

ROVER DRONE

Aditya Kushwaha¹, Chaitanya Jaiswal², Amol Sharma³, Ashwani Kushwaha⁴

Mohit Saxena⁵

The Department of Electronics & Communication, United College of Engineering & Research, Prayagraj, Uttar Pradesh.

ABSTRACT

An unmanned aerial vehicle (UAV) is an aircraft without a human pilot, crews or passengers on board and a type of unmanned vehicle. UAVs are basically a component of a system which include a UAV, a ground-based controller, and a system of communications between the two. The aviation of UAVs may be controlled with various degrees of autonomy either with the help of remote control by a human operator or self-directed by onboard computers.

This project will consist of a Rover. It is a vehicle that is a combination of remote-controlled vehicle and robotic system specially designed for exploring and observing the activities.

We have a design combination of Drone and Rover and the structural design of our UAV has changed over its development.

As we have combined both the technologies that are drone and rover into a system (entitled as "Rover Drone") so it will help in monitoring infrastructure and as well in delivery.

This project will be very helpful in dealing with search and rescue operations, bridge inspection, spy and air surveillance.

INTRODUCTION

This project mainly focuses on combining both the technologies that are Rover and Drone into one system as 'Rover Drone' so that it can observe and explore the activities at ground level as well as aerial level.

This project consists of a drone equipped with a car chassis, camera and various sensors which will be helpful in designing a system that is capable of performing various operations such as search and rescue, air surveillance, bridge inspection and humidity and temperature checks. The main objective is to design and

implement a drone and rover in the structure of a quad-copter, development of a flight controller by proper interfacing of sensors controls and a wireless transmission system developed to telemeter the video and GPS data to ground control.

PRINCIPLE

- 1- Drones work on the principle of relative nature of forces or in short Newton's Third law of motion where propellers exert force on air and in reaction air lift the drone.
- 2- The Rover drone is based on the working principle of Arduino UNO R3. This drone has various modules along with flight controllers and sensors which are programmed to perform particular tasks.

MAJOR COMPONENTS

1. **Brushless Motor:** It comprises of a rotor with a permanent magnet and a number of electromagnets surrounding it, these are also called poles. Brushless motors can have anywhere from two to fourteen poles. The more numbers of poles as we have, the more accurately the motor can be controlled. By changing the connections on these wires, you can have the motor spin clockwise or counter-clockwise
2. **Electronics Speed Controller:** Electronic Speed Controller is specifically made for quad-copters and multi-rotors. Which provides faster and more efficient motor speed control resulting in better flight performance. ESC will have three sets of wires. There are three heavy wires that connect to the three wires on the brushless motor.

- Two other heavy-gauge wires connect to the power distribution board, this supplies voltage to the ESC and motors. There will also be 3 smaller wires which connect to the flight controller.
3. **KK2.1.5 Flight Controller Board:** KK 2.1 Flight Controller Board W/ 6050 MPU Board with Atmel 644PA, the LCD screen and built-in software. A host of multi-rotor craft types are pre-installed, simply select craft type, check motor layout/propeller direction, calibrate ESCs and radio and it is ready, all of which is done with easy-to-follow on-screen prompts!
 4. **Flysky FSi6 Transmitter & Receiver:** This is the FlySky FS-i6 2.4G 6CH PPM RC Transmitter With FS-iA6B Receiver. This radio is also really practical with a 3-position switch. It has two adjustable knobs for flight modes/ multiple flap positions. This is a compact 6-channel receiver with a range exceeding 500m in addition; it comes with a dual antenna for excellent reception and interference rejection capabilities.
 5. **Arduino Uno:** This is an ATmega328P based microcontroller board. It has basically fourteen digital input/output pins (of which six can be used as PWM outputs), six as analog inputs, a 16 MHz ceramic resonator, a USB connection, a power outlet jack, an ICSP header and a reset button. It can be powered by the USB cable or by a 9-volt external battery, although it accepts voltages ranging between 7 and 20 volts.
 6. **Battery:** Capacity of the battery goes up so does its weight, and adding weight to your quad-copter will reduce the flight time as more current will be required from your motors to lift the payload. The main specification of the battery is its current capacity, which is estimated in milliamps per hour or mAh. A different specification of the battery is in its voltage. The batteries comprise a number of cells, each cell of a common LiPo battery is capable to provide 3.7 volts.
 7. **Car Chassis:** The car chassis is transparent, consists of 1x Car chassis 2x Gear motor 2x Car tire 2x Speed encoder 2x Fastener 1x Universal wheel 1x Screwdriver 1x Battery box All necessary screw and nut.
 8. **L298 Motor driver:** L298N 2A Based Motor Driver is a high-power motor driver perfect for driving DC Motors and Stepper Motors. It uses the popular L298 motor driver IC and has an integrated 5 V regulator that it can provide to an external circuit. It can control up to four direct current motors, or two direct current motors with directional and speed control.
 9. **ESP 32 Cam Module:** The ESP32-CAM is an Ai-Thinker's Original ESP32 CAM WiFi+Bluetooth with OV2640 Camera Module based on the ESP32 chip with the additional facility of using a camera. It is ideal for various IoT applications. The ESP32-CAM has a very competitive small-sized camera module that can operate independently as a minimum system.
 10. **DHT11 Sensor:** The DHT11 Temperature and Humidity Sensor Module with LED is a small humidity and temperature sensor that you can connect to your Arduino and get readings for temperature and humidity in the environment.
 11. **HC-SR04 (Sonar Sensor):** HC-SR04-Ultrasonic Range Finder is a very popular sensor which is found in many applications where it is used to measure distance and detect the objects. The module has two forward eye-pattern projects in the front that comprises the ultrasonic transmitter and receiver. The HC-SR04 ultrasonic sensor uses sonar to measure the range of an object. The HC-SR04 ultrasonic ranging module offers contactless distance detection capabilities from 2cm to 400cm, with a precision of up to 3mm.

METHODOLOGY

Rover drone is based on the working principle of Arduino UNO R3. This drone has various modules which are programmed to perform particular tasks. Each rotor generates both thrust and torque around its center of rotation, as well as a drag force opposite the direction of flight of the vehicle. Quad-copter achieves lift, yaw, roll and pitch simply via manipulation of the thrusts of four motors relative to each other as shown in fig. below.

This section consists of components required for the flight system of the drone and components used here are flight controller (KK2.1.5), motors, propellers, electronic speed controller (ESC), battery, FlyskyFSI6 radio transmitter and receiver.

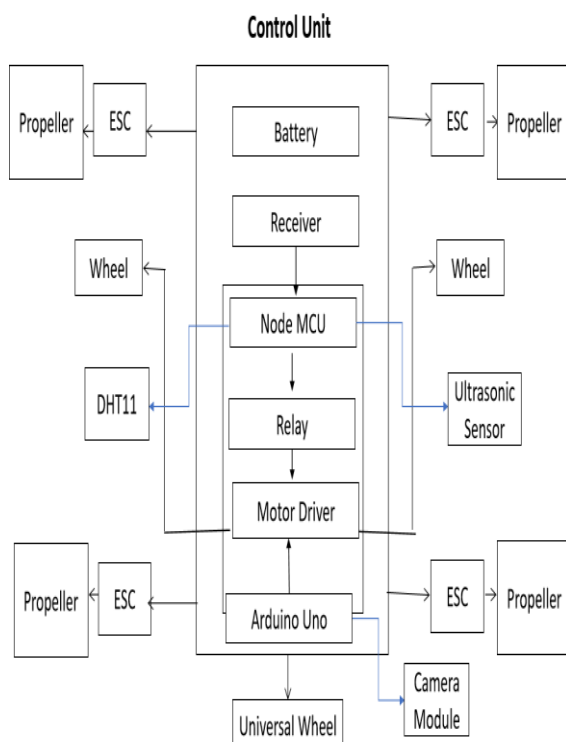
This section consists of Rover, which is our car chassis. In order to observe and explore the activities at ground level we have forward, backward, left and right motion.

Forward: When both the wheels rotate clockwise.

Backward: When both the wheels rotate anticlockwise.

Left and Right: When one of the wheels rotate clockwise and other anticlockwise, the rover will turn towards the left/right.

BLOCK DIAGRAM



RESULT AND DISCUSSION

The Rover Drone is a special kind of vehicle, which can be implemented in different applications. In the future applications, quadcopter could be used for a variety of new policing functions. Rover Drone Could be used for safety inspections, perimeter patrols around prisons and thermal imaging to check for cannabis being grown in roof lofts and other not easy to access locations. The police could use them to capture number plates of speeding drivers, for detecting theft from cash machines, railway monitoring, combat fly-posting, fly-tipping, abandoned vehicles, and waste management. Future research will be in the field of search and rescue. In the future, an effort will be devoted to the development of a system for defining the evacuation/safety route in case of natural disasters and accidents. The system consists of a quadcopter which is equipped with a camera to capture different terrain (land or water) and a processing unit for processing the recorded condition which is placed on the vehicle/vessel or in the form of handheld device. Static changes that affect the safety and health of the population. Aside from natural disasters and accidents, this system can be used in the event of climate change that affect the safety and health of the population, or in cases where it endangers the functionality of different economic systems.

FUTURE ENHANCEMENT

Rover Drone are becoming commonplace in both the commercial and non-profits sectors in future. In the near future their use will be even more widespread with moreover enhancement in technology. Here are some of the many ways unmanned aircraft can revolutionize some important tasks. It is easy to see why drone technology is the future.

• **Agriculture:** In the agriculture sector, the Environmental Protection Agency already uses drone's technology to manage livestock and survey crops. In the future farmers could use

unmanned aircraft to strategically monitor and spray their crops.

- **Conservation:** Rover Drone are being used to monitor endangered species and map the various ecosystems around the world. The impact and use of unmanned aircraft in conservation efforts will expand.

- **Delivery/fulfillment:** In the commercial sector, anything the postman can carry and also be delivered by drone. Generally, Food, prescriptions, that last-minute birthday gift for your dad in the near future, there will be big changes in the way packages arrive at our doors without hustle.

- **Disaster mitigation and relief:** Rover Drones can go places that human can't access, so they are an ideal solution for dangerous search and rescue efforts, as well as for delivering emergency supplies to remote locations.

- **Logistics:** It can work in heavy duty drones and can replace trucks for inventory management and moving goods between remote locations. It helps to decrease the number of hustles you see on the road.

- **Filming and Photography:** Low-budget filmmakers are already using drones to capture the aerial shots and Hollywood will soon be hiring full crews of drone Unmanned aircraft are also gaining ground with journalists who want to capture breaking news from above or live streaming.

- **ISPs:** In Information and Technology, Big tech companies are experimenting with solar powered drone technology to beam Internet to remote locals. This could transform connectivity.

- **Law enforcement:** In law enforcement, police forces might apply for permits to use rover drones, and we'll likely begin to see unmanned aircraft supplementing police presence at large public events.

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