

## Arduino Based Delivery Drone

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**ABSTRACT:** Drones are unmanned aerial vehicles that are remotely controlled. They range in size from under one pound to several hundred pounds. consumer drones have been available for purchase in greater numbers than ever before, legislation related to no-fly zones needs to be centrally organized. This can be done through the creation of a geo data base and web-GIS map, which will allow for visualization of drone use areas. The study area for this thesis is the state of Maryland, which was chosen because it contains every type of FAA no-fly zone and has not passed any drone use sub-national rules; this allows for the current FAA regulations to be studied and improvements recommended where necessary. This web-GIS map will allow state government policymakers, drone hobbyists, and other members of the public to see where it is appropriate to use drones in Maryland. Visualizing and making drone use data universally available will reduce accidental drone trespassing and will guide users to where drone fly-zones areas are located.

**Keywords:** Arduino, GPS, Gyroscope, ESC, Brushless motor, Bluetooth, Accelerometer, Servo motor.

### Introduction

Quad copter is an assistive device which has a high demand in the industrial & surveillance sector. As the technology has matured and become more mainstream, a number of practical and very interesting uses of Quad copter technology have merged. The present work includes the design and development of the Quad copter using ATMEGA328. This system will either use a GPS system. This system will be controlled by a Bluetooth module a transmitter by sitting inside our home, office, or any place within its transmitter range. This concept will thus facilitate the surveillance activities. The quad copter is useful for in many situations. From the scope of the quad copter, it's used for aerial photography, security and rescue, industrial inspection and much more. The result of this project will help people in

### BLOCK DIAGRAM:

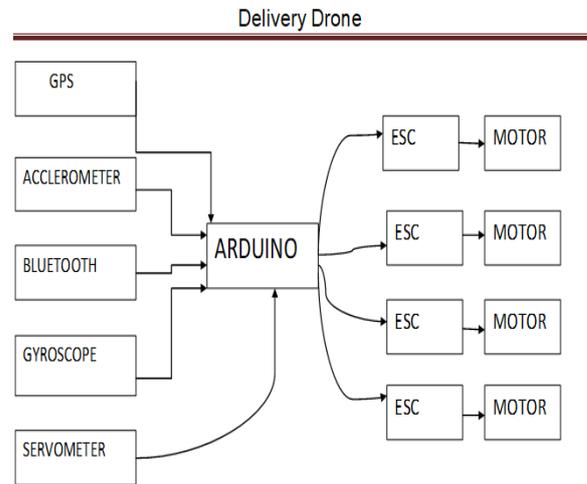


Fig1: System Block Diagram

### BLOCK DIAGRAM DESCRIPTION

#### 1. Arduino

Arduino Uno is an open source physical computing platform used for building digital devices and interactive objects that can sense and control objects in physical world. It's a micro controller, based on AT mega 328P which consist of 14 digital input/output pins (out of which 6 pin are used as PWM output), 6 analog inputs, a USB connector, 16 MHz quartz crystal, power jack, an ICSP header and a reset button. Arduino board consists of everything needed to work with microcontroller. Arduino IDE (Integrated Development Environment) is use to upload programs to the arduino boards and further these programmed boards can be used to perform intended tasks

#### 2. BLDC Motor

Also known as electronically commuted motors. BLDC motors are synchronous motor powered by DC electricity. Rated in KV, where it rotates 1000rpm per 1 volt supplied to it (if its rating is 1 KV). It offers several advantages over brushed DC motors

like more reliability, low noise, reduction in EM Interference (EMI), high torque per watt etc. These motors are little more expensive but they have since they have no brushes, there is less friction and higher efficiency. Typically between 80 to 90%. They are 3-phase AC synchronous motor three alternate voltage are applied to the stator's coils sequentially (by phase shift) creating a rotating magnetic field which is followed by the rotor. The brushless motor's max rpm is dependent on the 3-phase's frequency and on the number of poles:  $\text{rpm} = 2 \times \text{frequency} \times 60 / \text{number of poles}$

### 3. ESC

Four 30A ESCs (electronic speed controllers) are used in proposed Quad copter. It convert the PWM signal received from flight controller or radio receiver and then drives the brush less motor by providing required electrical power. Thus ESC is an electric circuit that controls the speed and direction of electric motor by varying the magnetic forces created by the windings and magnets within the motor. In accordance to the previous diagram, esc takes its input supply from a DC power source, eg LiPo battery. It has an in-build chopper circuit which regulates the dc voltage. This DC voltage is regulated in accordance to the PWM signals send by the transmitter to the receiver which is connected to the ESC. ESC then converts the regulated DC voltage to 3 phases AC Voltage using a 3 phase inverter which is inside the ESC. This change or regulation in voltage causes a change of speed in a motor..

### 4. Li- po Battery

Li-Po (Lithium Polymer battery) is a rechargeable battery of lithium ion technology. They provide higher specific energy and are being used where weight is a critical factor. It also provide high voltage and long run time as they hold huge power in small package and have high discharge rates required to meet the need of powering quad copters

### 5. Gyroscope

The MPU-60X0 is the world's first integrated 6-axis Motion Tracking device that combines a 3-axis gyroscope, 3-axis accelerometer, and a Digital Motion Processor™ (DMP) all in a small 4x4x0.9mm package. With its dedicated I2C sensor bus, it directly accepts inputs from an external 3-axis compass to provide a complete 9-axis Motion Fusion™ output. The MPU-60X0 Motion Tracking device, with its

6-axis integration, on-board Motion Fusion™, and run-time calibration firmware, enables manufacturers to eliminate the costly and complex selection, qualification, and system level integration of discrete devices, guaranteeing optimal motion performance for consumers.

### 6. GPS

Global Positioning System is a space based navigation system that provides location and time information in all weather conditions, anywhere on or near the Earth. This antenna is magnetic so it will stick to the top of any structure.

### Working

An electronic speed controller can be designed with three essential components like a voltage regulator/ BEC (Battery Eliminator Circuit), a Processor & the switching includes FETs. An ESC or electronic speed control mainly follows a speed reference signal to change the speed of a switching network of field-effect transistors. The motor speed can be changed by changing the switching frequency or the duty cycle of the transistors. To make the difference between the motors just check in which way the propeller screw close. It always has to be in the opposite direction as the motor turns. Now we have screwed each motor in place is time to add the ESCs. We can see that each ESC has 3 wires. The ESC middle wire always goes to the middle wire of the motor. But the other two will decide the spin way of the motor.

All the motors are connected to Electronic speed controllers (ESC) which control the speed of the rotors and supply motor the required power. Current speed controllers differ the power to the motor by fast switching the power ON and OFF. Here, MOSFET Transistor is used as a switch instead of a mechanical device, and the amount at which it is switched is

about 2000 times a second. So, the power to the motor is diverse by changing the amount of ON time, against off time in a specified cycle.

When the MOSFET is switched ON, the current rises as the magnetic field in the windings of the motor increases. When the MOSFET is switched OFF, magnetic energy stored in the windings has to be absorbed by the ESC. By cabling a diode across the motor, we return the energy into the motor as current, which rises down as the magnetic field fails.

### Conclusion:

Our research work yielded a successful development of Arduino Uno based Quadcopter at a cheaper and affordable amount. Quadcopter which can be easily made from shelf components. It can be used as a low cost alternative to various applications which includes pesticide sprinkling, end to end delivery within the transmitter's RF range, surveillance in defense and other sensitive places like nation border, mapping through remote sensing, etc. with very high level of precision

### References:

- [1] Stafford, Jesse, "How a Quadcopter works Clay Allen". University of Alaska, Fairbanks. Retrieved 2015-01-20.
- [2] Sandeep Khajure, Vaibhav Surwade, Vivek Badak, "Quadcopter Design and Fabrication," International Advance Research Journal in Science, Engineering and Technology (IARJSET), Vol. 3, Issue 2, February 2016.
- [3] Quadcopter Dynamics, Simulation, and Control, January 26, 2010.
- [4] David Roberts, "Construction and Testing of a Quadcopter," California Polytechnic State University, San Luis Obispo, CA, 93407, June, 2013.

[5] S. Bouabdallah, P. Murrieri, R. Siegwart, "Design and Control of an Indoor Micro Quadrotor", Robotics and Automation 2004. Proceedings. ICRA '04. 2004 IEEE International Conference on, vol. 5, pp. 4393-4398, 2004.

[6] J. Engel, J. Sturm, D. Cremers, "Camera-based navigation of a low-cost quadcopter", IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), pp. 2815-2821, Oct. 2012, ISBN 2153- 0858.

[7]. J. Valvano, "Embedded Microcomputer Systems: Real Time Interfacing", Brooks-Cole, 2000, ISBN