RF CONTROLLED ROBOT

ENGINEERING CLINICS PROJECT REPORT

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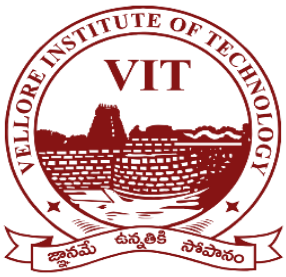

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ABSTRACT

The RF Controlled Robot project presents the development and implementation of a versatile and remotely operated robot using Radio Frequency (RF) communication. The objective of this project is to design a robot capable of traversing diverse environments while being controlled wirelessly from a distance, offering real-time interaction and maneuverability for various applications. The robot's mechanical design focuses on robustness and adaptability to navigate through challenging terrains and confined spaces. The integration of a multi-directional locomotion system, with differential drive and omnidirectional wheels, provides enhanced mobility and agility.

The core components of the project include a robot chassis, motors, motor drivers, microcontroller, RF transmitter and receiver modules, power source, and optional sensors for enhanced functionality. The microcontroller serves as the brain of the robot, orchestrating the execution of commands received from the RF transmitter. The RF transmitter module wirelessly communicates control signals to the RF receiver module situated on the robot, enabling it to perform various movements such as forward, backward, left, and right.

By employing this technology, the project demonstrates the seamless interaction between hardware components and software algorithms to achieve remote control over robotic movements.

INTRODUCTION

RF controlled robot is controlled by using Four push button placed at transmitter side. Here we only need to push the buttons to control the robot. A transmitting device is used in your hand which also contains a RF Transmitter and a RF Encoder. This transmitter part will transmit command to robot so that it can do the required task like moving forward, reverse, turning left, turning right and stop. All these tasks will perform by using four push buttons that are placed on RF transmitter.
Here we present a simple Arduino based RF controlled robot that can be driven remotely. This robot can be built very quickly on a small budget. The RF remote control provides the advantage of a good controlling range (up to 22 meters with proper antennae) besides being omnidirectional.
The robot is controlled wirelessly using the Rf (ASK) transmitter and receiver module. Both the circuits consist of two Arduino Boards and both are powered using 9 V batteries.

BACKGROUND

The background of an RF controlled robot project lies in the convergence of electronics, communication, and robotics. With the advent of wireless technologies like Radio Frequency (RF), the potential for creating efficient and responsive remote-control mechanisms has expanded. The integration of RF modules allows for the transmission of control signals over a distance, enabling users to interact with a robot without direct physical contact. The project's background also reflects the broader trend of automation and the growing interest in robotics as a means to simplify tasks, enhance safety, and provide new experiences.

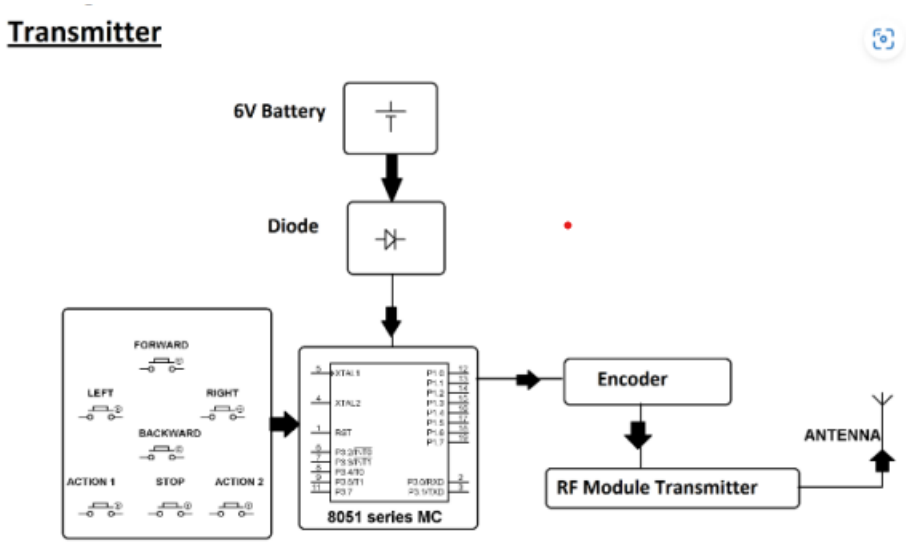
PROBLEM DEFINITION

One of the primary concerns with RF-controlled robots is the range of communication between the robot and the controller. Problems may arise if the robot's range is insufficient for the intended application or if it experiences signal dropouts or interference at certain distances. RF signals can be susceptible to interference from other devices operating on similar frequencies, which can result in erratic behavior or loss of control over the robot. By thoroughly reviewing these aspects and addressing any identified problems, the team can improve the overall performance, reliability, and user experience of the RF-controlled robot project.

OBJECTIVES

The objective of an RF (Radio Frequency) controlled robot is to design applications that require wireless communication and remote operation. An obstacle avoiding system and object following system which makes the device more useful in various security-based applications. The main aim is to build a wireless robot using Arduino which can be detect obstacles and follow the object. The objective of an RF (Radio Frequency) controlled robot is to enable remote control of the robot's movement and actions using radio signals. This technology allows operators to control the robot wirelessly from a distance, making it suitable for applications such as surveillance, exploration, remote handling of objects, and more.

BLOCK DIAGRAM

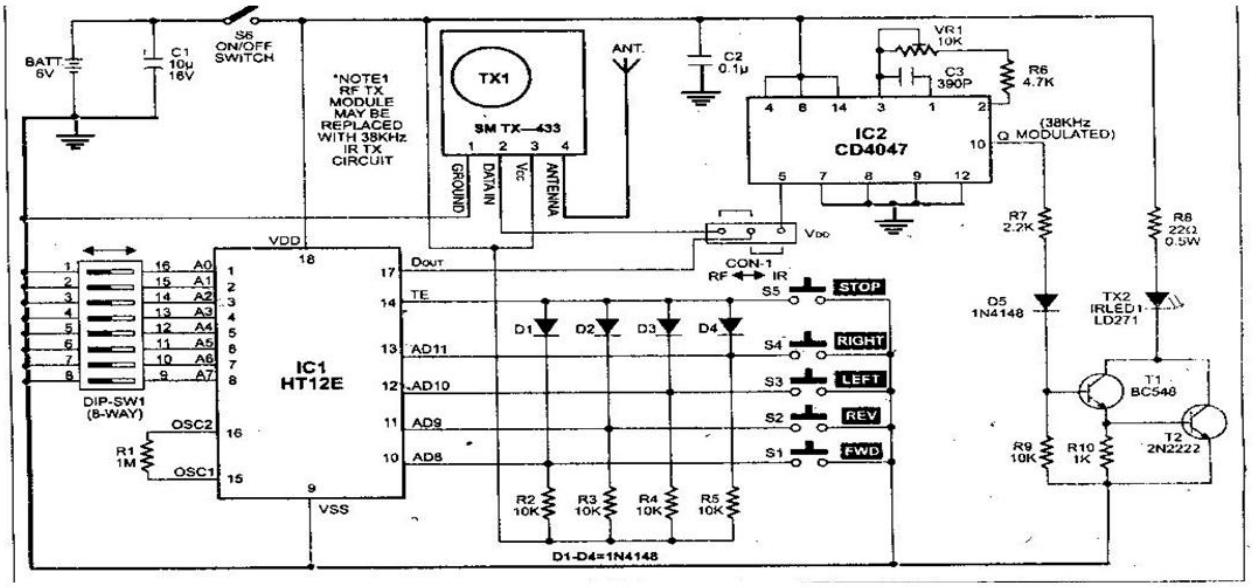


METHODOLOGY AND PROCEDURE:

The operator gives the commands through the RF controller board i.e. remote control which consists of four push button switches. The code which is programmed into Arduino reads whenever a button is pressed since the corresponding digital pin goes LOW. The Arduino generates a signal depending on the command given and this signal is then given to the transmitter module which transmits the command. The transmitted command is received at the receiver end by the receiver module which is interfaced to Arduino board. The transmitter and receiver communicate cross a defined frequency.

The code receives the transmitted byte and based on the command received, a signal is generated and the sensor which is activated will perform the task simultaneously which makes the two motor drivers drive each motors connected to them accordingly. Motors are controlled using the motor driver, with digital write commands. We are introducing three sensors i.e. obstacle detector, object follower and remote controller.

Here is a typical circuit for driving one of the motors, in forward or reverse direction, coupled to, say the left hand front wheel. Simultaneously, the right direction for the moving the vehicle in the same direction. It means that input terminals of the motor drive circuit for the right hand motor have to be fed with reverse polarity control signals compared to those of the left hand motor drive circuit.



COMPONENTS:

1. L293D MOTOR DRIVER

L293D is a motor driver IC which has two channels for driving two motors. L293D has two inbuilt Transistor Darlington pair for current amplification and separate power supply pin for giving external supply for motors.

2. RF TRANSMITTER

- Frequency Range: 433 MHZ
- Output Power: 4-16dBm
- Input supply: 3 to 12 volt dc

3. RF RECEIVER

- Sensitivity: -105dBm
- Frequency: 1MHz
- Low Power Consumption
- Current 3.5 mA
- Supply voltage: 5 volt

4. LITHIUM ION BATTERY

A lithium-ion or Li-ion battery is a type of rechargeable battery which uses the reversible reduction of lithium ions to store energy.

5. CONNECTING WIRES

Connecting wires allows an electrical current to travel from one point on a circuit to another, because electricity needs a medium through which to move.

We designed the mechanical structure of the robot. And determine the chassis, wheels, motors, and any other mechanical components. Arduino microcontroller that will control the robot's movements and communicate with the RF module (RF transmitter and RF receiver).The electrical circuit, including motor drivers, power supply, and connections to the RF module. Assembled the mechanical components according to design and connect the electronic components and wiring based on the circuit design. Ensured proper insulation and secure connections to avoid short circuits.

The Arduino microcontroller handle the RF communication, motor control, and any sensors that are being used. Configure the RF module's communication settings (frequency, data rate, addresses, etc.). Implement algorithms for controlling the robot's movements (forward, backward, left, right) based on the commands received via RF. We have coupled a 30rpm geared DC motor to the left front wheel and another identical motor to the right front wheel. Both these front motors are mounted side by side by facing in opposite direction

Set up the communication protocol between the remote control and the robot. Define the commands (such as movement instructions) are encoded, transmitted, and decoded. Implemented error checking mechanisms to ensure data integrity during transmission. Tested the RF communication to ensure the robot responds correctly to commands from the remote control. Double-check all connections, wires, and components to ensure everything is properly connected and insulated. Tested the range of the RF communication to ensure it operates within the desired distance.

FUTURE APPLICATION:

This project concept is widely used in ROBOTICS

1. The installation in loading vehicles may carry the loads in industries
2. The new and widely used PLC systems are used for AUTONOMOUS TECHNOLOGY.
3. It also used as servant robot by implementing AUTOMATIC GUIDED VEHICLE (AGV) .
4. It also act as sample collector and observing the behavior of animals where human beings cannot reach.
5. By implementing NANOTECHNOLOGY in project, it also generates power for itself and project work 24 hours.
6. By using VOICE RECOGNITION SYSTEM we also control the project on commanding in our voice.
7. On implementing Microprocessor programming we also used it as automatically controlled robot or a vehicle.
8. The project also used in alma maters as a supplementary carrier during examinations.
9. On implementing camera and spy devices we also get the pictures and information during charged suspect.

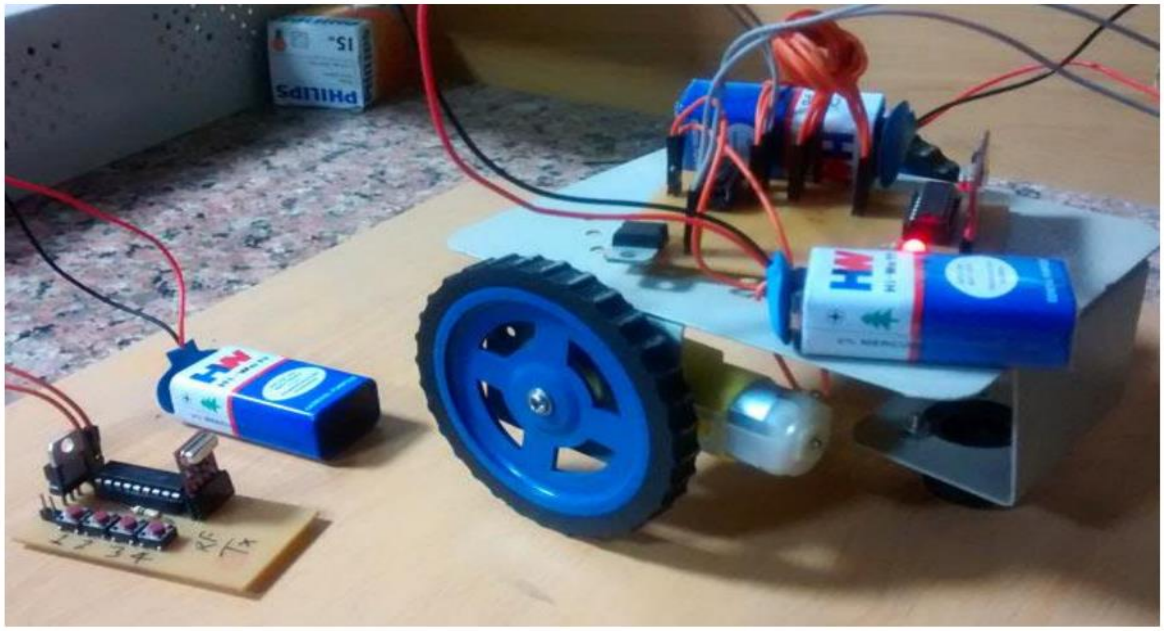
Wireless control devices are gaining enormous applications in robotics and industrial automation applications. The main objective of our project RF based spy robot is implement a radio frequency based wireless robot using a micro controller. In This RF based robot project we high lightened the importance of automated robots in defense and automatic guided vehicle systems.

RESULTS:

OBSTACLE AVOIDANCE: Obstacle Avoiding Robot is an intelligent device that can automatically sense the obstacle in front of it and avoid them by turning itself in another direction. This navigate in an unknown environment by avoiding collision.

OBJECT FOLLOWING: Object Following Robot is one of the modes of our project, which works by attaching a transmitter to the object and a receiver on the follower.

RF (Radio Frequency) controlled robots offer a valuable and versatile solution for various applications that require wireless communication and remote operation.



CONCLUSION

RF (Radio Frequency) controlled robots offer a valuable and versatile solution for various applications that require wireless communication and remote operation. Throughout this exploration, we have highlighted the numerous advantages of RF-controlled robots, such as their wireless communication, remote operation capabilities, real-time response, and adaptability to different environments. But now we have also developed obstacle avoiding system and object following system which makes the device more useful in various security-based applications. RF-controlled robots will continue to empower users and open up new possibilities across diverse fields of application.

FUTURE SCOPE

The future scope of the RF controlled robot project holds exciting potential for advancement. By integrating sensors, the robot could achieve autonomous navigation and obstacle avoidance. Incorporating a wireless camera module could enable real-time surveillance capabilities. Gesture control offers intuitive manoeuvring while a network of robots could collaborate for exploration or rescue missions. IoT integration allows remote monitoring and control. Machine learning enhances decision-making, and VR interaction provides immersive experiences.

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CODES IN APPENDIX

```
#define rf1 2
#define rf2 3
#define rf3 4
#define rf4 5
int m1=10;
int m2=11;
int m3=12;
int m4=13;
int md=0;
const int pingPin = A5; // Trigger Pin of Ultrasonic Sensor
const int echoPin = A4; // Echo Pin of Ultrasonic Sensor
long duration;
int distance;
void setup() {
Serial.begin(9600);
pinMode(pingPin,OUTPUT);
pinMode(echoPin,INPUT);
pinMode(rf1,INPUT_PULLUP);
pinMode(rf2,INPUT_PULLUP);
pinMode(rf3,INPUT_PULLUP);
pinMode(rf4,INPUT_PULLUP);
pinMode(m1,OUTPUT);
pinMode(m2,OUTPUT);
pinMode(m3,OUTPUT);
pinMode(m4,OUTPUT);
digitalWrite(m1,0);
digitalWrite(m2,0);
digitalWrite(m3,0);
```

```
digitalWrite(m4,0);
}
void loop() {
 digitalWrite(pingPin, LOW);
delayMicroseconds(2);
digitalWrite(pingPin, HIGH);
delayMicroseconds(10);
digitalWrite(pingPin, LOW);
duration = pulseIn(echoPin, HIGH);
distance=duration*0.034/2;
Serial.println(distance);
if(digitalRead(rf1)==0 && digitalRead(rf2)==0)
{
   md=0;
  Serial.println("MODE 0");
}
  if(md==0)
 {
  if(digitalRead(rf1)==0)
 {
digitalWrite(m1,1);
digitalWrite(m2,0);
digitalWrite(m3,1);
digitalWrite(m4,0);
}
else if(digitalRead(rf2)==0)
{
digitalWrite(m1,0);
digitalWrite(m2,1);
digitalWrite(m3,0);
```

```
digitalWrite(m4,1);
}
else if(digitalRead(rf3)==0)
{
digitalWrite(m1,1);
digitalWrite(m2,0);
digitalWrite(m3,0);
digitalWrite(m4,1);
}
else if(digitalRead(rf4)==0)
{
digitalWrite(m1,0);
digitalWrite(m2,1);
digitalWrite(m3,1);
digitalWrite(m4,0);
}
else
{
digitalWrite(m1,0);
digitalWrite(m2,0);
digitalWrite(m3,0);
digitalWrite(m4,0);
 }
}
if(digitalRead(rf3)==0 && digitalRead(rf4)==0)
{
   md=1;
   Serial.println("MODE 1");
  }
  if(md==1)
```

```
  {
   if(distance<30)
  {
     digitalWrite(m1,1);
     digitalWrite(m2,0);
     digitalWrite(m3,0);
     digitalWrite(m4,1);
  }
    else
   {
     digitalWrite(m1,1);
     digitalWrite(m2,0);
     digitalWrite(m3,1);
     digitalWrite(m4,0);
   }
  }
if(digitalRead(rf1)==0 && digitalRead(rf3)==0)
{
   md=2;
  Serial.println("MODE 2");
  }
  if(md==2)
   {
    if(distance<30)
     {
     digitalWrite(m1,1);
     digitalWrite(m2,0);
     digitalWrite(m3,1);
     digitalWrite(m4,0);
    }
```

```
  else
  {
    digitalWrite(m1,0);
    digitalWrite(m2,0);
    digitalWrite(m3,0);
    digitalWrite(m4,0);
  }
 }
}
```