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Military Equipped Drone

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Abstract

The main aim of the project is to develop a hexacopter equipped with sensors used to navigate through an obstacle laden environment. It has the capability to switch it's mode of operation from an aerial drone to a land rover. The rover can be removed and an EMP can be fitted using servo motor. The primary payload can vary from small equipment to even bigger depending on the capacity of the drone. It is of military significance.
Keywords: EMP, UAV, rover, Esc

I. INTRODUCTION

An unmanned aerial vehicle (UAV), commonly known as a drone. Drones are the emerging technology. With the amount of weight drone can carry and with a speed a drone can travel, drones are used for various purposes. This drone is made up for military. This design is of multipurpose autonomous drone which can do multiple functions based on how much battery is used, what are the general drone configurations and how much motor is needed to create a military acceptable system. A cost and utility analysis will be performed to ensure the system will be functional useful in real world.

A rover (or sometimes planetary rover) is a vehicle designed to move across the surface. Some rovers have been designed to transport members of a human spaceflight crew; others have been partially or fully autonomous robots. Rovers are generally used for exploring things. They originated mostly in military applications, although their use is expanding in commercial, scientific, recreational, agricultural, and other applications, like policing and surveillance, product deliveries, aerial photography, agriculture and drone racing.

An Electromagnetic Pulse (EMP), also sometimes called as transient electromagnetic disturbance, is a short burst of electromagnetic energy. Such a pulse's origination may be a natural occurrence or man-made and can occur as a radiated, electric or magnetic field depending on the source.

II. DESIGN OF A HEXACOPTER DRONE

There are various types of drone available in the market. The one which is used in the project is a hexacopter drone along with some special features built in it.

A. Frame

The frame is an object that ties everything in an UAV together. Its purpose is to attach the motors to each other and to support the electronics. The frame needs to be as stiff and it should also have good handling characteristics. These two features are contradictory to each other. The frame also has a number of other secondary requirements. It has to be neither too stiff nor too strong enough to survive an uncontrolled descent and collision with terrain (otherwise known as a crash).The frame used is F550, it is unique and allows for a more stabilized flight. The copters frame arms are built with PA66+30GF, a highly durable material that can better with stand crashes.

B. Hexacopter

A hexacopter has six arms, each connected to one motor. They are arranged in a circular shape above the main body of the hexacopter with three arms moving in a clockwise direction and the other three in anticlockwise direction.

C. Propellers

Propellers come in a variety of diameters and pitches as well as materials like plastic, reinforced plastic, carbon fibre and wood. There are 2 main specifications to consider diameter and pitch. Pitch is the travelling distance per single revolution of the propeller. A lower pitch generates more torque for lifting and hence increases flight time. Flight efficiency is closely related to the amount of the air contacting the propeller. A large diameter is equal to more air contact. Similarly, a smaller propeller requires less effort to speed up and slow down but is less efficient than a large one.

D. KV

The KV rating/value of a motor relates to how fast it will rotate for a given voltage. For our requirement we have chosen a low kV motor (1200Kv) which helps with stability. It is important note that using a lower voltage tends to mean the current draw will be higher (power = current × voltage). In our case it will be 1200rpm/V and a 11.1V, the motor will be45 rotating at 11.1V × 1200rpm/V =13320rpm

E. Payload

Payload is the carrying capacity of an aircraft or launch vehicle, usually measured in terms of weight. Depending on the nature of the flight or mission, the payload of a vehicle may include cargo, passengers, flights crew, scientific instruments or other equipment.

F. Thrust

Propulsive force with units in Newton's, kilogram and lbs. An important rule with multirotor is that all the motors should produce 50% more thrust than the weight of your drone. This means that the motors will have extra trust to control your motor in wind and during aggressive flight manoeuvres.

G. Brushless DC Motor

Like other motors, BLDC motor has a stator and rotor. Permanent magnets are mounted on the rotor. BLDC motors are more reliable and less noisy and lighter than brushed motor with the same power output. Brushes in conventional brushed motors wear out and cause sparkle while brushed motors have longer life span.

H. Electronic Speed Controller

Electronic Speed Controller (ESC) is an electronic circuit to vary the speed, direction and possibly to act as a dynamic brake, of a Brushless Motor. ESC's are used to create a balance between power available, and power requires, they also have an objective in regards to delivering this information in the most effective manner and quickest from possible.

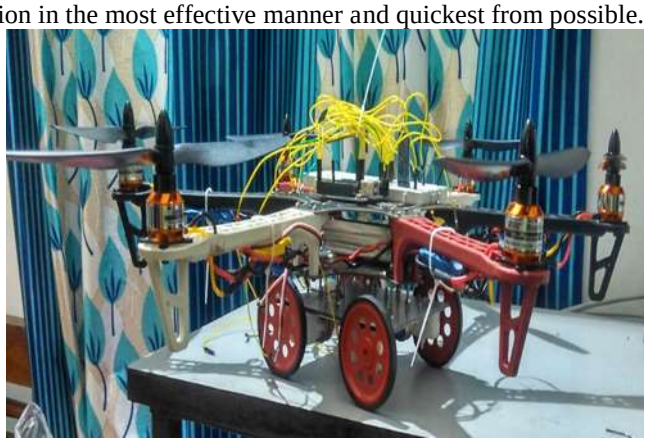

Fig. 1: Drone with rover attached

III. CALIBRATION OF ESC

Process which makes sure throttle range on esc matches the throttle range on radio controller since there are different radios and FCs have their own throttle ranges. Therefore, throttle calibration helps the esc set up low and high throttle end points.
To do the calibration:
Connect the esc to the throttle channel of the receiver. Have a motor connected to ESC as the motor will provide beeps necessary to hear the calibration steps.
Turn on the radio and put the throttle stick to maximum position.
Then connect the ESC to the battery.

The motor should beep 1 2 3 beep followed by two short beeps. Immediately after the two short beeps, put the throttle stick down all the way, the motors should make 3 short beeps and then finally make 1 long beep, indicating that the throttle range has been calibrated.

IV. FEATURES

The different sensors attached to a drone are RF module, IR module, ultrasonic module, GPS module, motor drive module and a camera which helps to function it better than a normal UAV.

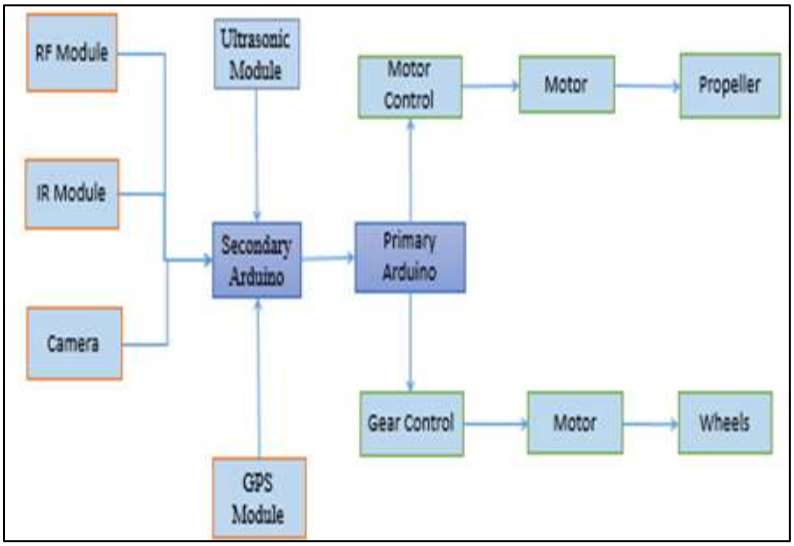

Fig. 2: Block diagram of drone

V. WHAT IS A PID?

A PID controller calculates an 'error' value as the difference between a measured [input] and a desired set point. The controller attempts to minimize the error by adjusting [an output].

A. Tuning Parameters

The main concept is to adjust the output to drive the Input towards setpoint. There are 3 Tuning Parameters: Kp, Ki & Kd. Adjusting these values will change the way the output is adjusted. It decides the whether the drone will be fast or slow. There are no standard tuning values, it changes depending on each multi copter.

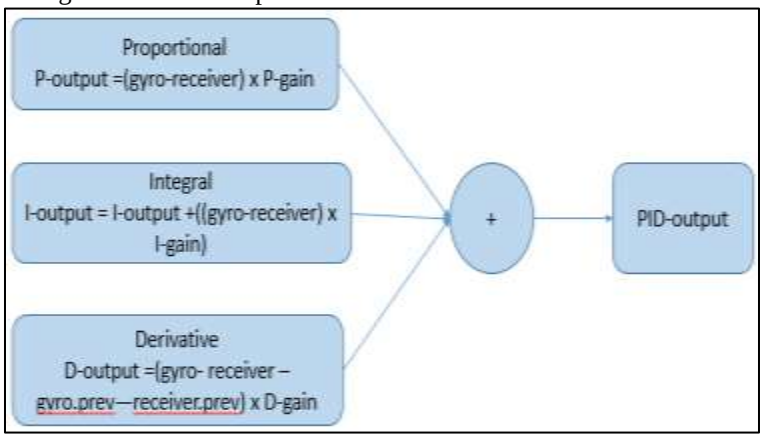

Fig. 3: Block diagram of PID

VI. DESIGN OF A ROVER

A. Chassis

Chassis is the base of the rover on which motor wheels are mounted and holds the whole weight of the drone while moving on the ground. The chassis is made up of lighter adhesive sheet, making it easier to lift.

B. Motor Drive Module

Motor Driver Module allows controlling the speed and direction of two DC motors, or controlling one bipolar stepper motor with ease. The L298N H-bridge module can be used with motors that have a voltage of between 5 and 35V DC.
There is also an onboard 5V regulator, so if your supply voltage is up to 12V you can also source 5V from the board.

VII. EMP

The current era is filled with the most sophisticated & hi-tech microprocessor & microcontroller technology, which controls transport, electricity, communications, etc. An EMP (Electro-Magnetic Pulse) has the tendency to devastate any electronic equipment in its specified path range, causing electronic equipment to burn out. There is a rapid development, use & dependability of modern day equipment, it is almost impossible to continue with the old technology. This makes the Electro-Magnetic Pulse one of the deadliest & terrifying weapon in the world causing huge collateral & infrastructural damage to any nation. This paper includes the miniature prototypes that are developed, so as to demonstrate the effect of Electro-Magnetic Pulse.

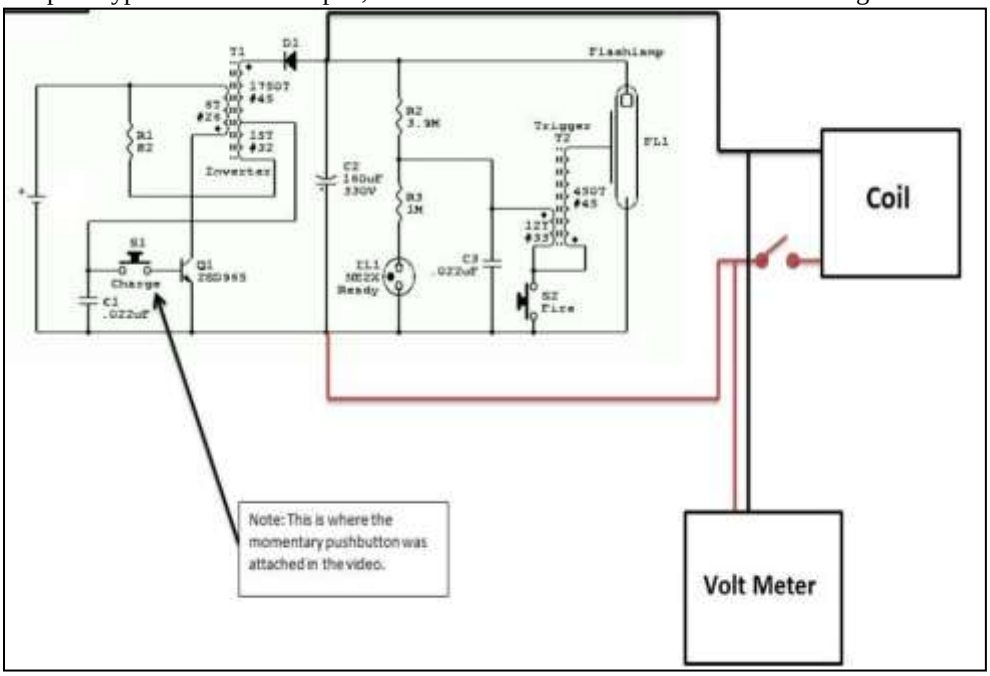

Fig. 4: Schematic Diagram of EMP

VIII. RESULTS AND DISCUSSIONS

Drone and rover is controlled using a Bluetooth module which acts like a path between the controller and drone or rover. When required rover can be removed and EMP can be fitted. Depending on the inputs on the controller the speed of the motor can vary as well as it controls the movement of the rover i.e. forward, backward and reverse. The EMP radiates waves which destroys the electronic equipment's.

IX. ADVANTAGES

A. Enhancing Public Safety

UAS provide superior situational awareness while minimizing the danger to which they are exposed. UAV provide a cost-effective solution for public safety agencies working to enhance public safety more efficiently. Allowing agencies to better protect themselves as they work to protect us and at a fraction of the cost.

B. Mitigating Disasters – Natural and Manmade

UAV help in analysing and mitigating their impacts when time is of the essence. Natural disasters such as volcanoes present conditions too dangerous to observe with manned vehicles.
Manmade disasters such as leaks at a nuclear power plant also prove too hazardous for humans. Under human control and operated remotely, UAS can enter hazardous spaces for long periods of time in a way that humans simply never could.

C. *Protecting the Environment*

UAV can be used to monitor forests for illegal logging, protect green space, observe wildlife and monitor erosion. UAS also examine power plants and other structures for leaks that could pose environmental risks.

D. *Enabling Scientific Research*

UAV remove the risk researchers previously faced while flying in helicopters through hazardous conditions or over difficult terrains

E. *Efficiency in Agriculture*

It enables precise crop management that can boost production and save farmers millions of dollars in time and resources. UAS also provides farmers with a cost efficient way to spray for pests and diseases, manage their crops, and check for signs of drought and blight.

F. *To Stop Cars*

EMPs could stop a vehicle safely, from a distance and without harming the driver or passengers. Because cars increasingly rely on electronics to operate such as microprocessors and electronic components for the engine, stopping them with an EMP is possible.

G. *To Cut through Steel*

Steel-cutting process uses powerful electromagnetic pulses to cut through steel. The EMP device uses a modified coil to convert stored energy to magnetic energy. The coil was modified to ensure the electromagnetic field was powerful enough to pierce the metal. While a laser could cut the steel in 1.4 seconds, the EMP device only needs 200 milliseconds.

X. CONCLUSION

"If there is a distinctive path that modern technological change has followed, it is that technology goes where it has never been," Langdon Winner. The development of drones, has followed this progression. It is a truism that drone technology is rapidly changing. But this is not the whole truth. Some aspects are changing rapidly; others, such as propellers, are changing slowly. A prototype EMP was developed which could destruct electronic equipment's nearby.

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