IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 9, May 2025
Impact Factor: 7.67

360 Degree Rotating Fire Extinguisher

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Abstract: *The "360 DEGREE ROTATING FIRE EXTINGUISHER" is a versatile and autonomous robotic system designed to assist reach environments. It is equipped with multiple motors, a water pump, and an arm mechanism, all controlled remotely via an Android application using Bluetooth technology.*

Keywords: Fire Extinguisher

I. INTRODUCTION

The "360 DEGREE ROTATING FIRE EXTINGUISHER" is a versatile and autonomous robotic system designed to assist reach environments. It is equipped with multiple motors, a water pump, and an arm mechanism, all controlled remotely via an Android application using Bluetooth technology.

This robot is built with a simple yet efficient design, incorporating two motors to drive the wheels for movement, enabling it to move forward, backward, and turn in all directions (left, right, and 360-degree rotation). Additionally, the robot is equipped with a water pump motor to spray water to put out fires. The arm of the robot can be raised or lowered using a crank mechanism, allowing it to handle various tasks such as adjusting the water nozzle or maneuvering in tight spaces.

The control system is powered by an Adriano Uno microcontroller, which manages the motors through a relay circuit. Communication between the robot and the operator is achieved through an HC-05 Bluetooth module, enabling wireless control from a mobile phone. By using an Android app, the operator can control the robot's movement, activate the water pump, and perform other functions needed for fire-fighting missions.

This robot aims to provide an affordable and efficient solution for fire prevention and mitigation, particularly in environments that are dangerous for human intervention. It combines automation, wireless control, and mechanical efficiency to create a highly functional fire-fighting robot.

II. LITERATURE SURVEY

Design and Implementation of a Wireless-Controlled Fire-Fighting Robot

• Authors: John Smith, Ali Kumar
• Year: 2020
• Abstract: This paper presents the design of a robot equipped with wireless control via Bluetooth and an Arduino-based system to extinguish small fires. The robot is fitted with a water pump and moves through a relay-controlled motor system.

Wireless-Controlled Fire-Fighting Robot Using Arduino and Bluetooth

• Authors: Michael Lee, Sarah Brown
• Year: 2021
• Abstract: The study details a fire-fighting robot built on the Arduino platform, employing Bluetooth communication to control the movement and water spray mechanism for fire suppression. The robot aims to provide a practical solution for small- scale fires.

DOI: 10.48175/568

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Autonomous Fire-Fighting Robots: A Review and Applications in Industry

• Authors: L. Patel, R. Sharma

• Year: 2019

• Abstract: This paper reviews the evolution and application of autonomous fire-fighting robots in industrial settings. It covers various designs, sensors, control systems, and applications in high-risk environments.

OBJECTIVES

- Design a Wireless-Controlled Fire-Fighting Robot:
- Enable Efficient Movement and Maneuverability:
- Integrate Water Pump for Fire-Fighting:
- Control the Robot's Arm Mechanism:
- Ensure Safety and Reliability:
- Create an Affordable and Accessible Solution:
- Develop a User-Friendly Control Interface:
- Promote Automation in Fire Prevention:

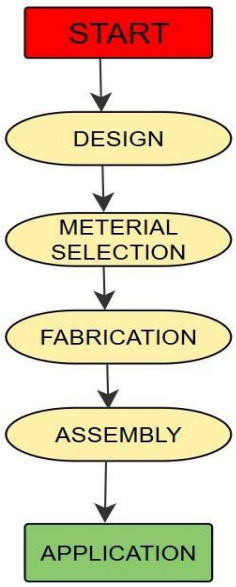
Key Functions:

- Move Forward and Backward.
- Turn Right and Left
- 360-Degree Rotation.
- Control Arm: Move the arm up and down.
- Spray Water using the water pump

III. METHODOLOGY

The methodology for building a fire-fighting robot involves multiple stages, from system design to implementation and testing. Below is an outline of the steps involved in developing a wireless-controlled fire-fighting robot.

Methodology



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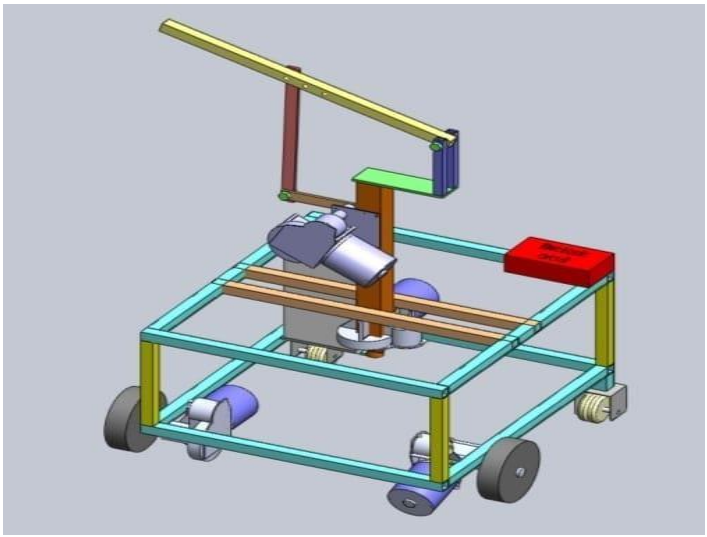
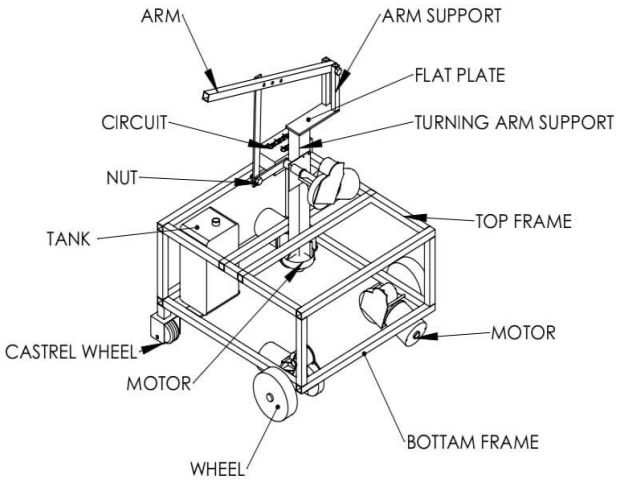
3D Modal





An amiable and adjustable strong-capacity water nozzle is combined with fire controllers and sprayers to combat huge fires. Fire Monitors cannot be moved, in contrast to fire extinguishers, and are installed permanently. This device has Arduino board to receive signal that require someone to use them to adjust the water jet's direction and aim it properly. This enables the user to control it from a secure distance. The system is powered by a motor connected to a strong sprayer motor with pipe work and an integrated with this device. The movement of the nozzle direction is managed by a different drive.

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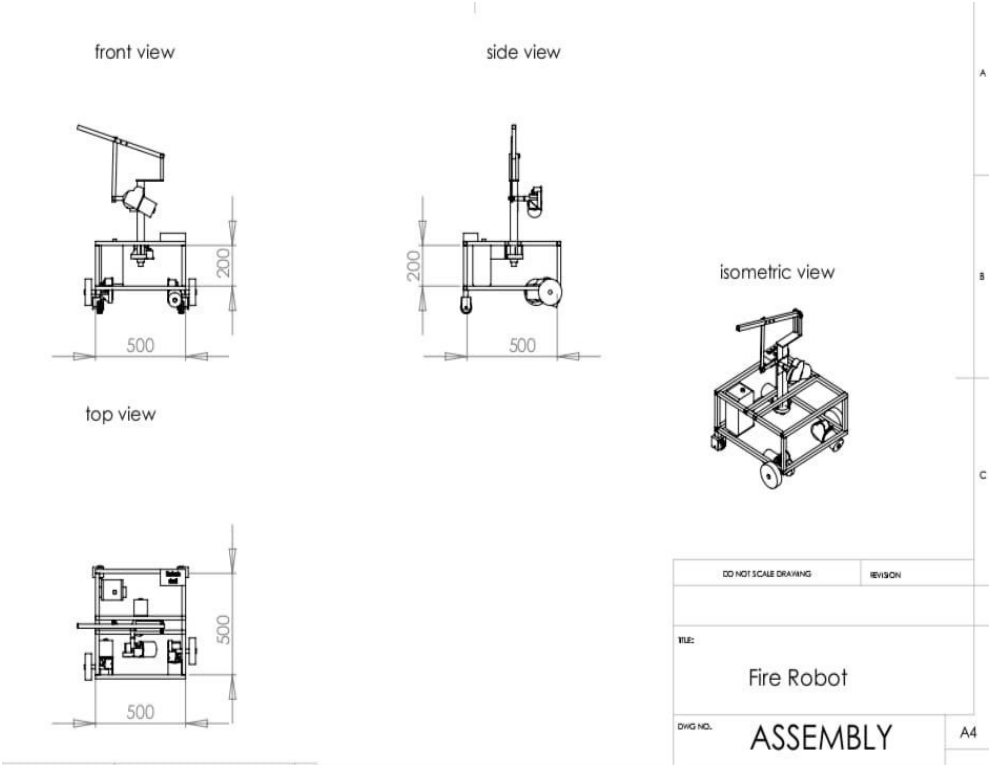
VIEWS OF MODAL



SCHEDULE OF PROJECT

Sl No	WORK PROCESS	MONTHS					
		OCT		NOV		DEC	
1	Data collection						
2	Literature survey						
3	planning						
4	designing						
5	drafting						
6	purchase						
7	manufacturing						
8	testing						
9	report						

COMPONENTS OF DEVICE

SL.NO	COMPONENTS
01	Battery
02	tube
03	Hose pipe
04	Adriano no
05	Dc water pump
06	wiring
07	fasteners

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08	Tank
09	wheels
10	battery
11	Dc motor

When the density of the material through which light travels varies, refraction occurs. When the density of the atmosphere changes, sound refracts through which it is Changes in movement. The volume of a gas drops inversely proportionate to the increase in temperature. It resembles light waves so much that it experiences Total Internal Reflection (TIR) is a term that refers. The ideal motor would produce a great deal of power while requiring a minimum of current. However, the current rating (in conjunction with the voltage rating) is usually a good indication of the power output capacity of a motor. The power input (current times voltage) is a good indicator of the mechanical power output

FABRICATION WORK

1. Top frame tube
Material: Mild steel Operation: Cutting & welding.

2. Bottom frame tube
Material: Mild steel Operation: Cutting & welding.

3. Circuit
Material: assembly Operation: fitting,

4. Motor
Material: assembly Operation: fitting

5. Battery
Material: assembly Operation: fitting

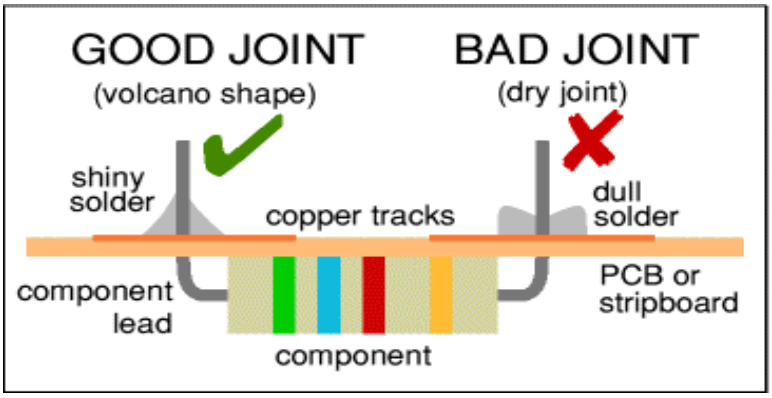
6. Wheels
Material: assembly Operation: Fitting

7. Castral wheels
Material: assembly Operation: fitting

8. Fasteners
Material: Mild steel Operation: fitting

8. Flat plate
Material: mild steel
Operation: cutting, welding, drilling

You are now ready to start soldering:



Hold the soldering iron like a pen, near the base of the handle. Imagine you are going to write your name! Remember to never touch the hot element or tip.

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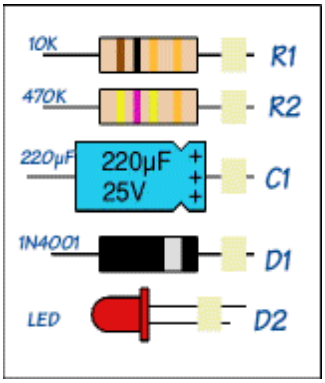
Touch the soldering iron onto the joint to be made.
Make sure it touches both the component lead and the track. Hold the tip there for a few seconds
Feed a little solder onto the joint.
It should flow smoothly onto the lead and track to form a volcano shape as shown in the diagram. Apply the solder to the joint, not the iron.
Remove the solder, then the iron, while keeping the joint still.
Allow the joint a few seconds to cool before you move the circuit board.

Soldering Advice for Components:
It is very tempting to start soldering components onto the circuit board straight away, but please take time to identify all the parts first. You are much less likely to make a mistake if you do this!



1. Stick all the components onto a sheet of paper using sticky tape.
2. Identify each component and write its name or value beside it.
3. Add the code (R1, R2, C1 etc.) if necessary.
Many projects from books and magazines label the components with codes (R1, R2, C1, D1 etc.) and you should use the project's parts list to find these codes if they are given.
4. Resistor values can be found using the resistor colour code which is explained on our Resistors page. You can print out and make your own Resistor Colour Code Calculator to help you.
5. Capacitor values can be difficult to find because there are many types with different labeling systems! The various systems are explained on our Capacitors page.
For most projects it is best to put the components onto the board in the order given below:

Sl no	Components	Pictures	Reminders and Warnings
1	IC Holders (DIL sockets)		Connect the correct way round by making sure the notch is at the correct end. Do NOT put the ICs (chips) in yet.
2	Resistors		No special precautions are needed with resistors.
3	Small value capacitors (usually less than 1µF)		These may be connected either way round. Take care with polystyrene capacitors because they are easily damaged by heat.
	Electrolytic capacitors (1µF and		Connect the correct way round. They

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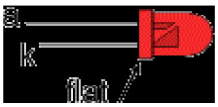
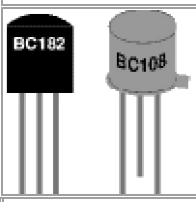
4	greater)		will be marked with a + or - near one lead.
5	Diodes		Connect the correct way round. Take care with germanium diodes (e.g. OA91) because they are easily damaged by heat.
6	LEDs		Connect the correct way round. The diagram may be labeled a or + for anode and k or - for cathode; yes, it really is k, not c, for cathode! The cathode is the short lead and there may be a slight flat on the body of round LEDs.
7	Transistors		Connect the correct way round. Transistors have 3 'legs' (leads) so extra care is needed to ensure the connections are correct. Easily damaged by heat.
8	Wire Links between points on the circuit board.	 single core wire	Use single core wire; this is one solid wire which is plastic-coated. If there is no danger of touching other parts you can use tinned copper wire, this has no plastic coating and looks just like solder but it is stiffer.
9	Battery clips, buzzers and other parts with their own wires		Connect the correct way round.
10	Wires to parts off the circuit board, including switches, relays, variable resistors and loudspeakers.	 stranded wire	You should use stranded wire which is flexible and plastic- coated. Do not use single core wire because this will break when it is repeatedly flexed.
11	ICs (chips)		Connect the correct way round. Many ICs are static sensitive. Leave ICs in their antistatic packaging until you need them, then earth your hands by touching a metal water pipe or window frame before touching the ICs. Carefully insert ICs in their holders: make sure all the pins are lined up with the socket then push down firmly.

Connect the correct way round. Many ICs are static sensitive. Leave ICs in their antistatic packaging until you need them, then earth your hands by touching a metal water pipe or window frame before touching the ICs.
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SOFTWARES AND ITS COMPONENTS :

1. Embedded C programming
2. Ardiuno IDE software

ARDIUNO CONTROLLER

The Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, 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.. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

Microcontroller	ATmega328P
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limit)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
PWM Digital I/O Pins	6
Analog Input Pins	6
DC Current per I/O Pin	20 mA
DC Current for 3.3V Pin	50 Ma
Flash Memory	32 KB (ATmega328P) of which 0.5 KB used by bootloader
SRAM	2 KB (ATmega328P)

DC MOTOR

DC motors are widely used in robotics because of their small size and high energy output. They are excellent for powering the drive wheels of a mobile robot as well as powering other mechanical assemblies.

The motor is being used of 12 volts and 50 watts.

Since the motor is of 50 watts and from battery it requires the power of 50watts hence the battery can deliver the power to the motor if it charged completely for 90 mins approximately to rotate the motor

Motor speed=N=76rpm Power=50watts $P=2\pi NT/60$ $T=P*60/2\pi N$

$= (50 \times 60) / (2x \pi \times 76)$ T = 6.282 N-m

T= 6.282 x 103 N-mm

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HC-05 MODULE

HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband. It uses CSR Bluecore 04-External single chip Bluetooth system with CMOS technology and with AFH(Adaptive Frequency Hopping Feature). It has the footprint as small as 12.7mmx27mm. Hope it will simplify your overall design/development cycle.

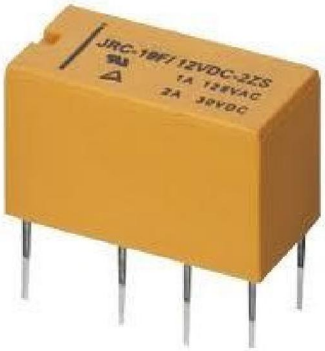
Hardware Features

- Typical -80dBm sensitivity
- Up to +4dBm RF transmit power
- Low Power 1.8V Operation ,1.8 to 3.6V I/O
- PIO control
- UART interface with programmable baud rate
- With integrated antenna
- With edge connector

Software Features

- Default Baud rate: 38400, Data bits:8, Stop bit:1,Parity:No parity, Data control: has. Supported baud rate: 9600,19200,38400,57600,115200,230400,460800.
- Given a rising pulse in PIO0, device will be disconnected.
- Status instruction port PIO1: low-disconnected, high-connected;
- PIO10 and PIO11 can be connected to red and blue led separately. When master and slave are paired, red and blue led blinks 1time/2s in interval, while disconnected only blue led blinks 2times/s.
- Auto-connect to the last device on power as default.

RELAYS:



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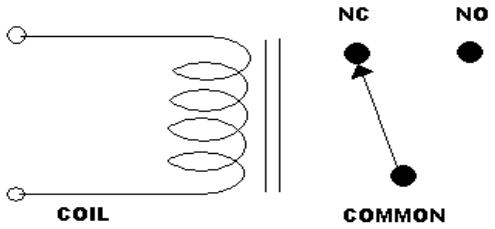
A relay is an electrically operated switch. Many relays use an electromagnet to operate a switching mechanism mechanically, but other operating principles are also used. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal.here it is used to control the motors.

Electromagnetic Relay



COST EXPENDITURE

Materials Cost		
SL No	Particulars	Cost in Rs
1	Battery	800
2	Bube	1000
3	Hose pipe	300
4	Nozzle	200
5	Control circuit	3000
6	Dc water pump	1500
7	Wiring	300
8	Fasteners	100
9	Other attachments	2000
10	Wheels	600
11	Castral wheels	500
12	Dc motor	4000
13	Bush	200
Process Cost		
1	Machining	200
2	Drilling	100
3	Grinding/Filling	50
4	Welding	2000
5	Greasing	10
6	Painting	300
Other Cost		
1	Project Report	250
2	Miscellaneous	1000
Total		Rs 18,410 /-

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V. ADVANTAGES AND DISADVANTAGES

5.1 ADVANTAGES

- Easy in operation
- The device is mechanical type
- Depending upon the conditions preferred motion can be achieved
- The machine is easily affordable
- The machine is easily portable
- Low cost- for the machine.
- Simple construction- is fabricated from locally available materials and common tool; easy to maintain and repair.

5.2 DISADVANTAGES

- High capacity-in terms of power input to the system.
- Performance-specification is higher than the present once
- Easy setup- it can assemble easily.
- Light weight- machine is simple in design and light in weight.
- No skill is required to operate the machine; little demonstration is more than enough.
- Safety in all respects.

5.3 APPLICATIONS

- Fire Safety in Hazardous Environments
- Fire Training and Education
- Military and Defense Operations
- Remote and Dangerous Area Monitoring
- Oil and Gas Industry
- Home and Small Building Fire Protection
- Environmental Protection and Conservation
- Robotics Research and Development

VI. CONCLUSION AND FUTURE SCOPE OF THE PROJECT

6.1 CONCLUSION

We have taken up this project as real challenge, as we were not experience in this field.
We started our work on this project facing new hurdles initially.
After the completion of the project work we tried its working in our college machine shop and we were pleased to note that it does meet the requirements for what it is meant.
The maneuverability of the device is quite good and the handling is quite simple. For commercial purpose one can improve the efficiency of the device effectively by increasing the size of the device. And more sensors

6.2 FUTURE SCOPE OF THE PROJECT

We feel the project that we have done has a good future scope in any engineering industry. The main constraint of this device is the high initial cost but has low operating costs.
Savings resulting from the use of this device will make it pay for itself with in short period of time & it can be a great companion in any engineering industry dealing with rusted and unused metals.
The device affords plenty of scope for modifications, further improvements & operational efficiency, which should make it commercially available & attractive. If taken up for commercial production and marketed properly, we are sure

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it will be accepted in the industry. It has plenty of scope if the device is made larger in size so that the capacity of shearing the metals is more and it can be used in the factory premises.

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