappaly

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Date: **JOYTHISH T.Y**

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ABSTRACT

Fire incident is a disaster that can potentially cause the loss of life, property damage and permanent disability to the affected victim. They can also suffer from prolonged psychological and trauma. Fire fighters are primarily tasked to handle fire incidents, but they are often exposed to higher risks when extinguishing fire, especially in hazardous environments such as in nuclear power plant, petroleum refineries and gas tanks. They are also faced with other difficulties, particularly if fire occurs in narrow and restricted places, as it is necessary to explore the ruins of buildings and obstacles to extinguish the fire and save the victim. With high barriers and risks in fire extinguishment operations, technological innovations can be utilized to assist firefighting. Therefore, this paper presents the development of a firefighting robot dubbed QRob that can extinguish fire without the need for fire fighters to be exposed to unnecessary danger. QRob is designed to be compact in size than other conventional fire-fighting robot in order to ease small location entry for deeper reach of extinguishing fire in narrow space.

QRob is also equipped with a flame sensor is attached for fire detection. This resulted in QRob demonstrating capabilities of identifying fire locations automatically and ability to extinguish fire remotely at particular distance. QRob is programmed to find the fire location and stop at safe distance from the fire.

Contents

CHAPTER 1

INTRODUCTION

A robot is an automated device which performs functions usually attributed to humans or machines tasked with repetitive or flexible set of actions. Numerous studies have shown that robot can be beneficial in medicine, rehabilitation, rescue operation and industry. Over the years, robotics has been introduced in various industries. The industrial robots are multi-function manipulators designed for more specialized materials, divisions, gadgets or devices through various programmatic movements to perform various tasks. In line with the Fourth Industrial Revolution (4IR), there is demand for a one system that can control, communicate and integrate different robots regardless of their types and specifications. Machine learning has also heated up interest in robotics, although only a portion of recent development in robotics can be associated with machine learning. Recent robotic development project has embedded machine learning algorithms to increase the intelligence in robots. This will increase the productivity in industry while reducing the cost and electronic waste in a long run.

Studies on the use of humanoid robots are actively carried out to minimize firefighters' injuries and deaths as well as increasing productivity, safety, efficiency and quality of the task given. Robot can be divided into several groups such as Tele-robots, Telepresence robots, Mobile robots, Autonomous robots and Androids robots. Telepresence robot are similar to a tele-robot with the main difference of providing feedback from video, sound and other data. Hence, tele-presence robots are widely used in many fields requiring monitoring capability, such as in child nursery and education, and on improving older adult's social and daily activities. Mobile robot is designed to navigate and carry out tasks with the intervention of human beings. Meanwhile, autonomous robots can perform the task independently and receive the power from the environment, as opposed to android robots which are built to mimic humans.

In this paper, a firefighting robot is proposed. The main function of this robot is to become an unmanned support vehicle, developed to search and extinguish fire. There are several existing types of vehicles for firefighting at home and extinguish forest fires. Our proposed robot is designed to be able to work on its own or be controlled remotely. By using such robots, fire identification and rescue activities can be done with higher security without placing fire fighters at high risk and dangerous conditions. In other words, robots can reduce the need for fire fighters to get into dangerous situations. Additionally, having a compact size and automatic control also allows the robot to be used when fire occurs in small and narrow spaces with hazardous environments such as tunnels or nuclear power plants.

Thermite and FireRob are two current available fire fighter robots that have been used widely in industry. Thermite (produced by Howe and Howe Technologies Inc) is a firefighting robot that uses a remote control and can operate as far as 400 m. It can deliver up to 1200 gpm of water or 150 psi of foam. The size of this robot is 187.96 cm x 88.9 cm x 139.7 cm. This robot powers up to 25 bhp (18.64 kW) using a diesel engine. The main component in the design of this robot are multi-directional nozzle that is backed by a pump that can deliver 600 gpm (2271.25 l/min). This robot is designed for use in extreme danger areas, such as planes fires, processing factories, chemical plants or nuclear reactors.

FireRob (Manufactured by Croatian manufacturer DOK-ING) is a fire-fighting vehicle controlled by a single operator via remote control. It extinguishes fire without intervention of fire fighters with a high pressure on a hydraulic arm that pumps water up to 55 m away. It also can carry 1800 litre of water and 600 litre of foam in its two on board tanks. The coating on FireRob allows it to withstand critical temperature of 250ºC and thermal radiation of 23 kW/m for a period of 30 minutes.

In this study, a compact and small firefighter robot has been developed. This robot is named QRob, which is short form of Rescue Robot. This robot can search and extinguish fire. Furthermore, this robot can increase the productivity, safety, efficiency and quality of the task given. QRob is more compact and more flexible compared to Thermite and FireRob robot. Another advantage of QRob is in its ability to enter location with small entrance or narrow space.

HISTORY

Figure.1

A newly recruited firefighter in Los Angeles put out a major fire even before being formally introduced at a news conference. That new recruit is a robot.

The Thermite RS3, the first robotic firefighting vehicle in the United States, was scheduled to arrive at the news conference the morning of 2006 October 13, but it was diverted to a major emergency structure fire in the fashion district in Downtown Los Angeles earlier that day. "It was exciting to see this unique piece of apparatus put into action on its first day in service," said Los Angeles Fire Department Capt. Erik Scott.

"What we had was a large one-story commercial building, it was housing piles of textiles, multiple rolls of fabric," Scott described. The Thermite RS3 helped push piles of smoldering wet debris, creating a path for the firefighters to operate safely.

DISORIENTATION

One of the largest threats to firefighter safety is getting lost in a hostile environment. Firefighters typically do not know the layout of a building before they enter it, which can lead to confusion and disorientation. William R. Mora wrote an article in "Understanding and Solving Firefighter Disorientation" about a study he conducted between 1999 and 2001. Mora found that, in general, firefighters who become lost or disoriented in a fire tended to follow a disorientation sequence which led to fatalities or serious injuries. The sequence involves the following steps:

1. Fire in an enclosed structure with smoke showing

2. An aggressive interior attack1

3. Deteriorating conditions such as Prolonged Zero Visibility Conditions (PZVC), flashover, backdraft, or structural collapse

4. Handline3 separation

5. Disorientation

6. Serious Injury or Firefighter Fatality

Why Fire Fighting Robot

Firefighting is an important job but it is very dangerous occupation. Due to that, Robots are designed to find a fire, before it rages out of control. It could be used to work with fire fighters to reduce the risk of injury to victims. Due to its mobility it has the ability to traverse situations unsafe for people, minimizing casualties and rescue time. It can also be used in a multitude of situations including wildfires and structure fires.

PROBLEM STATEMENT

Fire environments are dangerous and constantly changing. Firefighters can become disoriented or lost when engaging in interior attacks on structural fires in compartmentalized buildings which can lead to risk of injury or death. Robots can be used to provide real-time data and a map of a building's complex, unpredictable layout. The goal of this project is to design and build a robot that will provide firefighters with additional information about a fire environment to help them make more informed decisions when fighting a fire.

Challenges in Firefighting

Firefighting is one of the most dangerous professions due to its unsafe and constantly changing environment. Firefighters may be required to operate under conditions with a high level of uncertainty and must make time-critical decisions using insufficient information. Despite thorough preparation, firefighters continue to face challenges while operating in structural fires. These challenges are the result of uncertainties of structural integrity, unpredictability of fatal events such as flashovers and backdrafts, and getting disoriented or lost when entering buildings with unknown layouts.

Flashover and Backdraft

Flashovers and backdrafts are two dangerous events that can occur during a fire. Both situations can occur without adequate warning, and this unpredictability poses a danger to the lives of firefighters.

A *flashover* is a rapid transition of fire from the *growth* stage into the *fully developed* stage in which the temperature rises exponentially as shown in Figure 2. It is the physical event in which the temperature of the room has reached a critical point (approximately 500 ^{O}C) causing objects in the room to dry out and emit flammable gases. When this occurs, everything in the room will instantaneously burst into flames causing a rapid increase of temperature. Flashovers are typically contained in one room. Currently, firefighters attempt to anticipate the occurrence of flashover by looking at the smoke above them. If the smoke is ignited, it means a flashover is about to occur and they need to evacuate the room immediately.

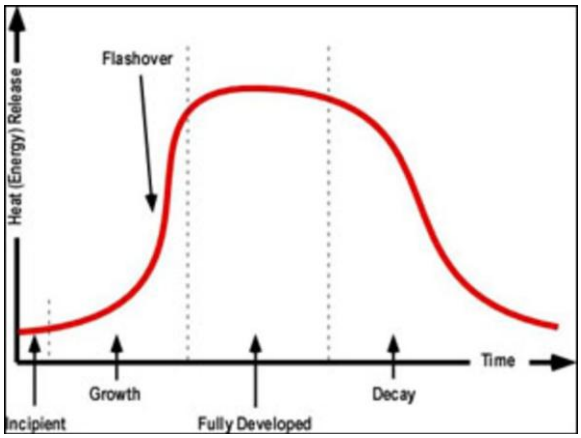
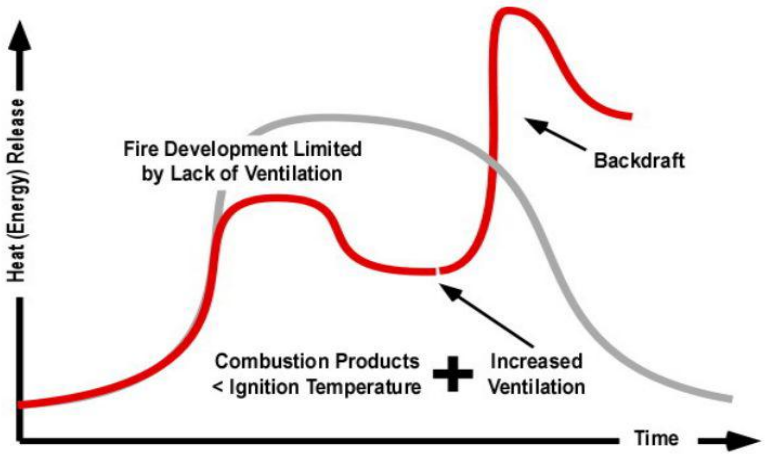


Figure 2. Stages of a fire in an enclosed structure

A *backdraft* is an explosion that occurs when a large quantity of additional oxygen is introduced to a smoldering flame with a temperature great enough to ignite the added oxygen. Additional oxygen can be introduced into the system by a crack in the structure's exterior, or by an opened window or door. A backdraft also involves the deflagration, or rapid combustion, of flammable products upon mixing with air. Backdrafts are more difficult to predict than flashovers because they happen quickly. Firefighters are trained to anticipate backdrafts by watching smoke patterns. If the smoke is being sucked into a room rather than flowing out, that means there is low pressure in the room and a backdraft may occur. Unlike a flashover, a backdraft can affect an entire floor of a building and even cause the building to collapse. Figure 3 shows the point at which backdrafts are likely to occur in relation to the heat release in the room



Occurrence of backdraft
Figure 3

CHAPTER 2

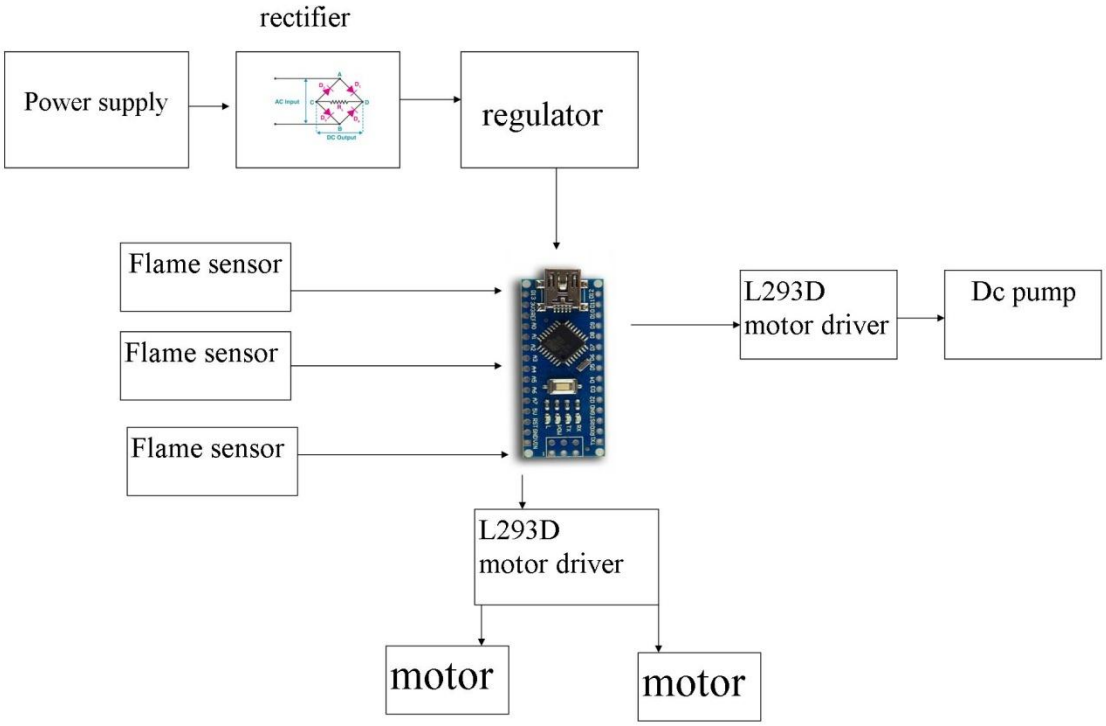


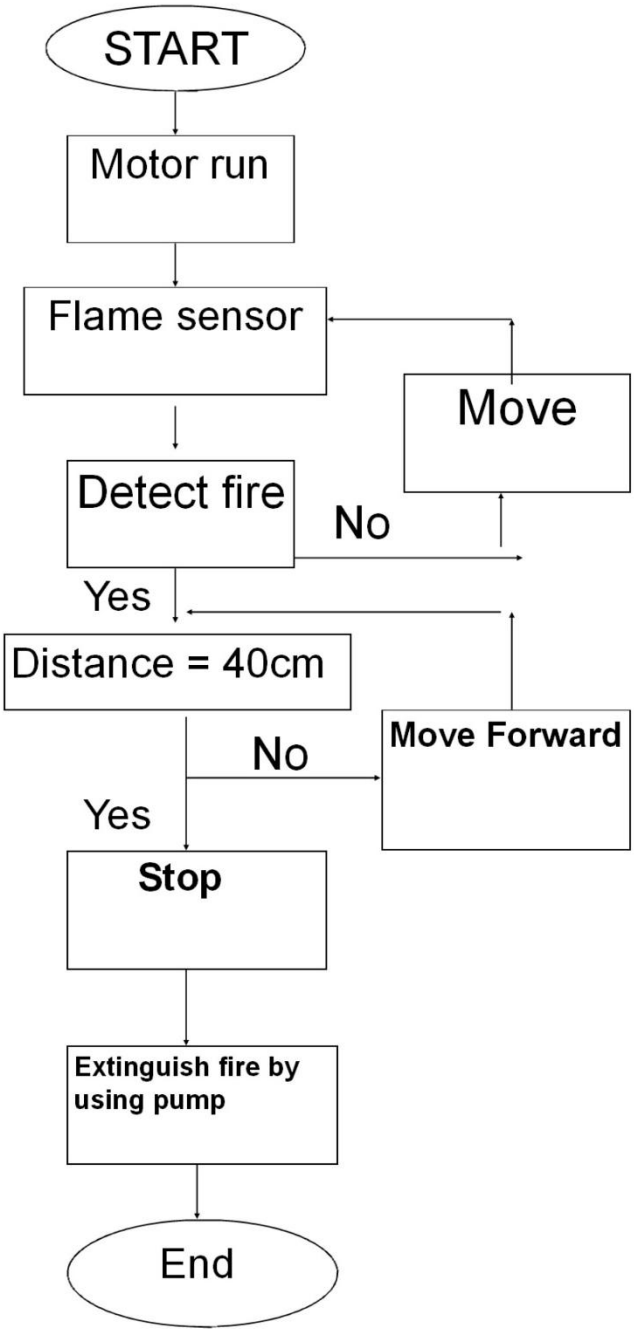
FIGURE 4. Block diagram

COMPONENTS

The main components used in the fire fire fighting robot

1. **Arduino Nano**
2. **1-Channel 5V Relay module**
3. **Power Supply**
4. **L293D Motor Driver**
5. **fire flame sensor**
6. **6V Mini Water Pump**
7. **Gear motor**
8. **Servo Motor**

FLOW CHART


START
Motor run
Flame sensor
Move
Detect fire
No
Yes
Distance = 40cm
Move Forward
No
Yes
Stop
Extinguish fire by using pump
End

CHAPTER 3

ARDUINO UNO

Product Review:

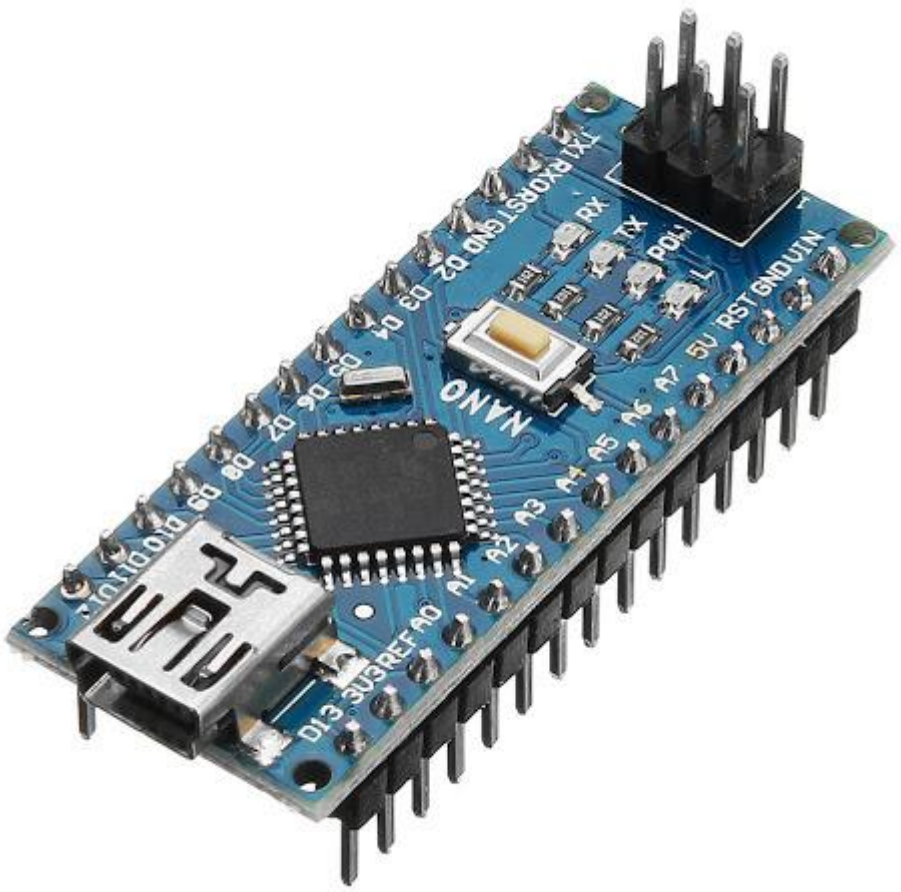


Figure 5. ARDUINO UNO

The Arduino Uno is a microcontroller board on the ATmega382. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs a 16 MHz ceramic resonator (CSTCE16M0V53-R0), 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 AC-to-DC adapter or battery to get started.

The Uno differs from all preceding boards in that it does not use the FTDI USB- to-serial driver chip. Instead, it features an ATmega16U2 programmed as a USB – to – serial converter.

This auxiliary micro controller has its own USB boot loader, which allows advanced users to reprogram it.

The Arduino has a large support community and an extensive set of support libraries and hardware add-o n "shields", making it a great introductory platform for embedded electronics.

This is the 3rd revision of the Uno (R 3), which has a number of changes:

- The USB controller chip changed from AT mega8U2 (8K flash) to AT mega1 6 U2 (1 6 K flash). This does not increase the flash or RAM available to sketches.
- Three new p ins were added, all of which are duplicates of previous p ins. The 12C pins (A4, A5) have been also been brought out on the side of the board near AREF. There is an IOR EF p in next to the reset p in, which is a duplicate of the 5V p in.
- The reset button is now next to the USB connector, making it more accessible when a shield is used.

Arduino consists of both a physical programmable circuit board and a piece of software, or IDE that runs on your computer, used to write and up lo ad computer code to the physical board.

Arduino uno microcontroller can sense the environment by receiving input from a variety of sensors and can affect its surroundings by controlling lights, motors, and other actuators. The micro controller is programmed using the Arduino programming language and the Arduino development environment.

Technical Specification:

Microcontroller	AT mega 328
Operating Voltage	5 V
Input Voltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	14
Analog Input Pins	6
DC Current per I/O Pin	40mA
DC Current for 3.3V	50mA
Flash Memory	32 KB of which 0.5KB used By boot loader
SRAM	2 KB
EEPROM	1 KB
Clock Speed	16 MHz

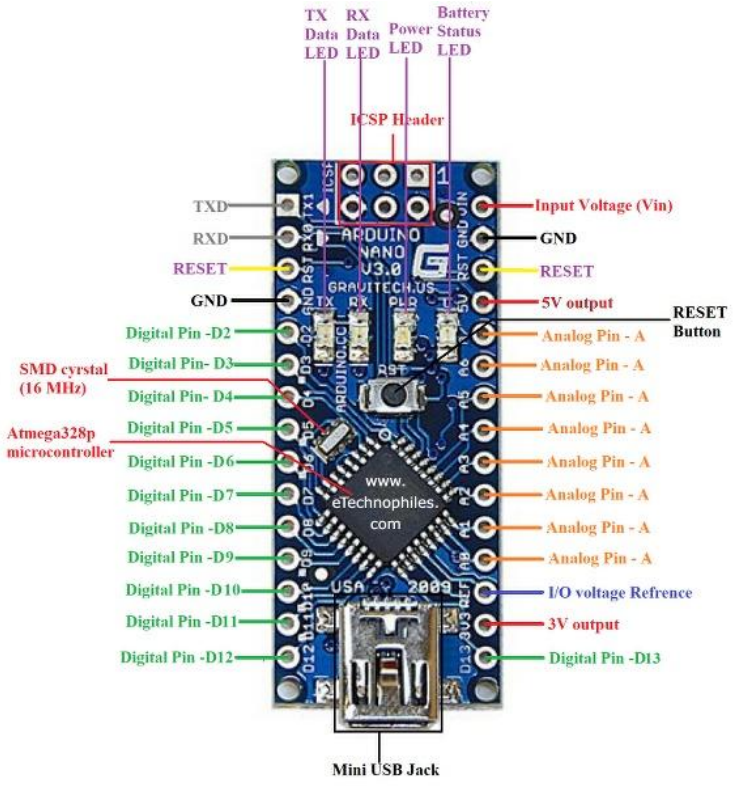


Figure6.ARDUINO PINOUT

Power:

The Arduino Uno 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 p lugging a 2.1 mm centre positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and V in p in headers of the POWER connector.

The board can operate on an external supply of 6 to 20 volts. If sup p lied with less than 7V, however, the 5V p in 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 1 2 volts.

The power pins are as follows:

- **VIN.** The input voltage to the Arduino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). Y o u can supply voltage thro ugh this pin, or, if supplying voltage via the power jack, access it through this pin.
- **5V.** This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (712V), the USB connector (5V), or the V IN pin of the board (7-12V). Supplying voltage via the 5V or 3.3V pins by passes the regulator, and can damage your board. We don't advise it.
- 3V 3. A 3.3-volt supply generated by the on-board regulator. Maximum current draw is 50 mA.
- GND. Ground pins.

Memory:

The Atmega328 has 32 KB of flash memory for storing code (of which 0.5 KB is used for the boot loader). It has also 2 KB of SRAM and 1 KB of EEPROM (which can be read and written with the EEPROM library).

Input and Output:

Each of the 14 digital pins on the UNO can be used as an input or output, using pinMode (), digitalWrite() and digitalRead (). They operate at 5 volts. Each pin can provide or receive maximum of 40 mA and has an internal pull-up resistor of 20-50 k22. In addition, some pins have specialized functions.

- **Serial Pins 0 (Rx) and 1 (Tx):** Rx and Tx pins are used to receive and transmit TTL serial data. They are connected with the corresponding ATmega328P USB to TTL serial chip.
- **External Interrupt Pins 2 and 3:** These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value.
- **PWM Pins 3, 5, 6, 9 and 11:** These pins provide an 8-bit PWM output by using analog Write() function.
- **SPI Pins 10 (SS), 11 (MOSI), 12 (MISO) and 13 (SCK):** These pins are used for SPI communication.
- **In-built LED Pin 13:** This pin is connected with a built-in LED, when pin 13 is HIGH - LED is on and when pin 13 is LOW, its off.

The UNO has 6 analog inputs, each of which provide 10 bits of resolution (i.e., 1024 different values). By default, they measure from ground to 5 volts, though it is possible to change the upper end of their range using the AREF pin and the analog Reference () function. Additionally, some pins have specialized functionality.

Communication:

Arduino can be used to communicate with a computer, another Arduino board or other microcontrollers. The ATmega328P microcontroller provides UART TTL (5V) serial communication which can be done using digital pin 0 (Rx) and digital pin 1 (Tx). An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The ATmega16U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, a .inf file is required. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. There are two RX and TX LEDs on the Arduino board which will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer. A Software Serial library allows for serial communication on any of the Uno's digital pins. The ATmega328P also supports 12C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify use of the I2C bus.

Programming:

The Arduino UNO can be programmed with Arduino software. Select "Arduino UNO w/ATmega328" from the Tools Board menu.

The ATmega328 on the Arduino UNO comes preburned with a bootloader that allows you to upload new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol.

We can also bypass the boot loader and program the microcontroller through the ICSP header. The ATmega8U2 firmware source code is available. The ATmega8U2 is loaded with DFU boot loader, which can be activated by connecting the solder jumper on the back of the board and then resetting the 8U2. We can then use ATMEL'S FLIP Software or the DFU programmer to load a new firmware or we can use the ISP header with an external programmer.

Automatic (Software) Reset:

Rather than requiring a physical press of the reset button before an upload the Arduino UNO is designed in a way that allows it to be reset by software running on a connected computer. One of the hardware flow control lines (DTR) of the ATmega8U2 is connected to the reset line of the ATmega328 via a 100 nF capacitor. When this line is asserted, the reset line drops long enough to reset the chip. The Arduino software uses this capability to allow you to upload code by simply pressing the upload button in the Arduino environment. This means that the boot loader can have a shorter timeout, as the lowering of DTR can be well-coordinated with the start of the upload.

This setup has other implications. When the UNO is connected to either a computer running Mac OS or Linux OS, it resets each time a connection is made to it from the software via USB. For the following half-second or so, the boot loader is running on the UNO, while it is programmed to ignore malformed data, it will intercept the first few bytes of data sent to the board after a connection is opened. If a sketch running on the board receives one-time configuration or other data when it first starts, make sure that the software with which it communicates waits a second after opening the connection and before sending the data.

The UNO contains a trace that can be cut to disable the auto-reset. The pads on either side of the trace can be soldered together to re-enable it. It's labelled "RESET-EN". We can also disable the auto-reset by connecting a 110 a resistor from 5 V to the reset line.

USB Overcurrent Protection:

The Arduino Uno has a resettable polyfuse that protects your computers USB ports from shorts and over current. Although most computers provide their own internal protection, the fuse provides an extra layer of protection. If more than 500 mA is

applied to the USB port, the fuse will automatically break the connection until the short or overload is removed.

Physical Characteristics:

The maximum length and width of the UNO PCB are 2.7 and 2.1 inches respectively, with the USB connector and power jack extending beyond the former dimension, three screw holes allow the board to be attached to a surface or case.

Why we need Arduino?

Arduino is a software company, project and user community that designs and manufactures computer open-source hardware, open-source software and microcontroller-based kits for building digital devices and interactive objects that can sense and control physical devices.

The project is based on microcontroller board designs, produced by several vendors, using various microcontrollers. These systems provide sets of digital and analog I/O pins that can interface to various expansion boards and other circuits. The boards feature serial communication interfaces, including USB on some models for loading programs from personal computers. For programming the microcontrollers, the Arduino project provides an integrated development environment (IDE) based on a programming language name 'Processing", which also supports the languages C and C++.

The first Arduino was introduced in 2005, aiming to provide a low cost, easy way for novices and professionals to create devices that interact with their environment using sensors and actuators.

Arduino boards are available commercially in preassembled form, or as do-it-yourself kits. The hardware design specifications are openly available, allowing the Arduino boards to be produced by anyone.

The whole point of the "Arduino Platform" is to allow for easy and fast prototyping. Being able to just hook up an LCD and be able to display messages on it in a matter of minutes, instead of hours is just amazingly powerful and convenient when you have an idea.

For proto-lyping, the Arduino platform gives you a lot of pre-wiring and free code libraries that will let you concentrate on testing your idea instead of spending your time building supporting circuitry or writing tons of low-level code.

RELAY MODULE

The 1 Channel 5V Relay Module provides a single relay that can' be controlled by any 5V digital output from your microcontroller. The relay is accessible using screw terminals and can handle up to 2A of current. A handy LED indicates the status of the relay.

At the heart of the module is a 5V relay covered in blue color plastic. Maximum operating current and voltage for both AC and DC load are 'also mentioned at the top of the relay cover. SRD-05VDC is part number and it shows the operating voltage. It is'known as a 5V relay module. Because the relay operates at 5V DC. In other words, a 5V active high or low signal activates the relay by energizing its coil. As mentioned earlier, internally a 5V relay consists of a NC, NO, COM terminals and a coil.

Figure 7. RELAY MODULE

12V 2 AMP POWER ADAPTER

Figure 8. POWER SUPPLY

A power Adapter is an electrical device that supplies electric power to an electrical load. All power supplies have a power input connection, which receives energy in the form of electric current from a source, and one or more power output connections. 12 Volt 2Amp Power takes an AC input of 100-240V and gives 12V 2A DC output.

Specifications:

- Input – 100-240V AC 50/60Hz
- Category – Switch Mode Power Adaptor (SMPS)
- Output Type – DC
- Output – 12Volts 2Amp

Features:

- Excellent Quality
- Short Circuit, Over Voltage & Over Current Protection
- Incredibly Low Fault Rates
- No Minimum Load
- This power is a regulated Centre Positive power supply
- Its plug design is for Indian power socket so, no plug converter is required
- Compact size & light weight

- High Reliability
- Regulated Stable Voltage
- Good quality SMPS Based Adapter
- Stabilized Output, low ripple & low interference
- Single Output Voltage
- High Efficiency & low energy consumption

L293D Motor Driver

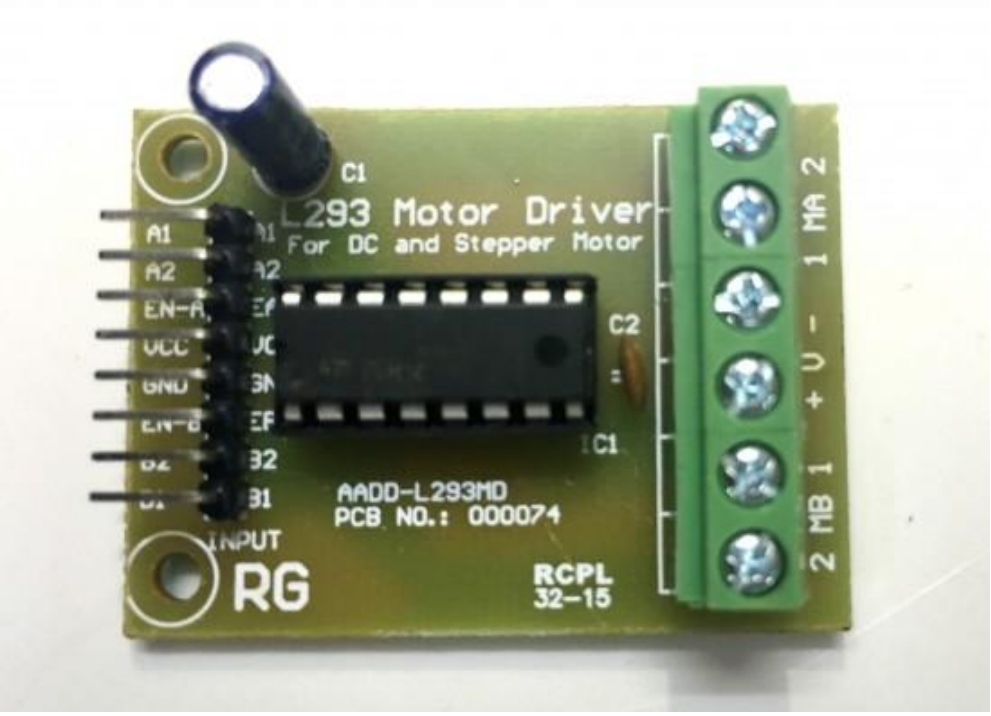


Figure 9. L293D Motor Driver

The Motor Driver is a module for motors that allows you to control the working speed and direction of two motors simultaneously .This Motor Driver is designed and developed based on L293D IC.

L293D is a 16 Pin Motor Driver IC. This is designed to provide bidirectional drive currents at voltages from 5 V to 36 V.

The motor driver IC (L293) attached on the robotic vehicle PCB Board is interfaced with the microcontroller 8051 which instructs the IC to drives the motorsfor the movement of our robot. L293 IC is a dual structured, H-bridge motor driver IC. We first, will have to detect the region of the fire at which the fire breaks out by continuous movement of the robot or by fixing certain no. of fire sensor around the robot. We make use of the dc motors to move the vehicle by making the wheels to rotate. When we reach near the fire by driving our robot through the use of this L293D module. Then pump is prompted to start its operation to put this fire out by sprinkling water. Using the container to carry water, a 5V brushless water pump is also fixed inside the container. We made use of two 5V rechargeable lead acid batteries that are used for giving the power to the 2 motors and 2 numbers of 9V batteries are used for driving the transmitter and the receiver. The motor RPM is 45.

L293D IC Pin Out

The L293D is a 16 pin IC, with eight pins, on each side, to controlling of two DC motor simultaneously. There are 4 INPUT pins, 4 OUTPUT pins and 2 ENABLE pin for each motor.

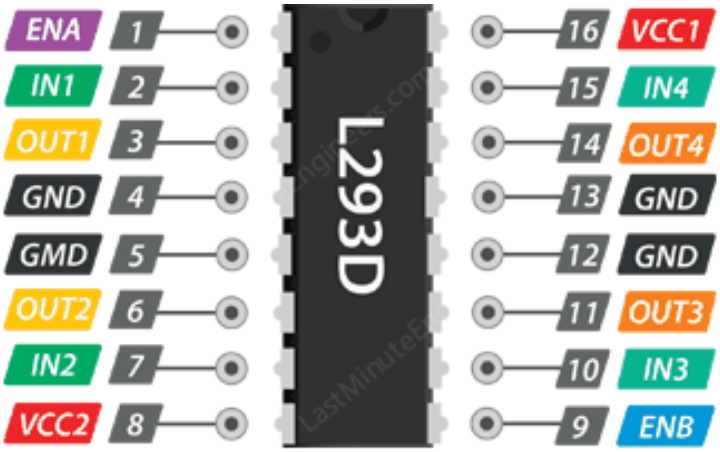


Figure 10. L293D Motor Driver Pinout

Pin 1: When Enable1/2 is HIGH, Left part of IC will work, i.e motor connected with pin 3 and pin 6 will rotate.

Pin 2: Input 1, when this pin is HIGH the current will flow though output 1.

Pin 3: Output 1, this pin is connected with one terminal of motor.

Pin 4/5: GND pins

Pin 6: Output 2, this pin is connected with one terminal of motor.

Pin 7: Input 2, when this pin is HIGH the current will flow though output 2.

Pin 8: VSS, this pin is used to give power supply to connected motors from 5V to 36V maximum depends on Motor connected.

Pin 9: When Enable 3/4 is HIGH, Right part of IC will work, i.e motor connected with pin 11 and pin 14 will rotate.

Pin 10: Input 4, when this pin is HIGH the current will flow though output 4.

Pin 11: Output 4, this pin is connected with one terminal of motor.

Pin 12/13: GND pins

Pin 14: Output 3, this pin is connected with one terminal of motor.

Pin 15: Input 3, when this pin is HIGH the current will flow though output 3.

Pin 16: VCC, for supply power to IC i.e 5V.

Instructions/Manuals/Technical details:

VCC is the voltage that it needs for its own internal operation 5v; L293D will not use this voltage for driving the motor. For driving the motors it has a separate provision to provide motor supply VSS (V supply). L293d will use this to drive the motor. It means if you want to operate a motor at 9V then you need to provide a Supply of 9V across VSS Motor supply. The maximum voltage for VSS motor supply is 36V. It can supply a max current of 600mA per channel.

Since it can drive motors Up to 36v hence you can drive pretty big motors with this l293d. VCC pin 16 is the voltage for its own internal Operation. The maximum voltage ranges from 5v and upto 36v.

TIP: Don't Exceed the Vmax Voltage of 36 volts or it will cause damage.

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

- Pin 2 = Logic 1 and Pin 7 = Logic 0 | Clockwise Direction
- Pin 2 = Logic 0 and Pin 7 = Logic 1 | Anticlockwise Direction
- Pin 2 = Logic 0 and Pin 7 = Logic 0 | Idle [No rotation] [Hi-Impedance state]
- 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.

Key Features:

- Design based on highly proven IC L293D driver
- Direct input from 5V microcontroller for L293D driver supply.
- Output terminal for both motor.
- Powered from external 12V or from wire header

Fire/Flame Sensor Module

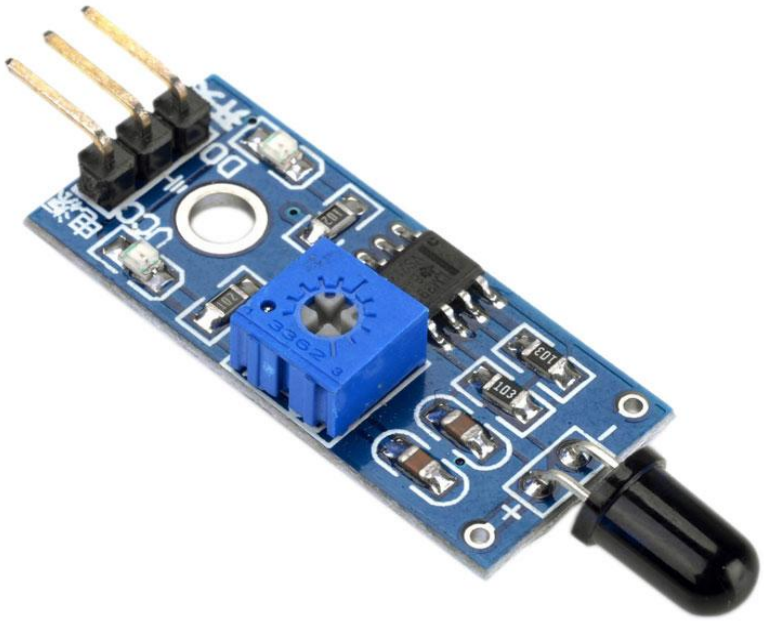


Figure 11. Fire/Flame Sensor Module

Flame sensor is the most sensitive to ordinary light that is why its reaction is generally used as flame alarm purposes. This module can detect flame or wavelength in 760 nm to 1100 nm range of light source. Small plate output interface can and single chip can be directly connected to the microcomputer IO port. The sensor and flame should keep a certain distance to avoid high temperature damage to the sensor. The shortest test distance is 80 cm, if the flame is bigger, test it with farther distance. The detection angle is 60 degrees so the flame spectrum is especially sensitive. The detection angle is 60 degrees so the flame spectrum is especially sensitive.

Working Principle

This sensor/detector can be built with an electronic circuit using a receiver like electromagnetic radiation. This sensor uses the infrared flame flash method, which allows the sensor to work through a coating of oil, dust, water vapor, otherwise ice.

Specifications:

- On-board LM393 voltage comparator chip and infrared sensing probe.
- Support 5V/3.3V voltage input.
- On-board signal output indication, output effective signal is high level, and the same time the indicator light up, output signal can directly connect with microcontroller IO.
- Signal detection sensitivity can be adjusted.
- Reserved a line voltage compare circuit (P3 is leaded out).
- PCB size: 30(mm) x15(mm).

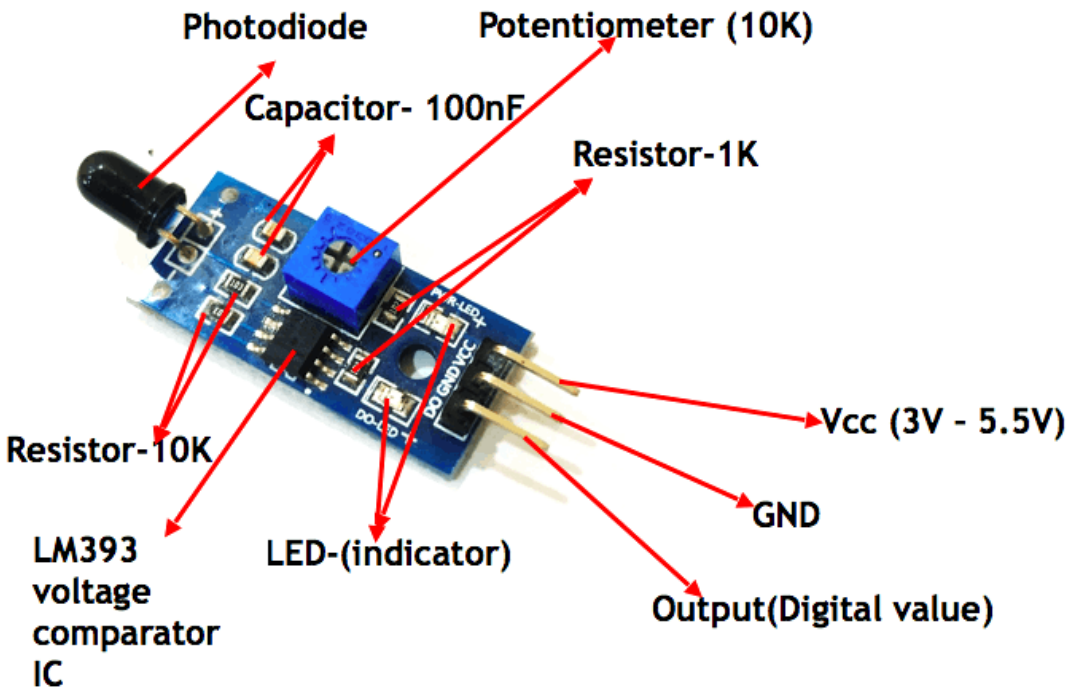


Figure 12. Fire/Flame Sensor

Pin Configuration:

1. VCC
2. Output
3. Ground

Schematic Diagram:

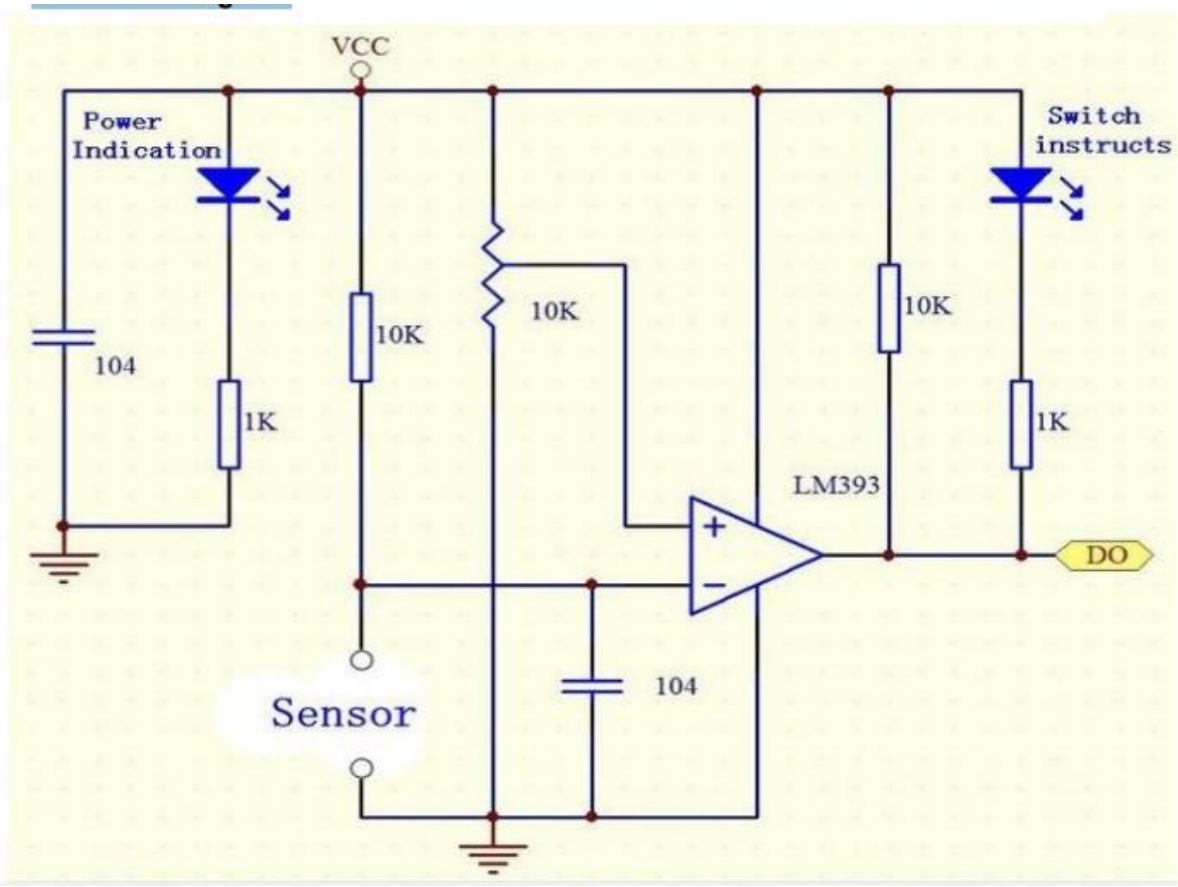


Figure 13.Schematic Diagram

Applications

These sensors are used in several dangerous situations which include the following.

- Hydrogen stations
- Industrial heating
- Fire detection
- Fire alarm
- Fire fighting robot

- Drying systems
- Industrial gas turbines
- Domestic heating systems
- Gas-powered cooking devices

6V Mini Water Pump

Figure 14. 6v Mini Water Pump

Micro dc 3-6v micro submersible pump mini water pump for fountain garden mini water circulation system DIY project dc 3v to 6v submersible pump micro mini submersible water pump 3v to 6vdc water pump for DIY dc pump for hobby kit mini submersible pump motor this is a low cost, small size submersible pump motor which can be operated from a 2.5 ~ 6V power supply.

It can take up to 120 liters per hour with very low current consumption of 220ma. Just connect tube pipe to the motor outlet, submerge it in water and power it. Make sure that the water level is always higher than the motor. The dry run may damage the motor due to heating and it will also produce noise.

FEATURES:

- Voltage: 2.5-6V
- Maximum lift: 40-110cm / 15.75"-43.4"
- Flow rate: 80-120L/H
- Outside diameter: 7.5mm / 0.3"
- Inside diameter: 5mm / 0.2"
- Diameter: Approx. 24mm / 0.95"
- Length: Approx. 45mm / 1.8"
- Height: Approx. 30mm / 1.2"
- Material: Engineering plastic
- Driving mode: DC design, magnetic driving

APPLICATIONS:

- Controlled fountain water flow
- Controlled Garden watering systems
- Hydroponic Systems
- Fresh water intake or exhaust systems for fish aquarium

GEAR MOTOR

4.5 - 10 Vdc gear motor with a 2.75" diameter x 1" wide hard plastic wheel and rubber tire. Wheel can be attached to either side of motor. Motor with gearbox is 2.5" long x 0.75" x 0.9" not including axle or wheel. Low current consumption, 120 RPM @ 6 Vdc, 100Ma (no-load rating).

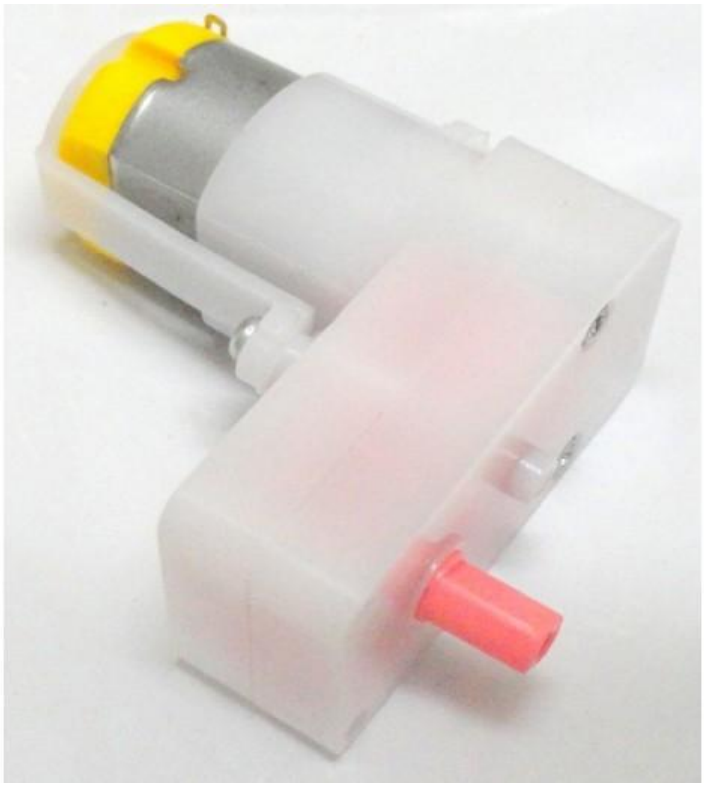


Figure 15. Gear Motor dc motor characteristics Important:

It must be borne in mind when reducing the speed of a dc motor the armature cooling fan efficiency drops and it is wise to reduce the rating or load of the motor by 30-40% over a speed range of 10 : 1 and by 50% for a speed range of 25:1.

CHAPTER 4

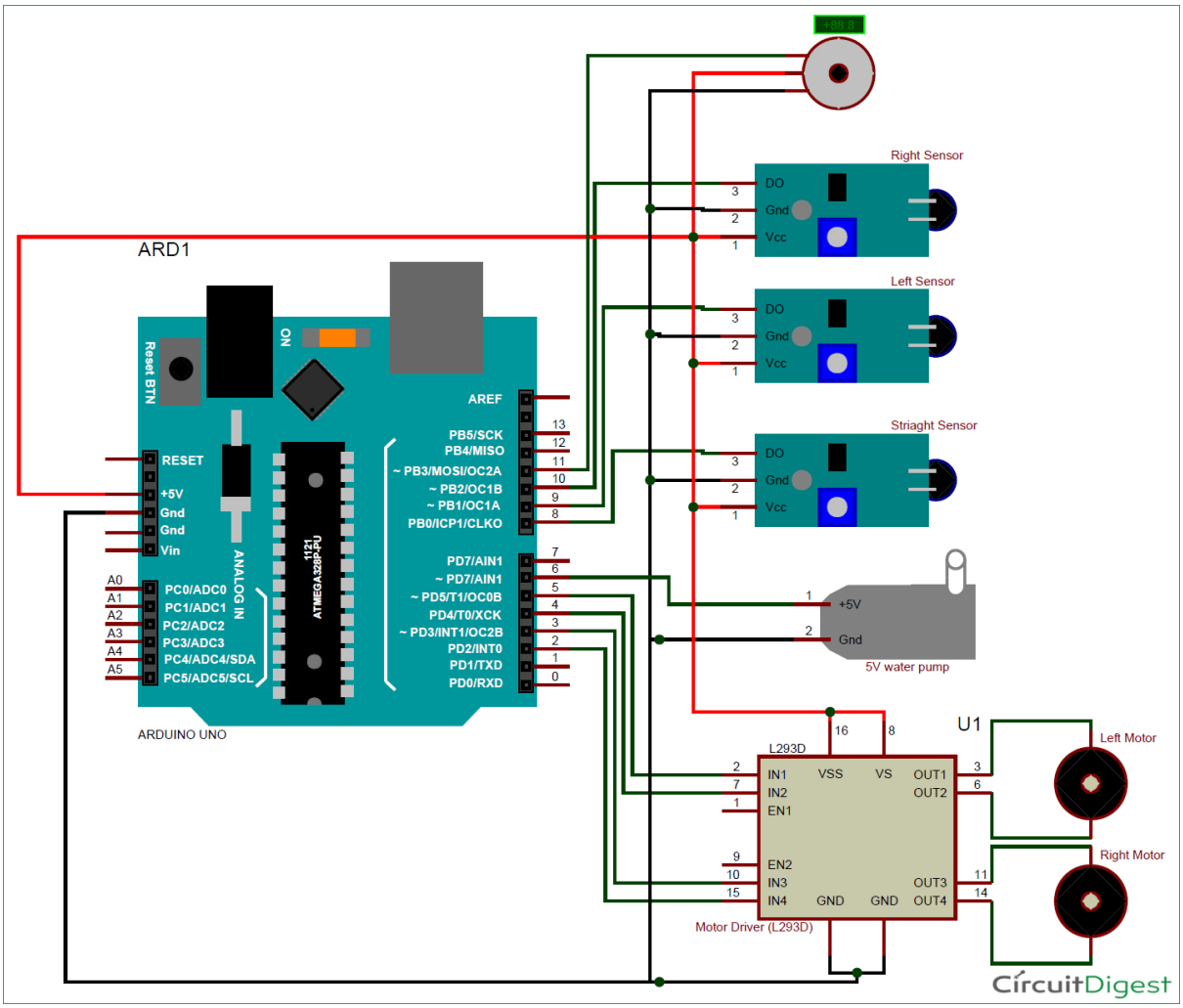


Figure 16.Circut diagram

CHAPTER 4

ARDUNIO IDE

The Arduino Integrated Development Environment - or Arduino Software (IDE) contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.

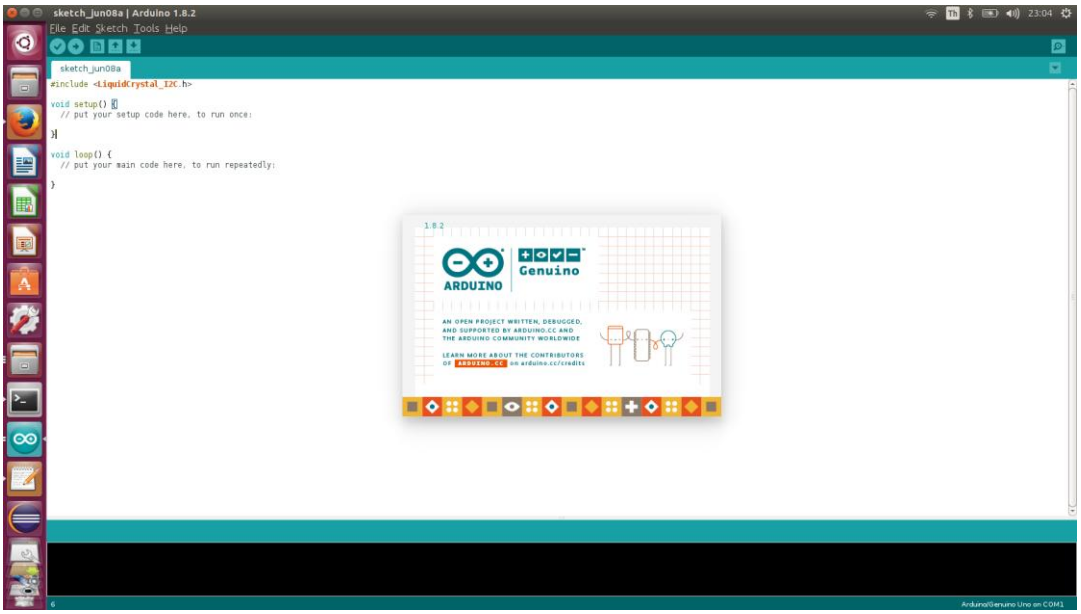


Figure 17. ARDUINO SOFTWARE

Programs written using Arduino Software (IDE) are called sketches. These sketches are written in the text editor and are saved with the file extension .ino. The editor has features for cutting pasting and for searching replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom right-hand comer of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor.

Sketchbook:

The Arduino Software (IDE) uses the concept of a sketchbook: a standard place to store your programs (or sketches). The sketches in your sketchbook can be opened from the File > Sketchbook menu or from the Open button on the toolbar. The first time you run the Arduino software, it will automatically create a directory for your sketchbook. You can view or change the location of the sketchbook location from with the Preferences dialog.

Uploading:

Before uploading your sketch, you need to select the correct items from the Tools > Board and Tools > Port menus. Once you've selected the correct serial port and board, press the upload button in the toolbar or select the Upload item from the Sketch menu. Current Arduino boards will reset automatically and begin the upload. With older boards that lack auto-reset, you'll need to press the reset button on the board just before starting the upload. On most boards, you'll see the RX and TX LEDs blink as the sketch is uploaded. The Arduino Software (IDE) will display a message when the upload is complete, or show an error.

When you upload a sketch, you're using the Arduino boot loader, a small program that has been loaded on to the microcontroller on your board. It allows you to upload code without using any additional hardware. The boot loader is active for a few seconds when the board resets, then it starts whichever sketch was most recently uploaded to the microcontroller. The boot loader will blink the on-board (pin 13) LED when it starts i.e. when the board resets).

Libraries:

Libraries provide extra functionality for use in sketches, e.g. working with hardware or manipulating data. To use a library in a sketch, select it from the Sketch > Import Library Menu. This will insert one or more #include statements at the top sketch and compile the library with your sketch. Because libraries are uploaded to the board with your sketch, they increase the amount of space it takes up. If a sketch no longer needs a library, simply delete its include statements from the top of your code.

There is a list of libraries in the reference. Some libraries are included with the Arduino software. Others can be downloaded from a variety of sources or through the Library Manager. Starting with version 1.0.5 of the IDE, you do can import a library from a zip file and use it in an open sketch.

CHAPTER 5

ADVANTAGES:

The fire detecting robot help in following ways:

- To detect the exact direction of the fire source
- Capability of sensing accurately with increased flexibility
- Reduce human effort
- Reliable and economical
- Not sensitive to weather conditions

DISADVANTAGES:

- No monitoring system for vehicle
- No remote control for the robotic movement
- Our system used only for less than 1kg application
- It is not used to put out large fires

APPLICATION:

- Can be used in server rooms
- Extinguishes fire where probability of explosion is high
- Disaster area monitoring and rescue.
- The robot can be used to guide the visitors from the entrance to the main office .
- It can help doctors to carry medicines from one ward to another .
- The main purpose is to rescue the people by extinguishing fire in a building.

- Can be used in record maintaining rooms where fire can cause lose of valuable data.
- Can be used in Server rooms for immediate action in case of fire.
- The potential application of the multifunctional firefighting system has been defined as a group that includes the chemical and oil industry, nuclear plants, military storage facilities, as well as mine fields and dangerous substance transport

CHAPTER 6

Future Enhancement

This project has been motivated by the desire to design a system that can detect fires and intervention. In the present condition it can extinguish fire only in the way and not in all the rooms. It can be extended to a real fire extinguisher by replacing the fan by a carbon-di-oxide carrier and by making it to extinguish fires of all the room using microprogramming. This provides us the opportunity to pass on to robots tasks that traditionally humans had to do but were inherently life threatening. Fire-fighting is an obvious candidate for such automation.

Given the number of lives lost regularly in firefighting, the system we envision is crying for adoption. Of course, this project has only scratched the surface. As in the design simplifications and the implementation constraints in suggest, our project is very much a proof-of-concept. In particular, a practical autonomous fire-fighting system must include a collection of robots, communicating and cooperating in the mission; furthermore, such a system requires facilities for going through obstacles in the presence of fire, and ability to receive instructions on-the fly during an operation.

All such concerns were outside the scope of this project. However, there has been research on many of these pieces in different contexts, e.g., coordination among mobile agents, techniques for detecting and avoiding obstacles, on-the-fly communication between humans and mobile agents, etc. It will be both interesting and challenging to put all this together into a practical, autonomous fire-fighting service

Conclusion

Fire-fighting robot can be easily and conveniently used and operated automatically when any fire incident occurs in educational, industrial and hospital areas to save human life. Fire-fighting Robot comprises of numerous sensors and motors, and has small in size, less in weight, with rechargeable batteries, in result it requires less space. Prototype provides us greater efficiency to detect the flame, temperature and gas presented in the affected area. The extinguisher robot effectively extinguishes fire before it becomes uncontrollable and gives threat to life

This paper has presented a unique vision of the concepts which are used in this particular field. It aims to promote technology innovation to achieve a reliable and efficient outcome from the various instruments. With a common digitalized platform, these latest instruments will enable increased flexibility in control, operation, and expansion; allow for embedded intelligence, essentially foster the resilience of the instruments, and eventually benefit the customers with improved services, reliability and increased convenience. The nineties witnessed quantum leaps interface designing for improved man machine interactions. The Mechatronics application ensures a convenient way of simplifying the life by providing more delicate and user friendly facilities in computing devices. Now that we have proven the method, the next step is to improve the hard ware. Instead of using cumbersome modules to gather information about the user, it will be better to use smaller and less intrusive units. The day is not far when this technology will push its way into your house hold, making you more lazy.

This paper presents the major features and functions of the various concepts that could be used in this field in detail through various categories. Since this initial work cannot address everything within the proposed framework and vision, more research and development efforts are needed to fully implement the proposed framework through a joint effort of various entities. This autonomous robot successfully performs the task of a fire fighter in a simulated house fire. Benefited from this technology, since the expense of activating other types of fire extinguishers may outweigh that of a robot, where product stock could be damaged by imprecise fire control methods.

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