IOT Based ATV Emergency SOS Vehicle

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Abstract:

This paper presents the design and implementation of a versatile 6x6 all-terrain vehicle (ATV) rover equipped with innovative features for remote operations, particularly in emergency response and surveillance scenarios. The rover is equipped with advanced features including Bluetooth control, solar-charged cells with wireless charging capability, a drone pad for aerial deployment of first aid supplies and surveillance, a high-resolution camera, an adjustable platform for a robotic arm, and an ECG sensor for monitoring vital signs. The vehicle also includes a smartphone with emergency numbers and a wireless headset for communication during emergencies.

Introduction:

The increasing demand for efficient and adaptable robotic systems in diverse fields such as search and rescue, surveillance, and healthcare has driven the development of novel solutions that can operate in challenging environments. In this context, the design and implementation of a 6x6 ATV rover with advanced features aim to address the need for a versatile platform capable of performing multiple tasks remotely and autonomously. we propose a 6x6 autonomous terrain vehicle (ATV) rover with Bluetooth control, solar charged cells, and wireless charging capabilities. The rover is equipped with a drone pad for easy take-off and landing. It also includes first aid supplies and a surveillance system with a camera and an ECG sensor. The rover can be used for rescue operations, supply aid to victims, and remove obstacles in case of accidents or earthquakes.

The rover is designed to be autonomous and capable of navigating through challenging terrain. It is equipped with a Bluetooth module for wireless control, allowing the user to remotely operate the rover. The rover is powered by solar charged cells, ensuring uninterrupted operation even in low light conditions.

The rover is equipped with a drone pad that can be easily detached and attached. This pad can be used to land and take off a drone for surveillance purposes. The drone can be equipped with a camera for real-time surveillance and an ECG sensor for monitoring the health of individuals or victims in case of emergencies.

The rover is also equipped with a smartphone that contains emergency numbers and a wireless headset. This allows the user to communicate with emergency services or other individuals in case of an emergency.

The rover can be used for various applications, including disaster relief, search and rescue operations, and surveillance. It can be used to supply aid to victims of accidents or earthquakes, remove obstacles, and perform rescue operations.

The need for rapid and efficient response to emergencies, such as highway accidents or natural disasters like earthquakes, has prompted the development of innovative robotic systems. This paper introduces a 6x6 ATV rover designed to access and assist patients in emergencies, remove obstacles, and perform rescue operations. The rover's integrated features enable it to function effectively in challenging environments and provide critical support to emergency response teams.

The 6x6 ATV rover with the described features has a wide range of potential applications, particularly in emergency response, surveillance, and remote monitoring scenarios. Here are some theoretical applications:

1. **Emergency Response**: The rover can be deployed in emergency situations such as highway accidents or natural disasters. Its ability to access patients, deliver first aid supplies via the drone pad, and use the robotic arm for rescue operations can significantly aid in saving lives and providing critical assistance.
2. **Surveillance and Monitoring**: The rover's camera system and drone pad can be used for surveillance and monitoring purposes. It can be deployed in remote areas or disaster zones to provide real-time visual information to response teams or authorities.
3. **Remote Healthcare**: The ECG sensor integrated into the rover allows for remote monitoring of vital signs. This feature can be particularly useful in providing healthcare services in remote or inaccessible areas, allowing healthcare professionals to monitor patients' health status remotely.
4. **Search and Rescue Operations**: The rover's ability to navigate rough terrain and its robotic arm can be invaluable in search and rescue operations. It can help in clearing debris, accessing hard-to-reach areas, and delivering supplies to individuals in need.
5. **Disaster Recovery**: After a disaster such as an earthquake, the rover can be deployed to assess damage, locate survivors, and assist in recovery efforts. Its versatility and

remote operation capabilities make it a valuable asset in disaster recovery scenarios.

6. **Infrastructure Inspection**: The rover can also be used for inspecting infrastructure such as bridges, dams, or pipelines in remote or hazardous areas. Its camera system and drone pad can provide detailed visual information for inspection purposes.

Overall, the 6x6 ATV rover's combination of features makes it a versatile and valuable tool in various fields, particularly in emergency response, surveillance, and remote monitoring applications.

Codes:

I. CODING FOR ROBOTIC ARM

```
#include <Servo.h>

Servo myservo;  // create servo object to control a servo
int pos = 0;    // variable to store the servo position

void setup() {
  myservo.attach(9);  // attaches the servo on pin 9 to the servo object
  Serial.begin(9600); // opens serial port, sets data rate to 9600 bps
```

```
}

void loop() {
  if (Serial.available() > 0) {
    char input = Serial.read(); // read the incoming byte from
Bluetooth

    if (input == 'a') {  // if 'a' is received, move servo to 0
degrees
      for (pos = 0; pos <= 180; pos += 1) { // goes from 0
degrees to 180 degrees
        myservo.write(pos);              // tell servo to go to
position in variable 'pos'
        delay(15);                       // waits 15ms for the servo to
reach the position
      }
    } else if (input == 'b') { // if 'b' is received, move servo to
90 degrees
      myservo.write(90);
    } else if (input == 'c') { // if 'c' is received, move servo to
180 degrees
      for (pos = 180; pos >= 0; pos -= 1) { // goes from 180
degrees to 0 degrees
        myservo.write(pos);              // tell servo to go to
position in variable 'pos'
        delay(15);                       // waits 15ms for the servo to
reach the position
      }
    }
  }
}
```

II. CODING FOR ECG SENSOR

```
// Include required libraries
#include <Arduino.h>
#include <Wire.h>

// Define the analog pin for ECG sensor
const int ECG_PIN = A0;

void setup() {
  // Initialize serial communication
  Serial.begin(9600);
}

void loop() {
  // Read the ECG sensor value
  int ecgValue = analogRead(ECG_PIN);

  // Print the ECG value
  Serial.println(ecgValue);

  // Add a short delay
  delay(10);
}
```

III. CODING FOR ROVER

```
#include <AFMotor.h>    // Library for L293D motor driver
```

```
AF_DCMotor motor1(1);   // Define motors
AF_DCMotor motor2(2);
AF_DCMotor motor3(3);
AF_DCMotor motor4(4);
AF_DCMotor motor5(5);
AF_DCMotor motor6(6);

char command;           // Variable to store Bluetooth
commands

void setup()
{
  Serial.begin(9600);   // Set baud rate for Bluetooth
communication
  motor1.setSpeed(255); // Set motor speed (0-255)
  motor2.setSpeed(255);
  motor3.setSpeed(255);
  motor4.setSpeed(255);
  motor5.setSpeed(255);
  motor6.setSpeed(255);
}

void loop()
{
  if (Serial.available())   // Check if data is available from
Bluetooth module
  {
    command = Serial.read(); // Read the incoming
command

    // Move forward
    if (command == 'F')
```

```
{
  motor1.run(FORWARD);
  motor2.run(FORWARD);
  motor3.run(FORWARD);
  motor4.run(FORWARD);
  motor5.run(FORWARD);
  motor6.run(FORWARD);
}

// Move backward
else if (command == 'B')
{
  motor1.run(BACKWARD);
  motor2.run(BACKWARD);
  motor3.run(BACKWARD);
  motor4.run(BACKWARD);
  motor5.run(BACKWARD);
  motor6.run(BACKWARD);
}

// Turn left
else if (command == 'L')
{
  motor1.run(FORWARD);
  motor2.run(FORWARD);
  motor3.run(FORWARD);
  motor4.run(BACKWARD);
  motor5.run(BACKWARD);
  motor6.run(BACKWARD);
}

// Turn right
```

```
    else if (command == 'R')
    {
      motor1.run(BACKWARD);
      motor2.run(BACKWARD);
      motor3.run(BACKWARD);
      motor4.run(FORWARD);
      motor5.run(FORWARD);
      motor6.run(FORWARD);
    }

    // Stop
    else if (command == 'S')
    {
      motor1.run(RELEASE);
      motor2.run(RELEASE);
      motor3.run(RELEASE);
      motor4.run(RELEASE);
      motor5.run(RELEASE);
      motor6.run(RELEASE);
    }
  }
}
```

Design and Features:

The 6x6 ATV rover is designed with a rugged chassis and six-wheel drive system, enabling it to traverse various terrains with ease. The vehicle is equipped with Bluetooth technology for wireless control, allowing operators to maneuver it from a safe

distance. The rover's power system consists of solar-charged cells, supplemented by wireless charging capability, ensuring continuous operation even in remote locations.

One of the key features of the rover is its integrated drone pad, which enables the deployment of a drone for aerial surveillance or delivery of first aid supplies. The drone pad is designed to be easily accessible and provides a stable platform for take-off and landing, enhancing the rover's versatility and operational range.

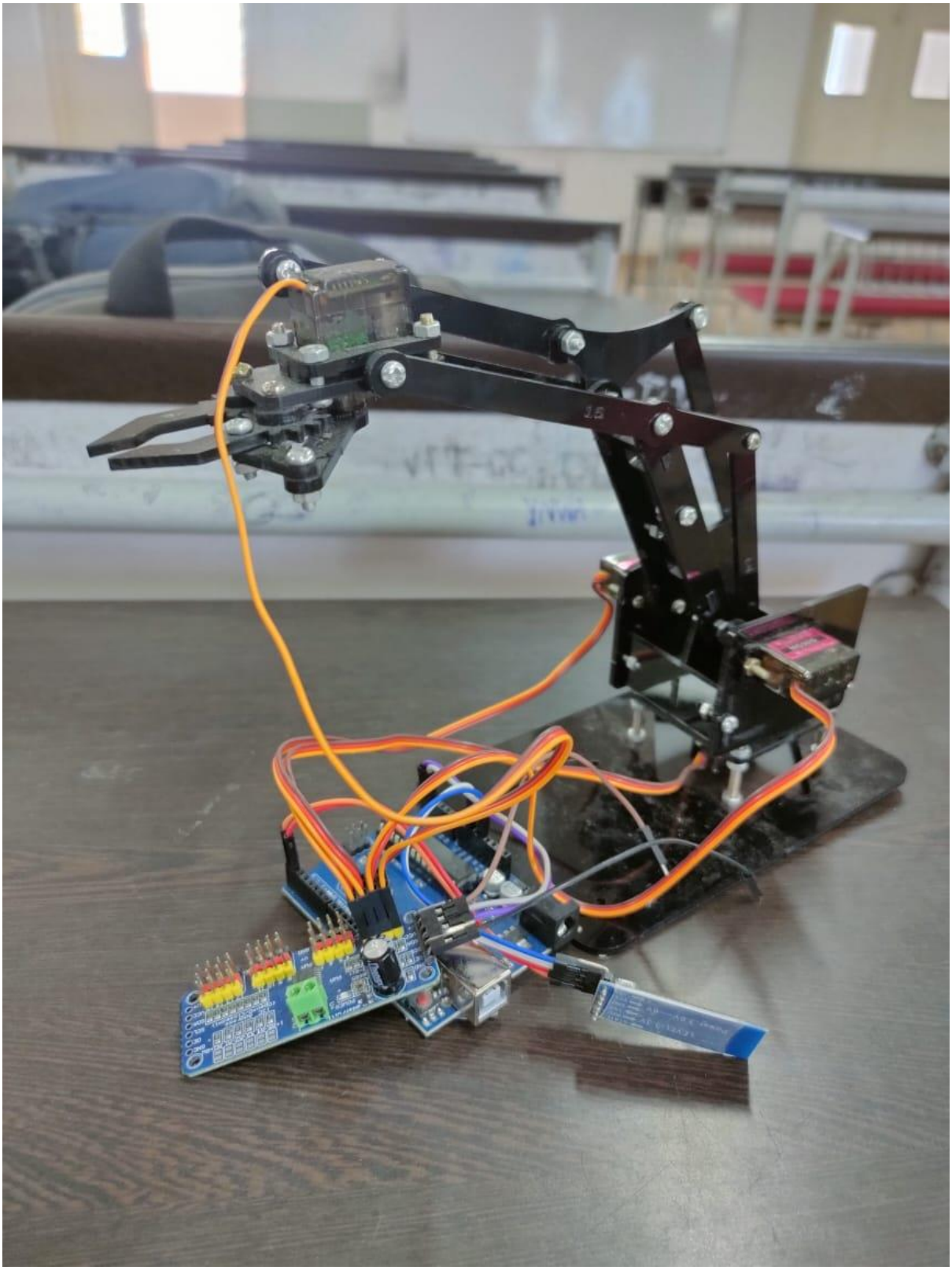
The rover is equipped with a high-resolution camera system for real-time surveillance, providing operators with a comprehensive view of the surrounding area. The camera can be controlled remotely, allowing for precise monitoring and recording of critical events.

Another notable feature of the rover is its adjustable platform, which houses a robotic arm for performing various tasks such as object manipulation or sample collection. The robotic arm can be controlled remotely, enabling precise and dexterous operations in challenging environments.

Additionally, the rover is equipped with an ECG sensor for monitoring vital signs, which can be accessed and analyzed through any cloud-based platform. This feature enhances the rover's utility in healthcare applications, enabling remote monitoring of patients in emergency situations.

HARDWARE IMPLEMENTATION

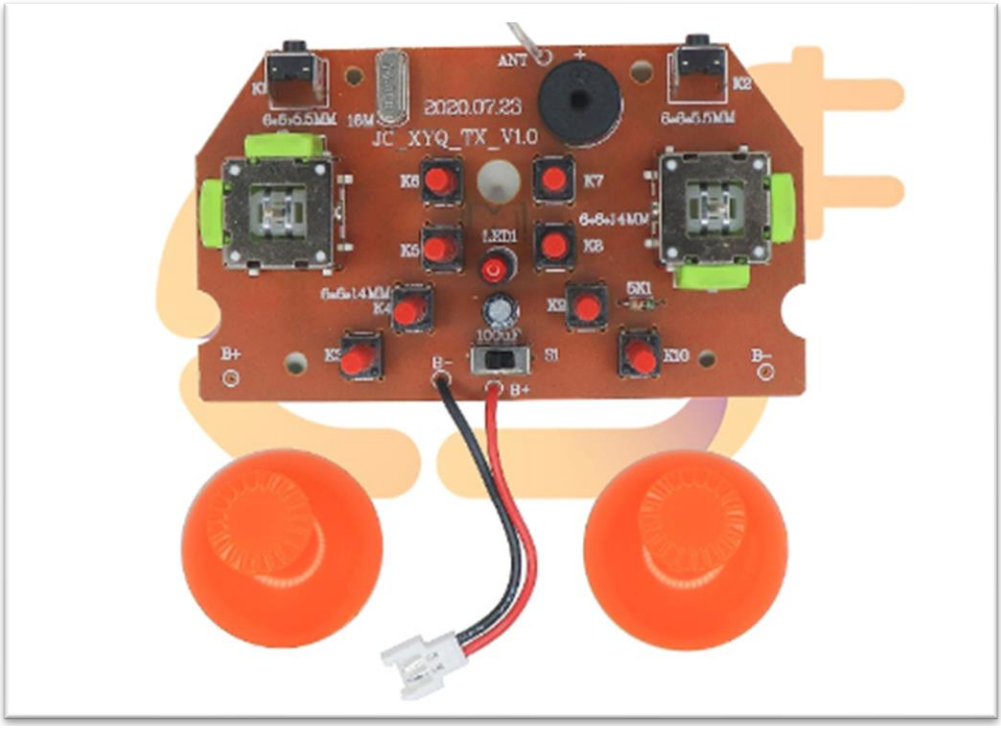
Robotic arm

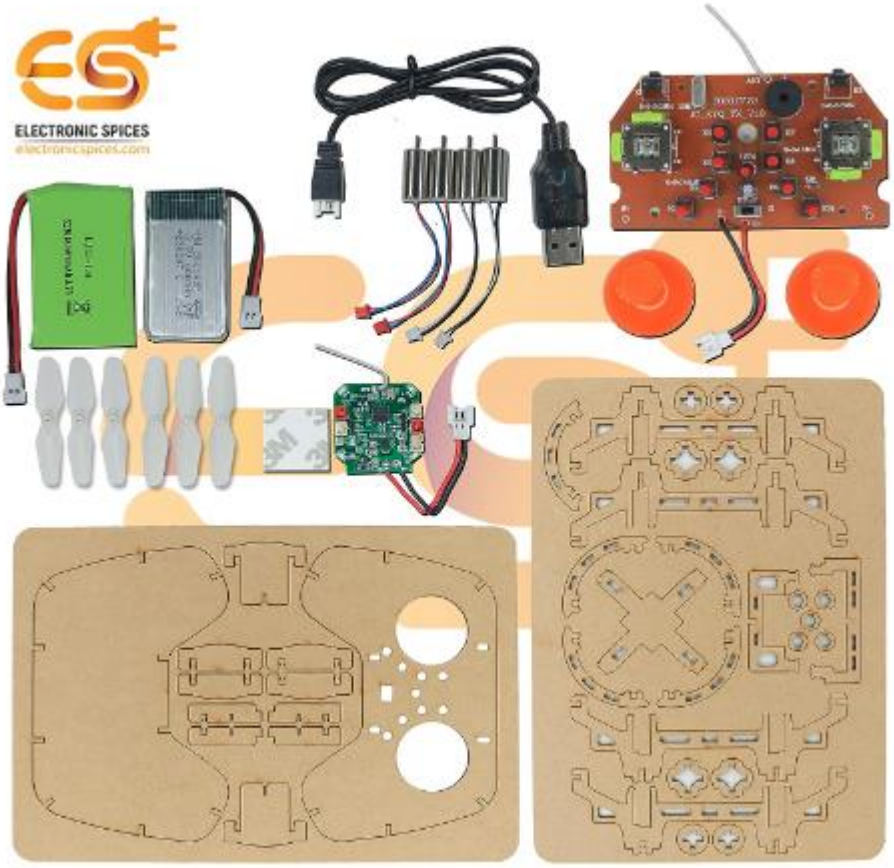


Drone with camera

Receiver module

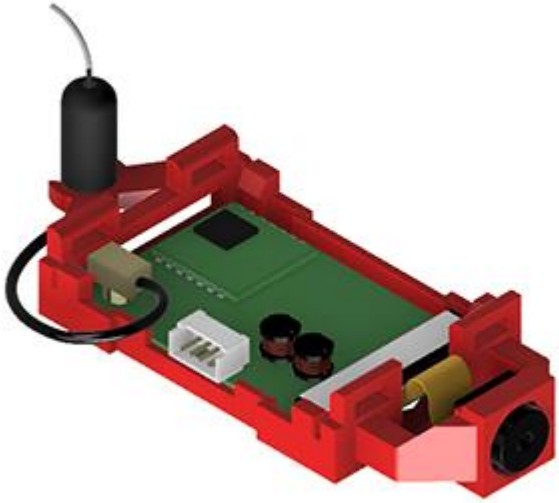
Transmitter board



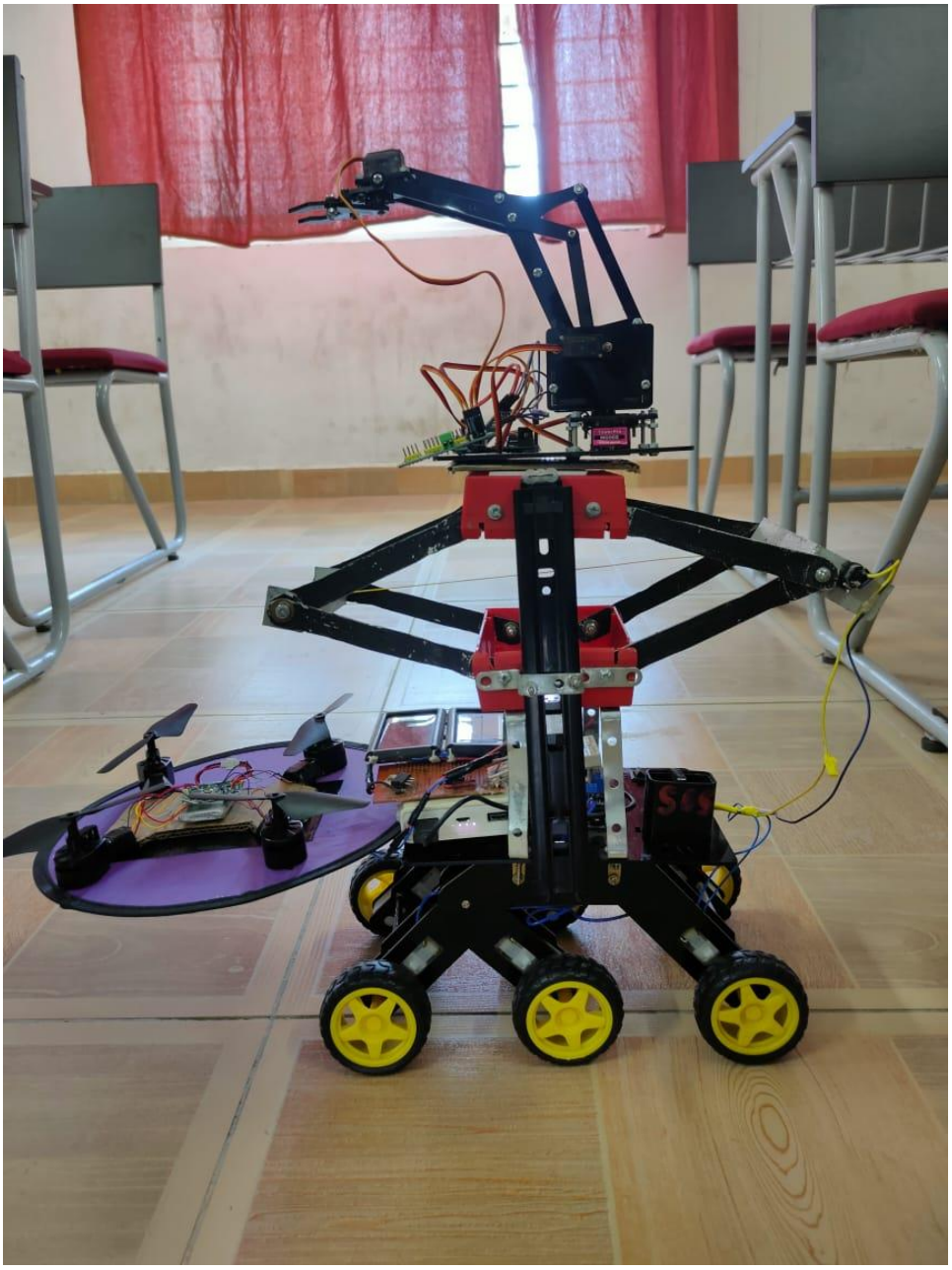


Coreless dc motor

Wireless circit diagram of camera in built gps module

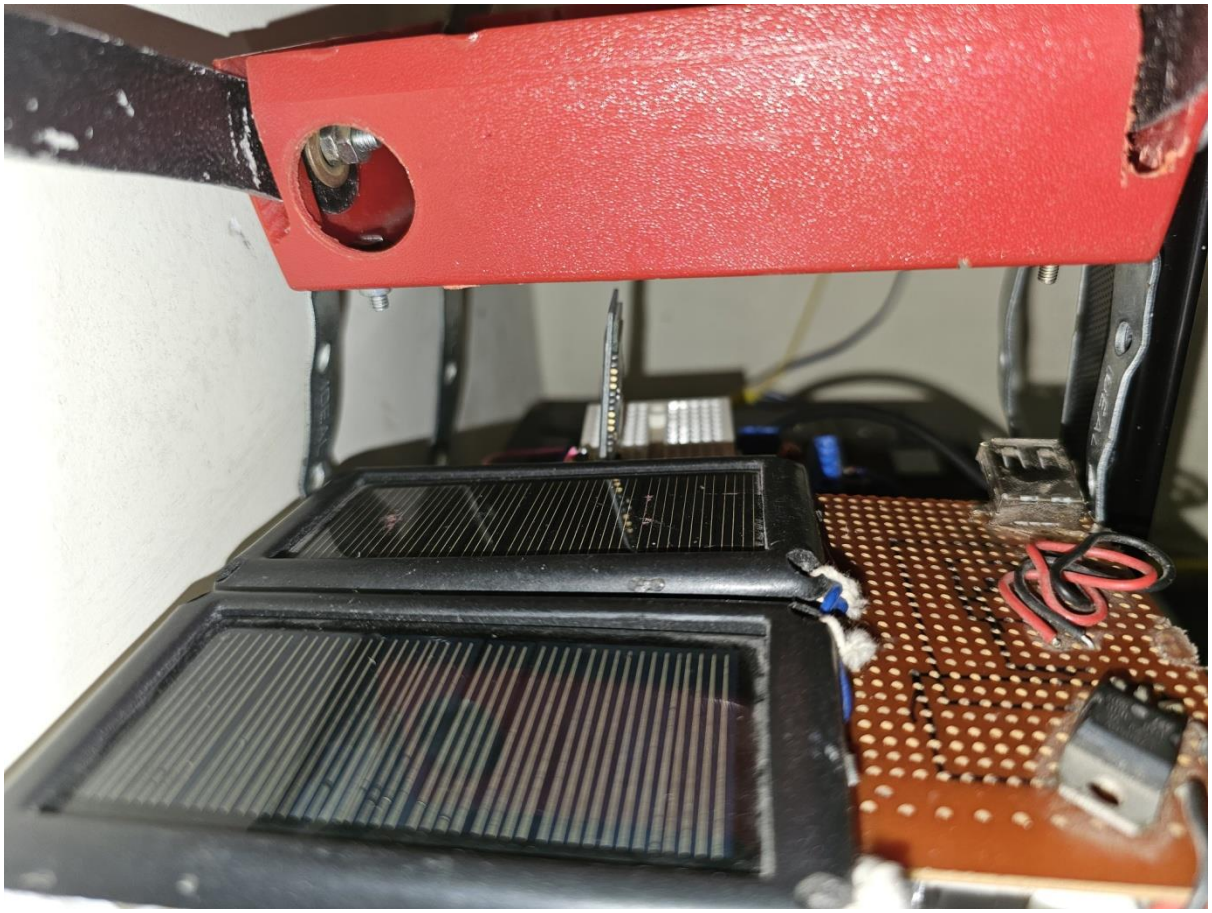


ATV WITH SOLAR CHARGER AND WIRELESS CHARGER

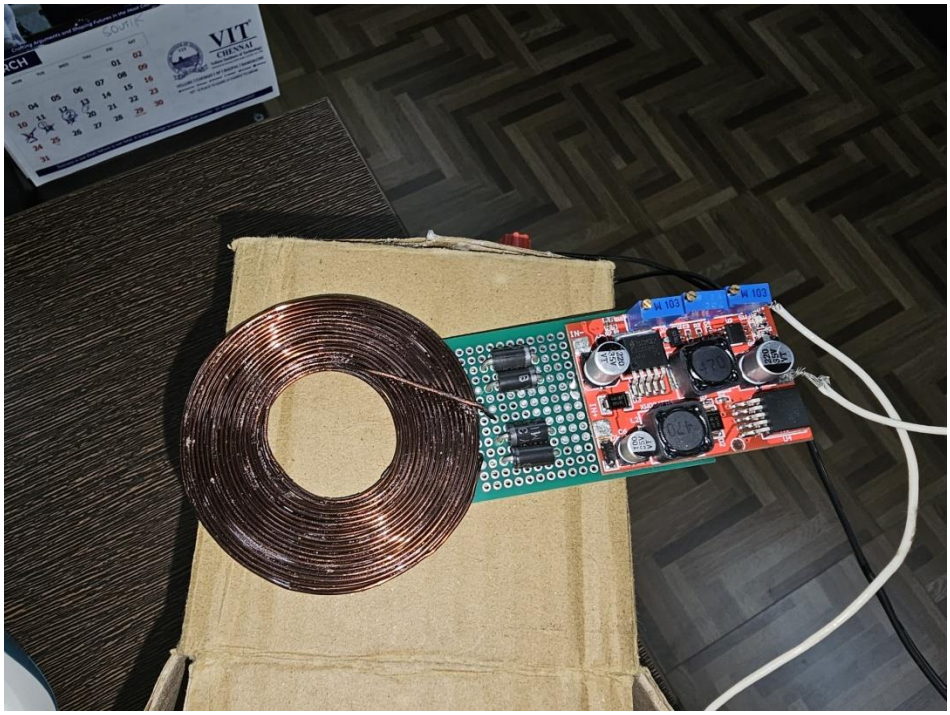


Adjustable platform

SOLAR CHARGING MODULE



Wireless charger module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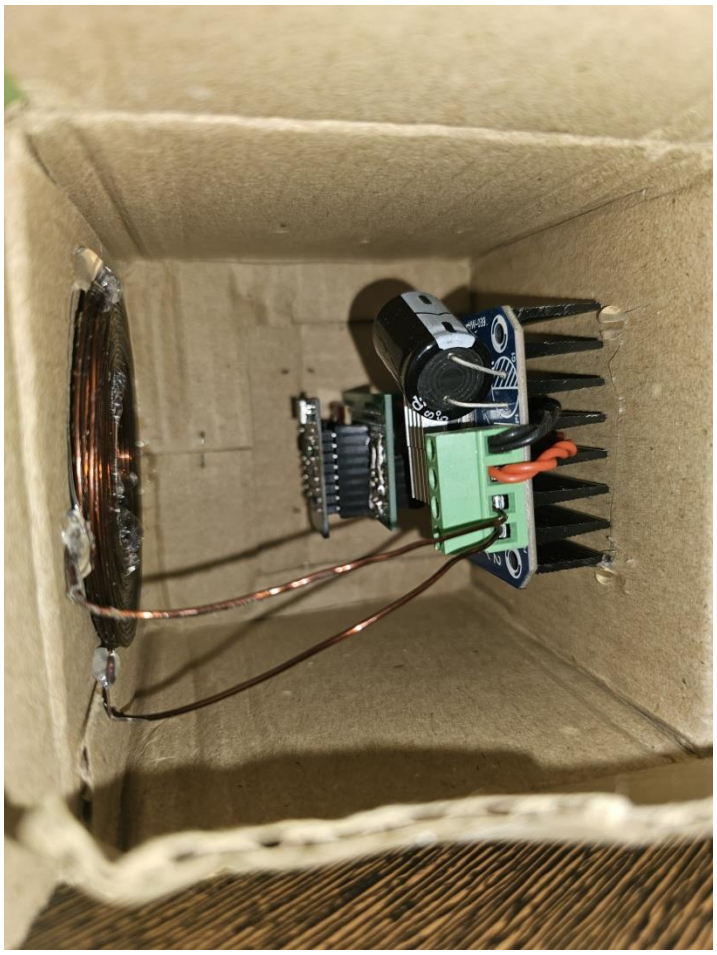
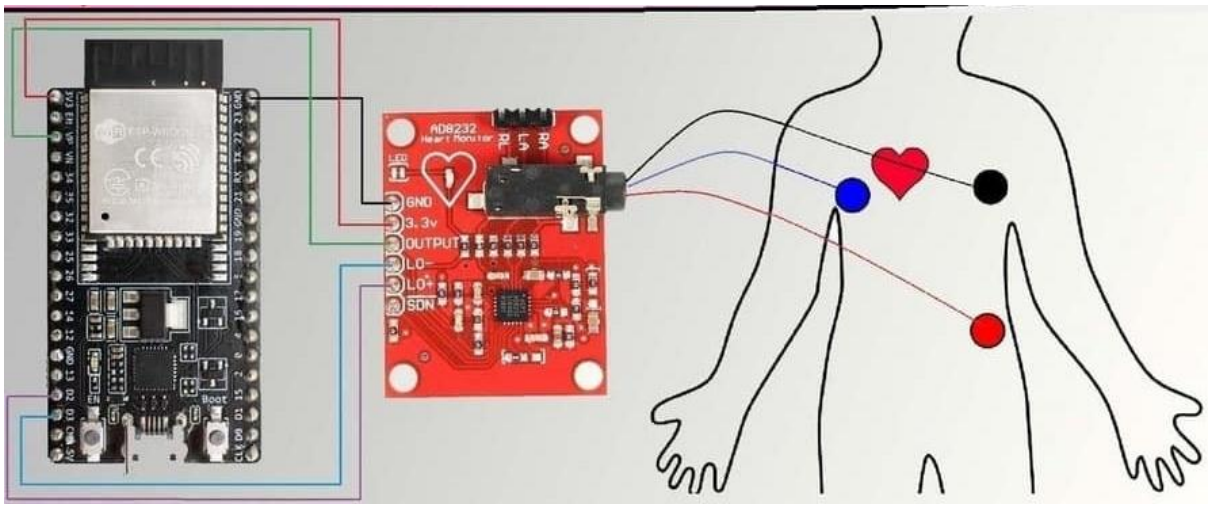


Ecg sensor


AD8232
Heart Monitor
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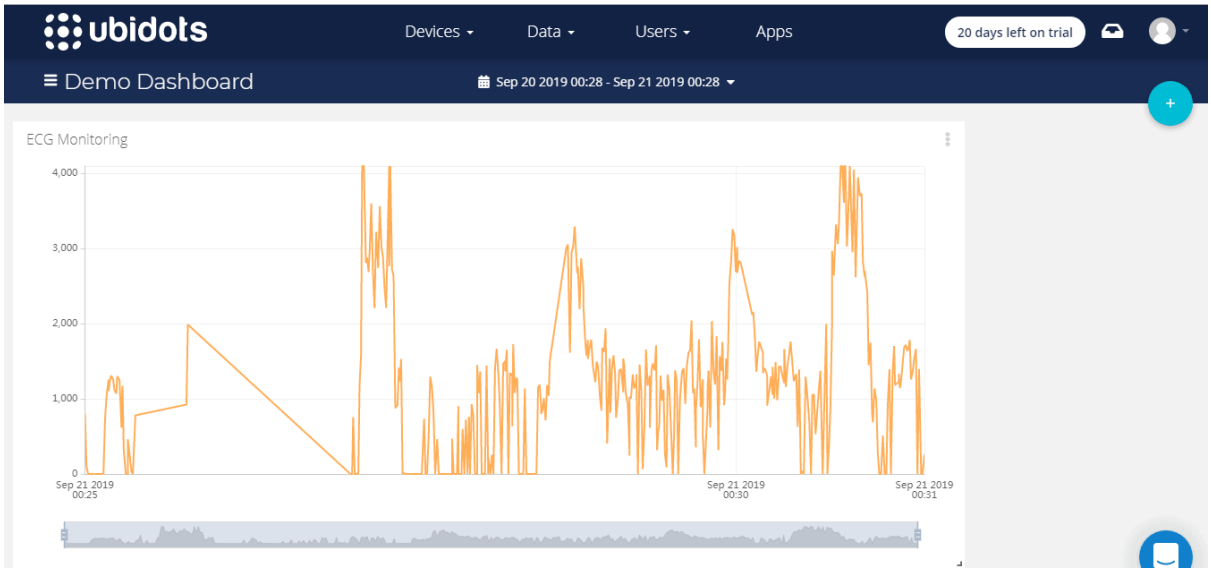
3.3v
OUTPUT
LO-
LO+
SDN


ubidots
Devices
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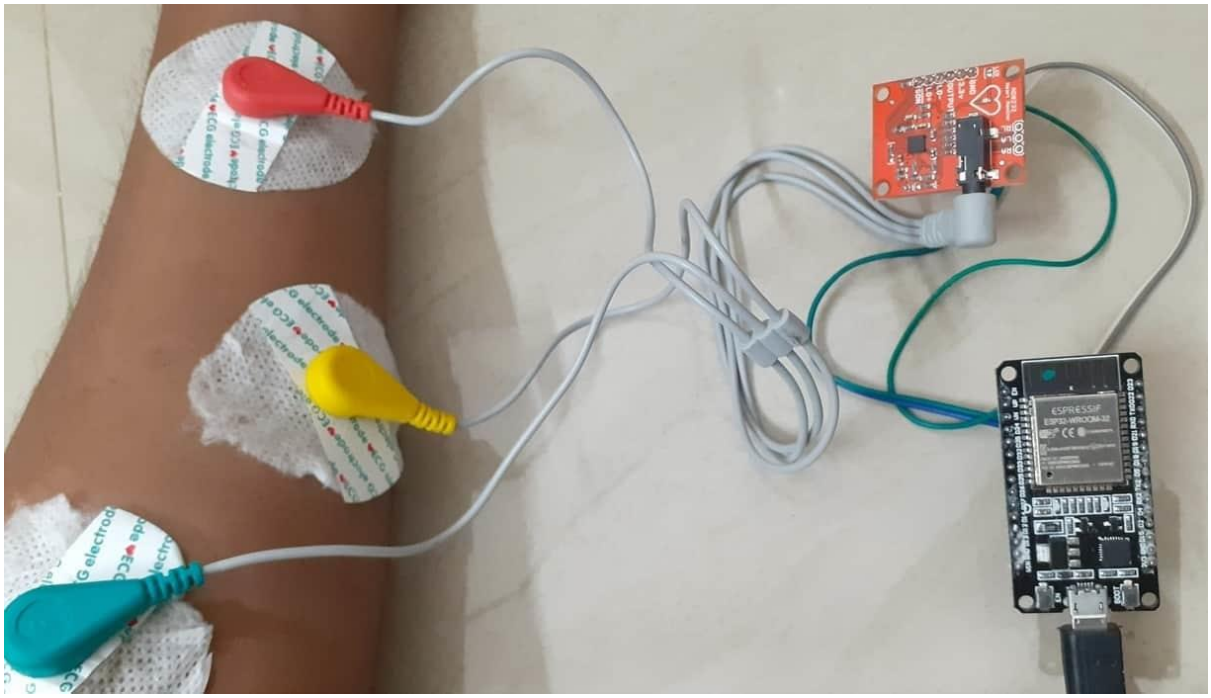
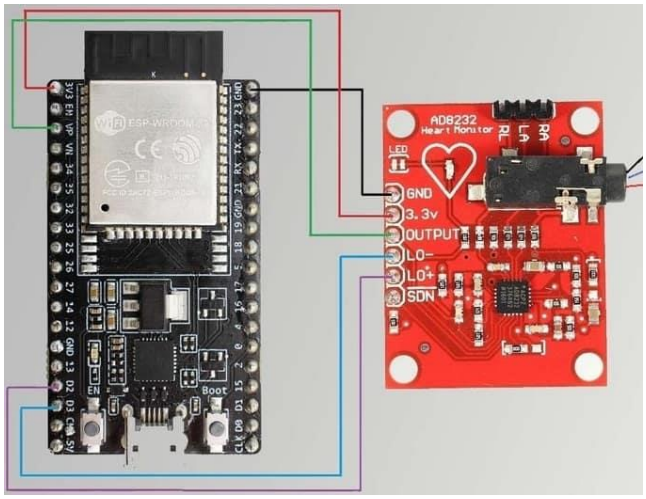




Wireless charger theoretical;

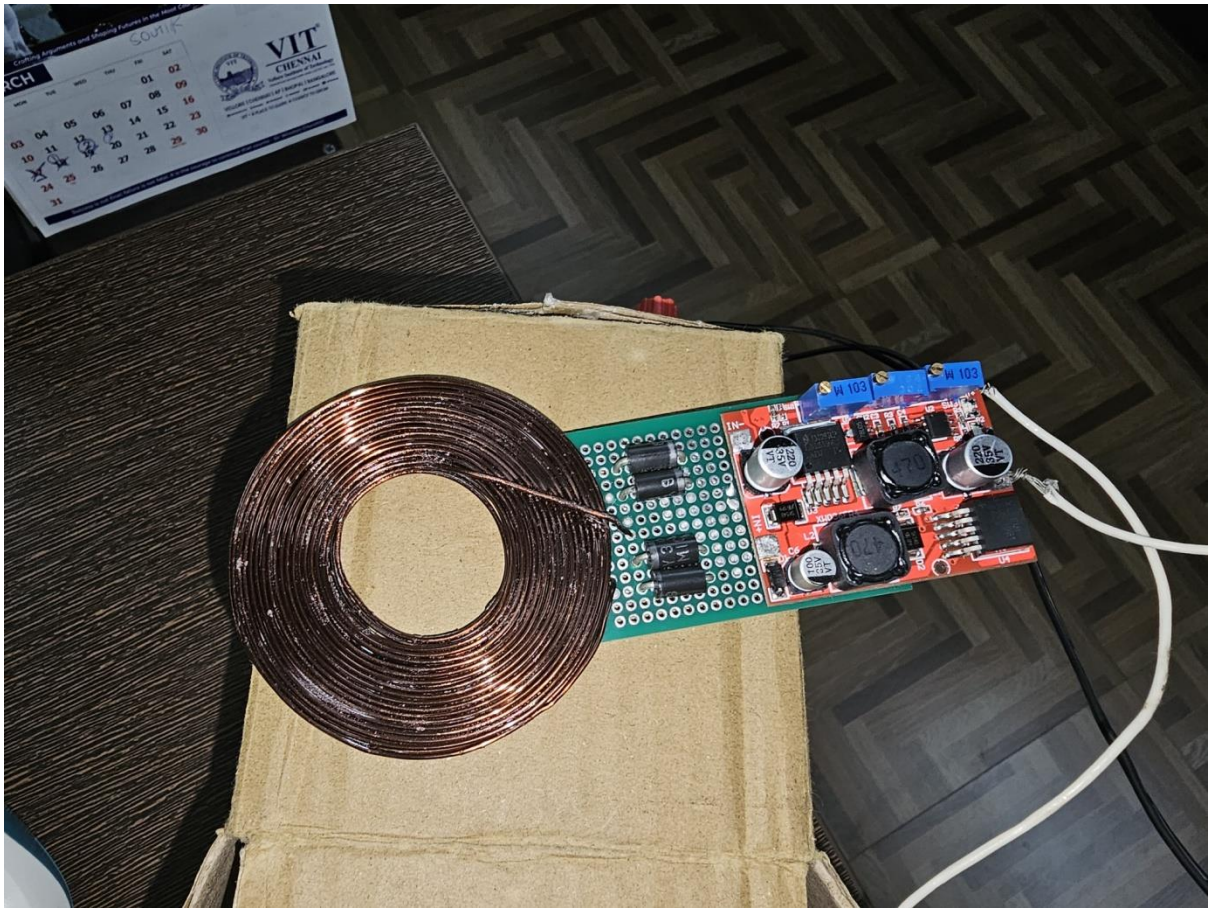
This project utilizes wireless energy transfer to operate a captivating motor rotation system. By employing an advanced H-bridge MOSFET driver, an alternating current effortlessly flows through a primary coil, resulting in the creation of a captivating electromagnetic field. As a result, this

electromagnetic field induces a corresponding current in a secondary coil, enabling the fascinating transmission of electrical power wirelessly. The skillful utilization of the induced current in the secondary coil powers a motor, leading to an enthralling demonstration of wireless energy in motion.

Introduction

The primary goal of this project is to create a wireless transmission system that is both reliable and efficient. This system aims to address the drawbacks of conventional wired connections, allowing for increased mobility, scalability, and flexibility. The study will examine the existing methods being used and aim to enhance areas where their performance is currently lacking.

The hardware system will encompass the development and assembly of modules for both the transmitter and receiver components. A variety of components can be used to connect to the secondary end as per use.



Requirements for Wireless power transfer

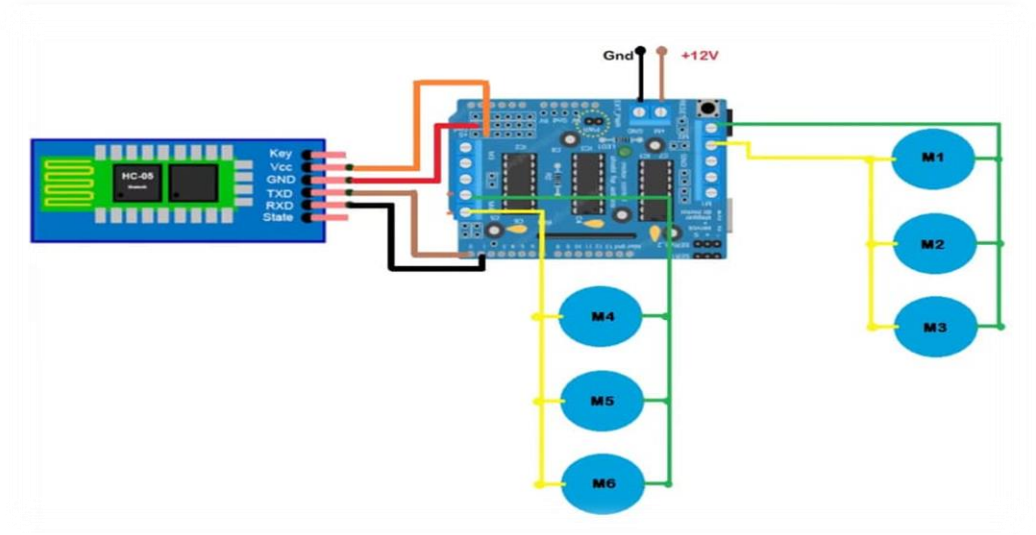
H bridge driver: The H-bridge primary coil driver is a circuit configuration commonly used to control and drive the primary coil of a transformer or an inductor. It consists of four switches arranged in an "H" shape, hence the name. By selectively turning on and off these switches, the H-bridge can effectively control the direction and magnitude of current flowing through the primary coil. This configuration allows for precise control of the magnetic field generated by the coil, enabling applications such as motor control, power conversion, and wireless power transfer.

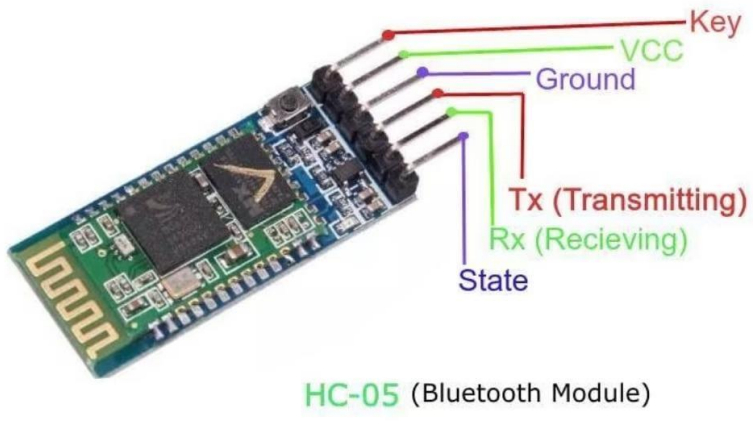
PWM generator: A PWM (Pulse Width Modulation) generator using a microcontroller is a circuit designed to generate variable-width pulses with a specific duty cycle. It involves utilizing a microcontroller, a small integrated circuit that can execute programmed instructions, to generate these pulses. By controlling the duration of the "on" and "off" periods of the pulse, the duty cycle can be adjusted, allowing for precise control over the average power or voltage delivered to a load.

Voltage regulator: A voltage regulator is an electronic circuit or device designed to maintain a stable and constant output voltage regardless of fluctuations in input voltage or load conditions. It ensures that the output voltage remains within a specified range, providing a reliable and regulated power supply to connected components or devices.

Primary and secondary coil: In wireless power transmission, the primary and secondary coils are essential components of the system used to transfer electrical energy without the need for physical contact. These coils are part of an electromagnetic induction process that enables power transfer.

Circuit diagram of rover





HC-05 module

Conclusion:

In conclusion, the 6x6 ATV rover represents a significant advancement in remote robotic systems, with its innovative features and versatile design. The rover's ability to operate in challenging environments, coupled with its advanced

technologies, makes it an ideal platform for various applications, including emergency response, surveillance, and healthcare. Further research and development are needed to enhance the rover's capabilities and explore its full potential in real-world scenarios the 6x6 ATV rover represents a significant advancement in emergency response and surveillance technology. Its innovative design and integrated features make it a valuable asset in highway accidents, earthquakes, and other disaster scenarios. Further research and development are needed to enhance the rover's capabilities and adapt it to a wider range of emergency situations.

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