Advanced Fire Fighting Robot

Rahul R. Pardeshi[1], Rima R. Vedpathak[2], Akshay S. Ghatkar[3], Sangram M. Bhosale[4], Prof. A. D. Gaikwad[5]
[1, 2, 3, 4, 5] Dept of Mechanical Engineering
[1, 2, 3, 4, 5] P.D.E. A's college of Engineering Manjari(BK.), Pune Maharashtra, India

Abstract- *The aim of our project is to implementation and designing an Advanced Fire Fighting Robotusing 2.4GHz R/C transmitters and receivers. We have chosen the Sabertooth Dual 12A Motor Driver because, it is a high performance and low power controller, which exactly having the required features. This project helps to improve the safety to us in our day-to-day life.*

Keywords- Sabertooth Dual 12A Motor Driver, 2.4GHz R/C transmitters and receivers, Dc Motors, water pump.

I. INTRODUCTION

Robotics is part of everyday communication. In the everyday world, ROBOTICS is a rapidly growing and interesting field. This is the easiest way for the latest technology change. Now, the communication of a day is part of the advancement of technology, so we decided to work in the field of robotics, the implementation and design of something that will simplify human life in the aspect of today. Therefore, we support this cause. Robots are usually designed to make life easier. Robots can be used to perform tasks in dangerous situations that humans cannot cope with, such as nuclear leaks and burning buildings. In our concept, we extend the robot with an accessory to extinguish fires.

Robotics is the branch of Science that deals with the designs and application of robots and computer technology for their control,sensorly feedback and controls. data processing. During fires in relatively large buildings, spraying the structure through windows and openings in the ceiling allows fire control, but the remaining fires in the building can last. This requires firefighters to enter such a structure, which can be structurally unstable, in search of fires that could endanger the firefighter due to lack of visibility and breathable air.

The elimination of the human factor in tasks where the user may encounter unnecessary danger has led to the introduction of vehicles with remote control. These devices are able to do what the human user desires through a series of interactions between the machine and the user. The possibility that these robots are controlled remotely allows the user to have eyes and ears on the ground without having to put himself physically in danger. Firefighting has become a curious area in which robotics is applied, to the point where competitions are held so that hand robots extinguish fires at random, and for companies that approach the concept as an untapped robotic market The design of the proposed robot can detect and extinguish small fires by manual means. The robot can detect a fire from any position in its work area, which allows manual control of the robot by the user, who in turn can "interact" with the environment if necessary while having a constant return with the need for a computer screen

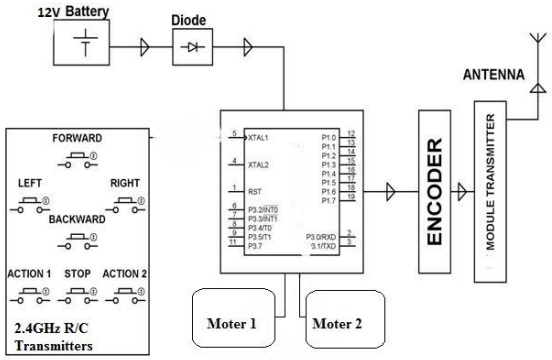


Fig. No. 1 The processes for Advanced Fire Fighting Robot flow

II. PROBLEM STATEMENT

AdvancedFirefighting robot is specifically designed to help humans, especially for firefighters in case of fire. This robot uses can be applied at home or residential, depending on how it works. Regardless of whether it is used by firefighters or by individuals, the goal is to save lives when they are against fire.

The time factor is a problem in a fire situation. The small fire only took a few minutes to become big, which can spread to other areas. Information through a phone call about a fire that has been reported to firefighters takes time to determine the location of the fire. Information on the location of the burn should be recorded before firefighters travel to that location. In addition, the vehicle they drive is large and difficult to cross traffic jams. By producing a fire-fighting robot, the time can be reduced by placing the robot in a high-risk fire zone.

Project Objectives

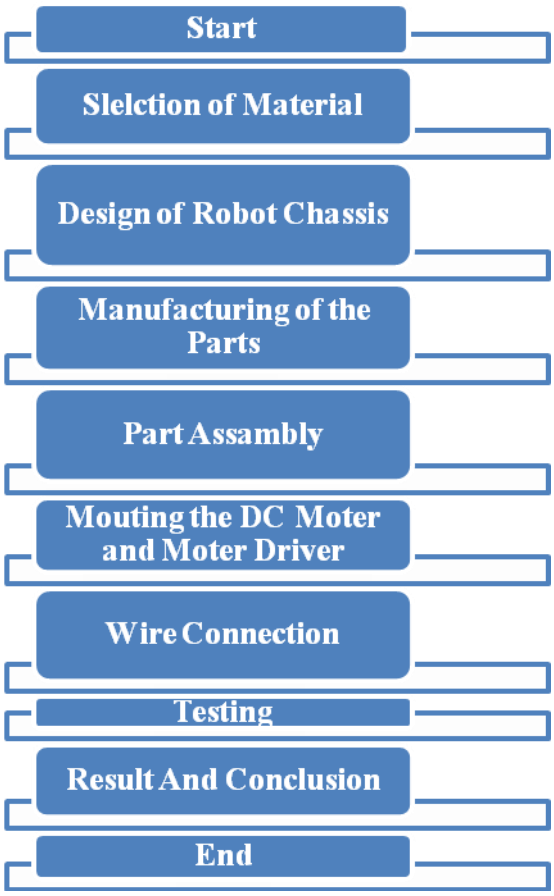
The objectives for this project are:

I. The water nozzle monitor can turn 360^0
ii. The Water Nozzle can turn 180^0
iii. The robot can turn 360°.

Scope of Work

- This provides a great opportunity for automation and will be useful in places where humans cannot reach or are dangerous.
- The robot will be used in places where it is dangerous for humans to enter.
- He can move. It can move wirelessly in the room without supervision

III. FLOW CHART OF THE PROJECT



IV. LITERATURE REVIEW

The viability of an advanced firefightingrobot to deal with such difficult situations that are beyond the reach of man has been proposed in several articles. In this article, we have dedicated our efforts to the design of a manual fire extinguishing robot, since the independent firefighting robots proposed in the previous articles do not produce more effective results than those that can be manually controlled by users. Some of the proposed robots generally take more time to process and scan the environment in search of fire, their inability to extinguish vulnerable areas can cause the spread of fires that cause loss of life and loss of life. massive destruction. In some cases, the robots are exploited in a certain restricted environment and, therefore, present a limitation in their application in a real-time environment. Depending on the sensor readings in an environment with a fire risk, this may not be appropriate because an incorrect reading of the sensors due to environmental disturbances can make the robot totally ineffective. Robots controlled wirelessly using a 2.4 GHz transmitter and receiver. The movement of the robot was controlled by a DC planetary motor with encoder.

V. PART SELECTION:

1. Motor Driver

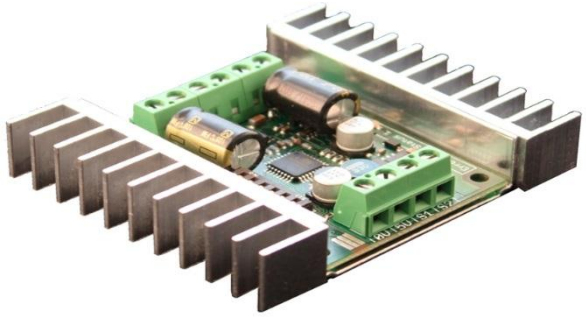


Fig. No.2 Sabertooth Dual 12A Motor Driver

The Sabertooth Dual 12A Motor Driver is one of the most favorite effective and easy to control dual motor controllers on the market place. It is suitable for medium power robots: up to 30 lbs in combat or 100 lbs for general purpose robotics. The Sabertooth can power two DC motors with brooms up to 12 A each. The maximum currents of 25A can be reached for a few seconds. Over-current protection and thermal protection means you never have to worry about accidentally killing the driver or connecting an oversized motor.

Sabertooth has incorporated 1A 5V BEC switching that can power a microcontroller or an R / C receiver and a pair of servos. This integrated BEC is almost identical in performance to our Park BEC. The lithium-cut mode allows Sabertooth to operate safely with lithium ion and lithium ion batteries - the highest energy density batteries available.

Specifications:

1. 12A continuous, 25A peak per channel Up to 24V in
2. Synchronous regenerative drive
3. Ultra-sonic switching frequency
4. Thermal and overcurrent protection
5. Lithium protection mode
6. Input modes: Analog, R/C, simplified serial, packetized serial
7. Dimensions: 59 x 75 x 17 mm(LxWxH)
8. Weight: 65 gms

2. PLANETARY DC GEARED MOTOR

Fig. No.3Planetary geared motor

The planetary geared motor is still known for its lower clearance and greater efficiency to meet the most demanding requirements. This planetary gear motor is manufactured by a Taiwanese engine company to ensure the quality and durability of the engine. This 42mm diameter motor is a more effective than the 32mm motor to produce its high torque. It also comes with a 5-channel rotating output and a single channel to provide real-time feedback in the rotational position.

Specification of Planetary geared motor:

- Voltage: 12VDC
- Rated Torque: ~25.24 kg.cm (1.76 N.m)
- Rated Speed: 365 RPM
- Rated Current: 5500mA
- Rated Power output: 41.3W
- Weight: 360g
- Dimension: Body Length– 98 (max); Body Diameter – 50mm; Shaft Diameter – 10mm; Shaft Length – 27mm.
- Compatible motor driver:
  - Arduino - Shield MD100
  - Sabertooth Dual 12A Motor Driver
- Gear ratio: 24:1
- Encoder Output: 245 pulses per rotation, single channel output
- Brushed motor type

3. Servomotors:

A servomotor is a rotary actuator or linear actuator that allows precise control of angular or linear position, velocity, and acceleration. It is a servomotor compatible with a sensor for position response. And it also requires an experienced driver, often a dedicated module specifically designed to be used with servomotors. Servomotors are not a specific class of engine although the term servomotor is often used to designate a suitable engine for use in a closed-loop control system.

Servo motors are used in applications such as robotics, CNC machines or automated manufacturing.

Fig. No.4 Servomotor

Specifications of Servomotors:

- Operating Voltage:3.0-7.2 Volts
- Operating Speed (4.8V no load): 0.10sec/60 degrees
- Dimensions: 22 x 11.5 x 27mm
- Weight: 9 g
- Stall Torque: 1.2kg / 42.3oz(4.8V); 1.6 kg / 56.4oz (6.0V)
- Temperature Range: -30 to +60 Degree C
- Dead Band Width: 7usec
- All Nylon Gear
- Connector Wire Length 150mm
- Rotational Degree: 180 degree

Design of Robot Chassis

This robot contains two wheels at rear side and one two wheel at front side. The all wheel are 4WD (4 Wheel Drive)the robot and use to rotate the robot 360°.

Fig. No.5 Robot Chassis

Steering Method:

In order to assign tasks to the destructive burned area of the robot, the steering method is the most important thing that the focus should be. These methods help the advanced firing robot reach targets to completely extinguish the fire. The table below shows the future task at the control of the motor that turns the wheel.

Remote Control Commands:

Key	Action
UP	Move Forward
Down	Move Backward
Right	Turn Right
Left	Turn Left
Analog	Enable/Disable joystick for speed control mode
Left Joystick up	Move forward with speed control
Left joystick down	Move backwards with speed control
Left joystick left	Take left turn with speed control
Left joystick right	Take right turn with speed control

VI. DESIGN OF WHEEL

nylon wheel with bearing:

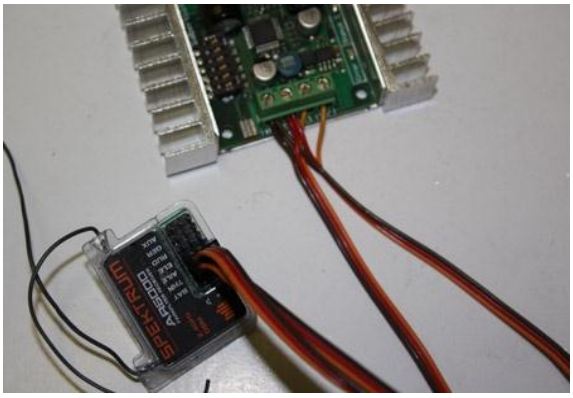
Nylon wheels offer capacities from 600 to 7200 lbs. In addition to withstanding solvents, caustic / corrosive environments and extreme temperatures. Sizes range from 3 "to 10" in diameter with tread widths of 1⅜ "to 3". Nylon wheels are also available in high temperature and low noise styles. Customization, special application options and alternative bearings are available.

Fig. No.6Nylon wheel with Chain Sprocket

Specifications of Nylon wheel with bearing:

Bearing Type	Ball Bearing
Bore	20mm
Hub Width	60mm
Load Capacity	800kg
Wheel Diameter	150mm
Wheel Tread Width	50mm
Wheel Type	Nylon

Wire Connection:



The R / C input mode is used with a standard radio control transmitter and receiver or a microcontroller that uses the same protocol. The R / C mode is selected by placing switch 1 in the DOWN position and switch 2 in the UP position. If it is run from a receiver, it is necessary to get one or more streamers and connect them according to figure 5.1. If you are using a receiver box, do not connect the power supply to the Sabertooth 5V line because the maximum voltage you can tolerate is 6 V.

TESTING:

APPLICATIONS

1. It is used in server rooms for immediate action in case of fire.
2. The possible application of the multifunctional fire-fighting system has been defined as a group consisting of the chemical and petroleum industry, nuclear power plants, military storage facilities, minefields and the transport of substances. dangerous.

RESULT:

- Pressure on Pump Head: 45 psi
- Pressure on Nozzle Head: 25 psi
- Pressure Loss in System = Pressure on Pump Head - Pressure on Nozzle Head
  = 45 – 25 = 20 psi
- Pump Discharge (Q) = Q = 280/1000 = 0.28m^3/min
- Distance of Projectile:

45*12*2.54 =1371/2 = 13.71 Meter

- Area of Nozzle:

$\frac{\pi}{4} * D_2 = \frac{\pi}{4} * 12$ = 0.000113097 m^2

- Velocity of Water:

0.28/0.000113.97 = 2475.750/ 60 = 41.26 m/s

VII. CONCLUSION

With this, we can conclude that a robot can be used instead of humans reducing the risk of life of firefighters. We can use them in our homes, laboratories, offices, etc. They provide us with greater efficiency. It can be extinguished before it becomes uncontrollable and threatens life. Therefore, this robot can play a crucial role.

REFERENCES

[1] International Research Journal Of Engineering And Technology (Irjet)
Makhare Sonal1, Mane Bharat2, Sapkal Saraswati3, Prof.V.U.Bansude Volume: 04 Issue: 06 | June-2017

[2] Manually Controlled Enhanced Wireless Intelligent
Fire Fighting Robot Sandip Gupta Farogh Ahmad S. SundarAndShanmugasundaram M. School Of Electronics Engineering, Vit University, Vellore, Tamil Nadu, India Vol. 12, No. 21, November 2017

[3] International Journal Of Innovation And Scientific Research Fabrication Of Fire Fighting Robot *Sunil Mathew1, Gaikwad Sushanth1, Kr Vishnu1, V. Vishnu Nair1, And G. Vinoth Kumar2* Issn 2351-8014 Vol. 22 No. 2 Apr. 2016

[4] Firefighting Robot Development AtNmtEe Department By William Feilner, Jordan Keeley, Marco Martinez, And Jeremy Smith Ee Department Robot Development Team Excellent Extinguishers May 7, 2014

[5] Fire Fighting Robot ByNorhakeem Bin Mustapa Faculty Of Electronics And Computer EngineeringuniversitiTeknikal Malaysia Melaka June 2013

[6] International Journal Of Emerging Trends & Technology In Computer Science SahilS.Shah, VaibhavK.Shah, PrithvishMamtora And MohitHapani Volume 2, Issue 4, July – August 2013

[7] Manually Operated Fire Fighting All-Terrain Robot With Fire Extinguisher Using Arduino Micro Controller By VijayalaxmiIcirstm 22 & 23 Jan 2017

[8] Dimensions EnginneringSabertooth 2x12 User's Guide April 2012
[9] Https://Robu.In/