International Journal of Advances in Engineering and Management (IJAEM)
Volume 2, Issue 8, pp: 818-833 www.ijaem.net ISSN: 2395-5252

Design and Implementation of Humanoid Octocopter for All Modes of Transport

Mohammed Nauman Shariff, H.S.Niranjan Murthy
**Department of Electronics and Instrumentation Engineering, M.S.Ramaiah Institute of Engineering, Bangalore, India*
**Associate Prof., Department of Electronics and Instrumentation Engineering, M.S.Ramaiah Institute of Engineering, Bangalore, India*

Date of Submission: 05-11-2020 Date of Acceptance: 15-11-2020

ABSTRACT: This project is about making of an Octocopter which is an aerial vehicle operated to fly independently with a capacity of a single person and is one of the representations of a UAV (Unmanned Aerial Vehicle). The different about this Octocopter compared to others is that it has three modes of travel i.e. it goes on land, air as well as water. They are controlled by pilots on ground or simultaneously driven. They are also called "rotorcrafts" because unlike a fixed wing aircraft, here lift is generated by a set of revolving narrow chord aerofoil. Drones are fascinating, and in this project, we are going to implement the same concept along with their components and about their widespread applications that determine its scope for the future. They are a mixture of streams of Electronics, Mechanical and especially Aviation.
KEYWORDS: Octocopter, Wireless Control, Self Balancing, 3 modes Transport, Multi Terrain Rover, Aviation, No-Fly Zone

I. INTRODUCTION

Research and development of unmanned aerial vehicle (UAV) and micro aerial vehicle (MAV) are getting high encouragement nowadays, since the application of UAV and MAV can apply to variety of area such as rescue mission, military, film making, agriculture and others. Octocopter or octo rotor aircraft is one of the UAV that are major focuses of active researches in recent years. Compare to terrestrial mobile robot that often possible to limit the model to kinematics, Octocopter required dynamics in order to account for gravity effect and aerodynamic forces.

Octocopter operated by thrust that produce by eight motors that attached to it body. Octocopter has advantages over the conventional helicopter where the mechanical design is simpler. Besides that, Octocopter changes direction by manipulating the individual propellers speed and does not require cyclic and collective pitch control.

II. LITERATURE SURVEY

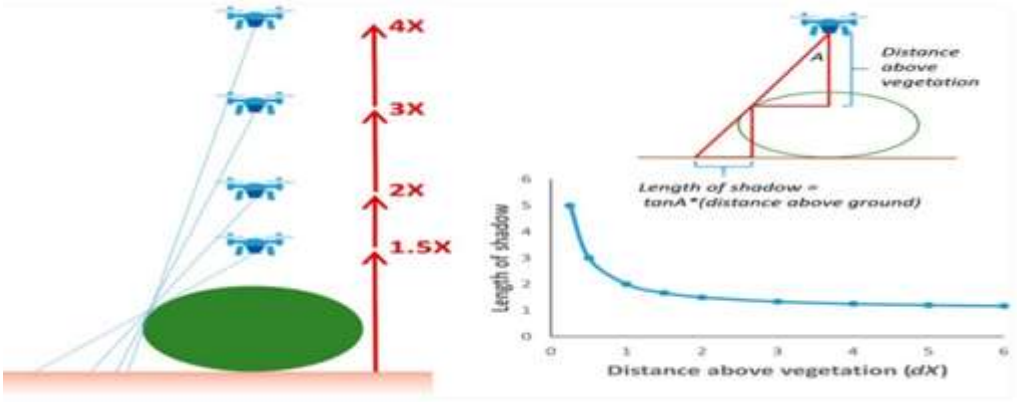
In order to run "Wireless Control Octocopter with Stereo Camera and Self Balancing System" research, several theoretical and techniques are needed. The review includes the technology development and control method that used in Octocopter.

Technology development:

With the increasing application of wheeled mobile robots on soft terrains, the challenge of lateral and longitudinal slippage existing in the contact surface between the wheels and the terrainhas attracted more attention. To address the difficulties caused by the lateral and longitudinal slippage, this paper proposes an improved linear active disturbance rejection control (LADRC) method for path tracking control of a six-wheeled corner steering rover. Based on the LADRC, the tracking differentiator and nonlinear state error feedback are introduced into the improved LADRC. By using the improved LADRC, the influence of disturbances in inputs can be attenuated and a higher regulating efficiency than LADRC can be achieved. The simulations validate the effectiveness of the proposed approach with a good tracking performance.

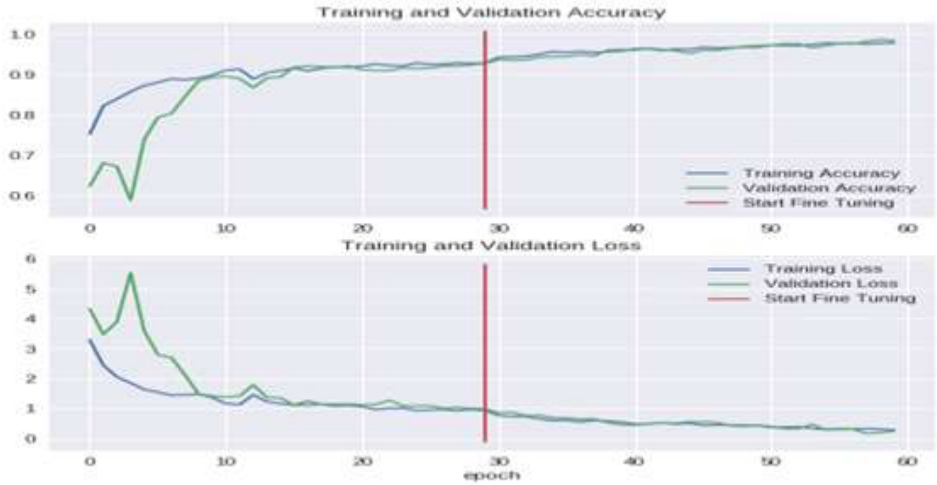
International Journal of Advances in Engineering and Management (IJAEM)
Volume 2, Issue 8, pp: 818-833 www.ijaem.net ISSN: 2395-5252

Figure shows the distance of Octocopter above vegetation



The research work on this paper aims to develop an unmanned aerial vehicle equipped with modern technologies various civil military applications. It is an automatic system the shrinking size and increasing capabilities of microelectronic devices in recent years has opened the doors to more capable autopilot and pushed for more real time UAVs applications. The Unmanned Aerial Vehicle (UAV) market is to grow dramatically by 2020, as military, civil and commercial applications continue to develop. Potential changes in air traffic management include the creation of an information It defines a UAV to be ”An aircraft which is management system to exchange information among Air Traffic Management users and providers, the introduction of navigation, and the development of alternative separation procedures. The impact of each scenario on the future air traffic and surveillance is summarized, and associated issues identified. The paper concludes by describing the need for a UAV roadmap to the future. This paper aims to provide a simple and low-cost solution of an autonomous aerial surveyor which can do aerial surveillance, recognize and track various objects, able in making simple 3d map.

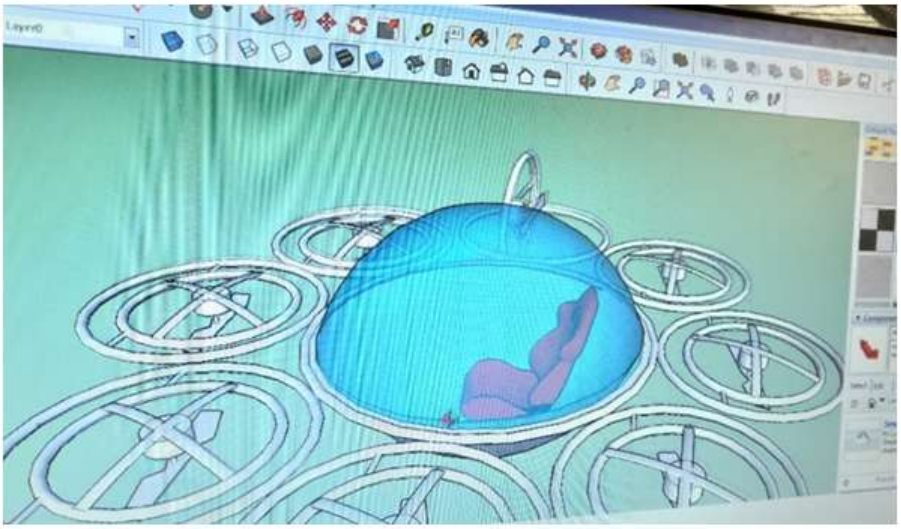
Graph of Validation Accuracy and Validation Loss

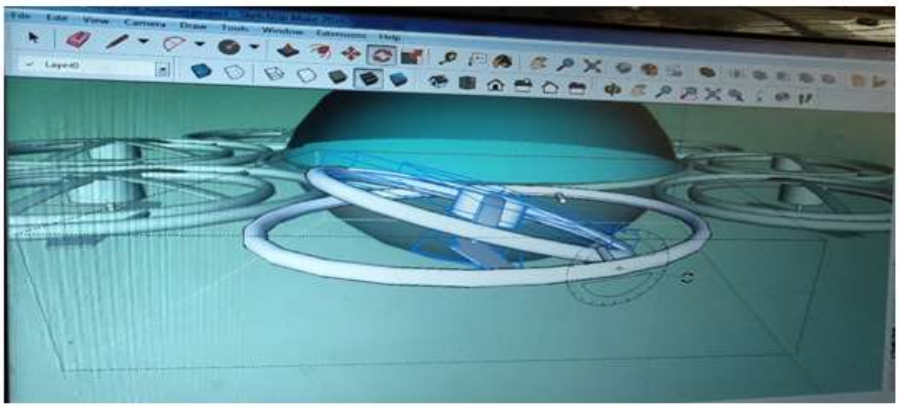


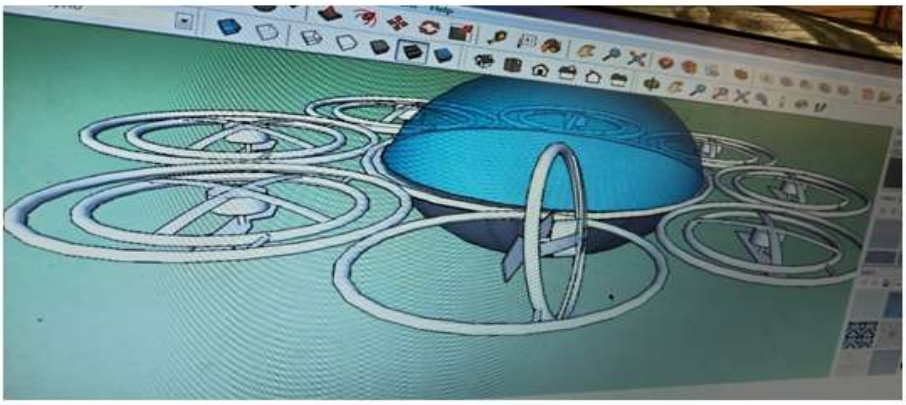
International Journal of Advances in Engineering and Management (IJAEM)
Volume 2, Issue 8, pp: 818-833 www.ijaem.net ISSN: 2395-5252

III. SYSTEM DESCRIPTION AND OPERATION

First of all, the Octocopter design is very important for proper stability of the system and since we have used all the 3 modes of transport, it will make the design quite complicated. The design is made in such a manner that during each mode of transport the design gets changed. As in, if you take for land transport, all the rings of the Octocopter get rotated to 90 degrees and by the rotation of the propeller the Octocopter moves front and back. If you take for water transport the movement of rings would be same as for land, but a float comes into picture. And finally, for movement in air, the rings get back into its normal position and by the rotation of the propeller the Octocopter goes up and down**.**

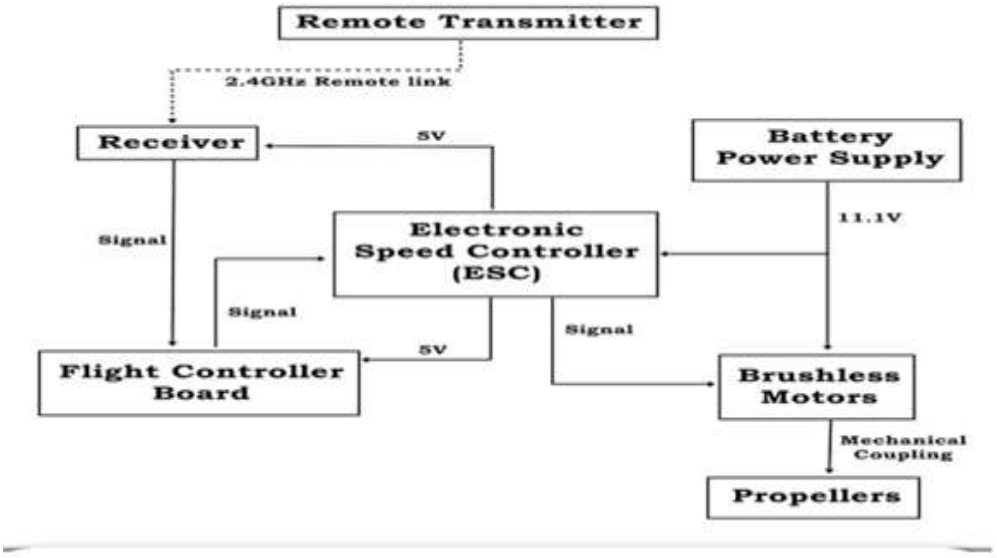




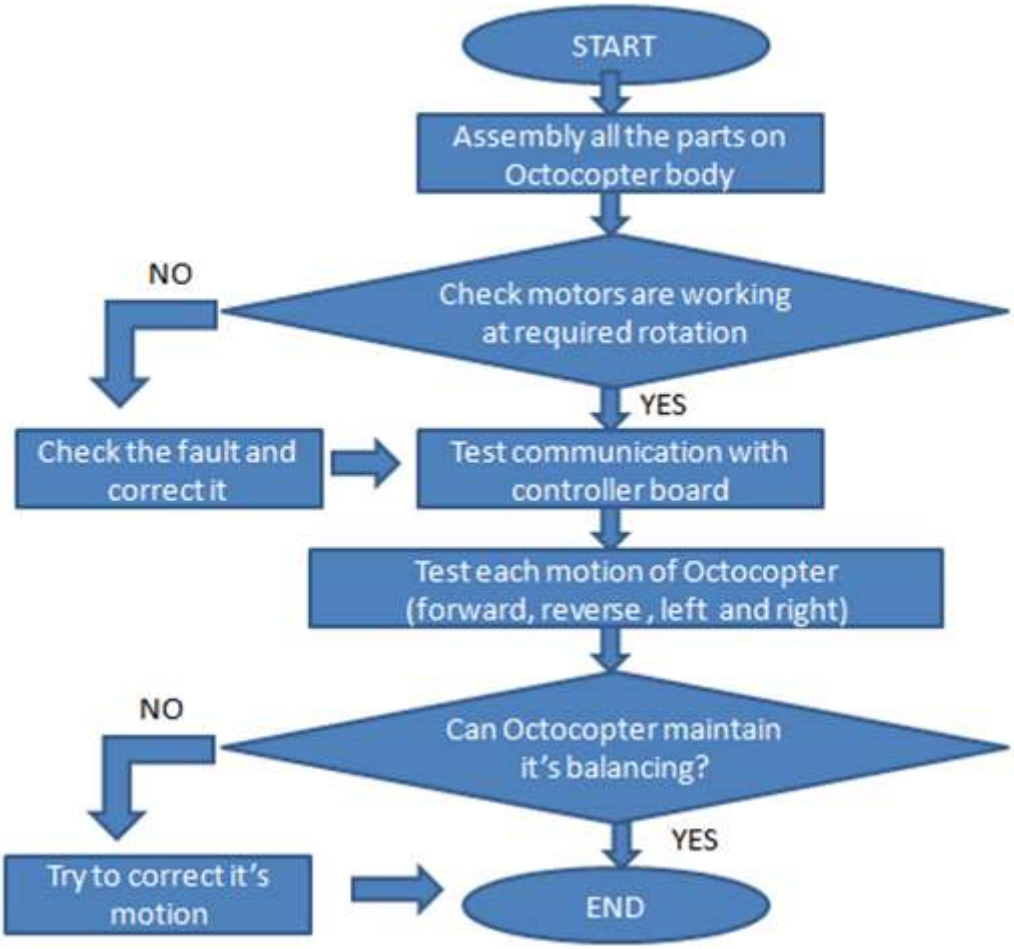


International Journal of Advances in Engineering and Management (IJAEM)
Volume 2, Issue 8, pp: 818-833 www.ijaem.net ISSN: 2395-5252

Basic Block Diagram



IV. WORKING



International Journal of Advances in Engineering and Management (IJAEM)
Volume 2, Issue 8, pp: 818-833 www.ijaem.net ISSN: 2395-5252

The radio signals from the radio transmitter are sent to the receiver. The frequency of the waves is 2.4GHz, from the receiver the signals are passed onto the flight control board. The board acts as a controller circuit with feedback. The signal is then passed onto the electronic speed controller. This Electronic speed controller (ESC) helps to control the speed of the motor and acts as a drive circuit. Power supply is given to the ESC and motors and 5 V of voltage is applied to the circuit. 4 propellers rotate in clockwise direction and rest 4 in anticlockwise direction.

V. COMPONENTS SELECTION

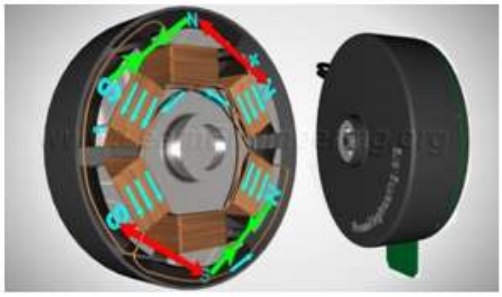
1. Brushless DC Motor 8318-Swiss
2. Electronic Speed controller
3. Flight Controller-Tarot ZYX-M
4. Reverse Parking Beep Module (HC-SR04)
5. 4 X Clockwise Propellers and 4 X Anticlockwise Propellers
6. Futaba T10J Transmitter and Receiver
7. Li-Po Batteries
8. 360 Degree Camera

1) Brushless DC Motor-8318 Swiss

The rotor of a BLDC Motor is a permanent magnet. The stator has a coil arrangement as shown. By applying DC power to the coil, the coil will energize and become an electromagnet. The operation of BLDC is based on the simple force interaction between the permanent magnet and the electromagnet. In this condition when the coil A is energized, opposite poles of the rotor and Stator are attracted to each other. As the rotor nears coil A, coil B is energized. As the rotor nears coil B, coil C is energized after that coil A is energized with the opposite polarity. This process is repeated, and the rotor continues to rotate.

Construction of BLDC motor

The main design difference between brushed and brushless motors is the replacement of mechanical commutator with an electric switch circuit. Keeping that in mind, a BLDC Motor is a type of synchronous motor in the sense that the magnetic field generated by the stator and the rotor revolve at the same frequency.



Brushless Motors are available in three configurations: single phase, two phase and three phase. Out of these, the three phases BLDC is the most common one. The following image shows the cross-section of a BLDC Motor.

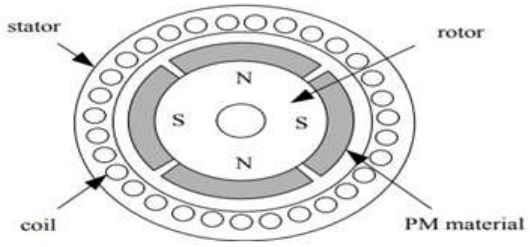
Cross-section of BLDC Motor

As you can see in the image, a BLDC Motor consists of two main parts: a stator and a rotor.

Stator

- The structure of the stator of a BLDC Motor is like that of an induction motor. It is made up of stacked steel laminations with axially cut slots for winding. The winding in BLDC are slightly different than that of the traditional induction motor.
- The figure shows the view of a stator inside a BLDC motor.
- Generally, most BLDC motors consist of three stator windings that are connected in star or 'Y' fashion (without a neutral point).
- For a complete 360^0 rotation of the rotor magnet, six possible combinations of the coils A, B and C are applicable and are shown in the following timing diagram.

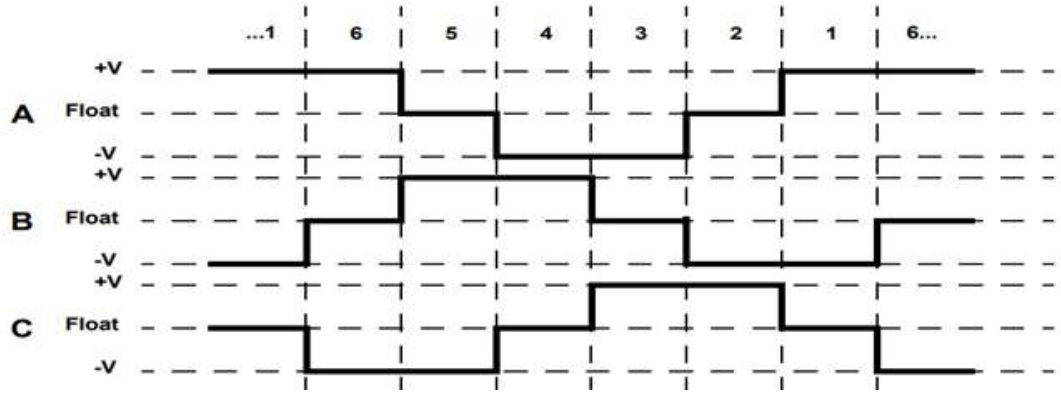
International Journal of Advances in Engineering and Management (IJAEM)
Volume 2, Issue 8, pp: 818-833 www.ijaem.net ISSN: 2395-5252



Variation of voltage vs. time for different pole of motor

Based on the above diagram, we can confirm that at any time, one phase is positive, one phase is negative, and the third phase is idle (or floating). So, based on the inputs from the Hall Sensors, we have to switch the phases as per the above diagram.

Calculation of Torque for BLDC Motor



Let, M = the weight in Kg that Dc motor can carry
g = acceleration due to gravity (9.8m/s^2)
R = Radius of the shafted wheel=5cm=0.05m
According to the required parameter of the motor,
P = 3350W
M = 11 kg
Power [W] = M * g * linear speed
Linear speed = P / (M*g)
= 3350/ (11*9.8)
= 31.07 m/s
Power = Rated HP of motor * 746 [W]
Rated HP of motor = Power / 746
= 3350 / 746 = 4.5 HP
Linear speed = Rated RPM * 2 * PI *R / 60 [m/s]
Rated RPM = Linear speed / (2*PI*R)
= (31.07*60) / (2*3.14*0.05) = 5936.94 RPM
Load Torque = M * g *R [Nm]
= 11*9.8*0.05 = 5.39 N-m

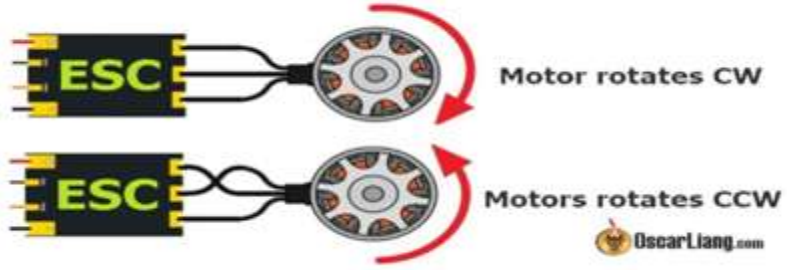
2) Electronic Speed Controller

ESC is an electronic circuit that controls and regulates the speed of an electric motor. It may also provide reversing of the motor and dynamic braking. Miniature electronic speed controls are used in electrically powered radio-controlled models. Full-size electric vehicles also have systems to control the speed of their drive motors.

International Journal of Advances in Engineering and Management (IJAEM)
Volume 2, Issue 8, pp: 818-833 www.ijaem.net ISSN: 2395-5252

To change the Rotation of the motors using the ESC

The direction of the motor in the Octocopter can be changed using 2 ways. One is by swapping he the wires and other by configuration in the ESC



Types of an Electronic Speed Controller

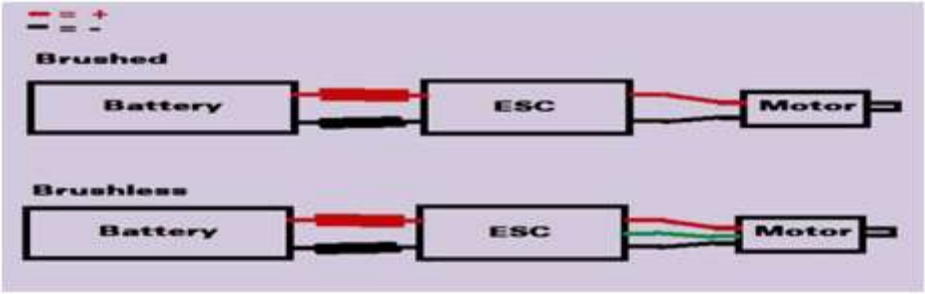
There are two kinds of electronic speed controller based on the specific requirements, you can acquire the exact one existing in RC Models shops such as brushed ESC and brushless Electronic Speed Control

Brushed ESC

Brushed ESC is the first electronic speed controller, which has been around for several years. It is very cheap to use in various RTR electric RC vehicles

Brushless ESC

It is also a bit more costly. Connected to a brushless motor, it carries more power higher performance as compared to the brushed ones. It can also last a longer period. In this project we are using the Brushless ESC.



3) Flight Controller-Tarot-ZYX-M

An Intelligent flight controller, The Tarot ZYX-M integrated advanced inertial guidance system with Navigation control algorithms to simplify the operation and to enhance the multirotor stability. It is very easy to set the pitch, roll and yaw of the multirotor within the way we need.

The Tarot ZYX-M flight controller is far safer than any other controllers because it can warn any other controllers because it can warn the users of dangers to guard the multirotor in abnormal conditions. The settable fly range and no-fly zone

International Journal of Advances in Engineering and Management (IJAEM)
Volume 2, Issue 8, pp: 818-833 www.ijaem.net ISSN: 2395-5252

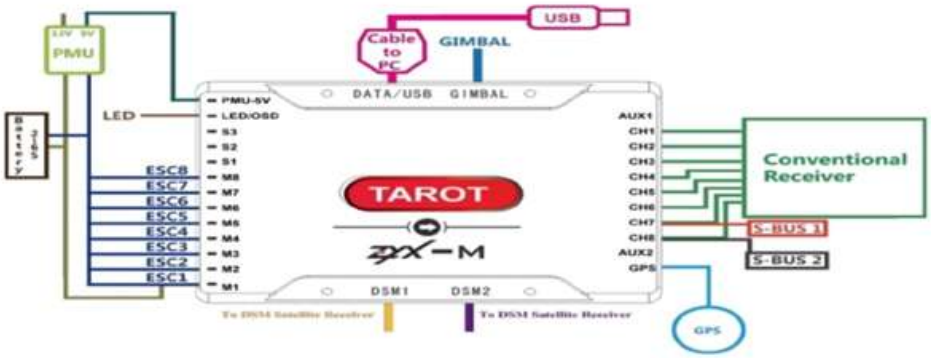
protection always allows the user to control multirotor.

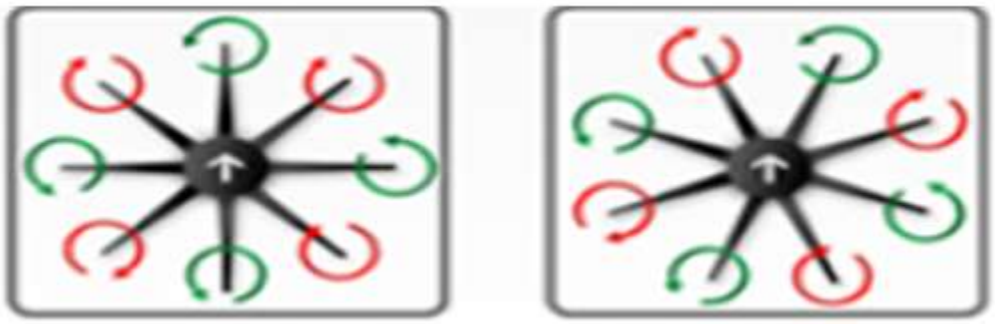
Features	Main Controller
1. Up to 9 types of multirotor supported	1. 32-bit processor with powerful computing capabilities
2. One-motor Fail Protection	2. Built-in sensors for shock absorption, superior shock resistance
3. GPS Speed Mode	3. Dual DSM satellite receiver
4. Auto Return-to-Home/One- key Go-home	4. Full metal case to provide comprehensive protection
5. Intelligent Orientation Control (IOC)	5. Dual S-BUS receiver supported
6. Point of Interest (POI)	6. Exclusive port for gimbal
7. Intelligent Landing Gear Function	

GPS	PMU Module
1. High-performance GPS receiver	1. Simultaneous power supply for flight controller, gimbal and transmitter supported
2. High-gain antenna	2. Dual power output
3. Fast speed to search satellite	3. Integrated voltage testing and low voltage alarm
4. Accurate locating	

International Journal of Advances in Engineering and Management (IJAEM)
Volume 2, Issue 8, pp: 818-833 www.ijaem.net ISSN: 2395-5252

Connections to Flight Controller

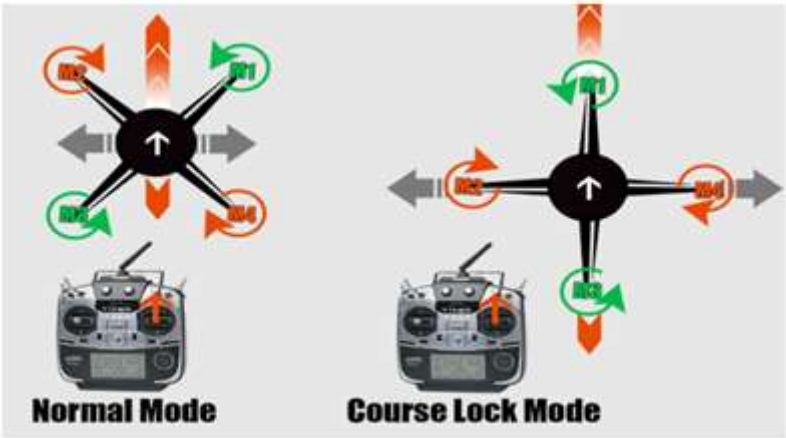




Arrangement of 2 Different types of Octocopter

The flying speed, ascending speed and descending speed are in direct proportion to the throttle, so the unexpected acceleration in ascending and descending is totally evitable

In course Lock Flying, The Forward direction is the same as recorded nose direction

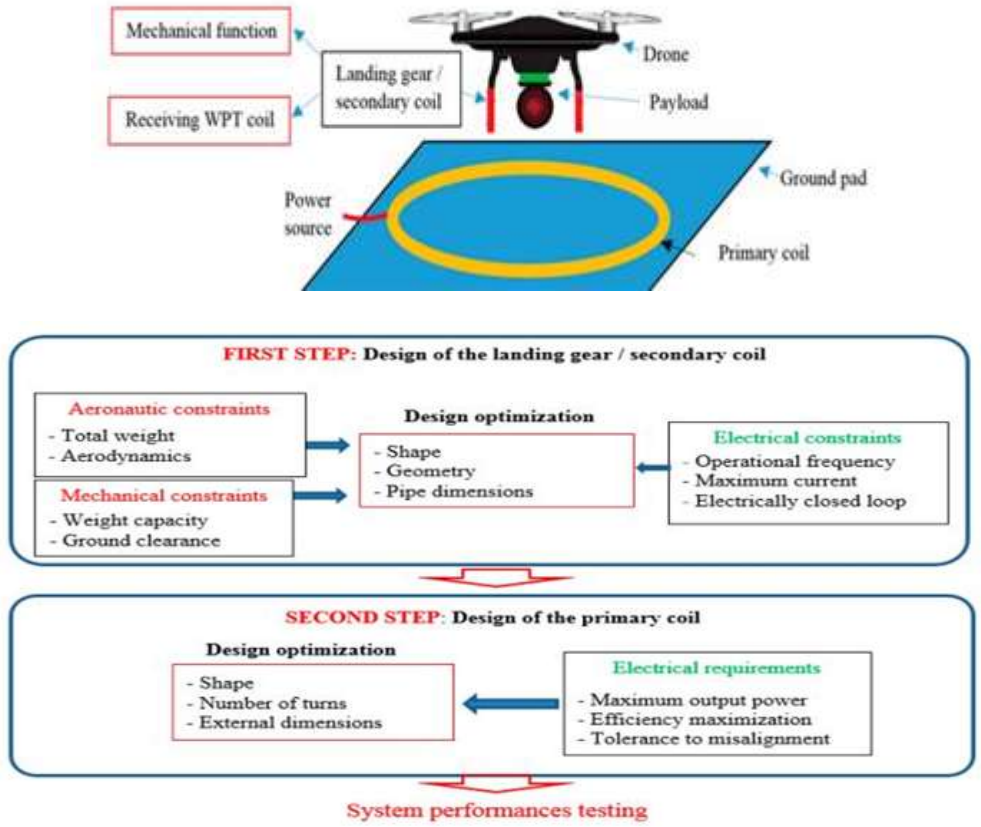


Landing Gear Function

In case of an emergency, the system will automatically lower the landing gear to protect the multirotor and the gimbal. A near-field wireless power transfer (WPT) technology is applied to recharge the battery of a small size drone. The WPT technology is an extremely attractive solution to build an autonomous base station where the drone can land to wirelessly charge the battery without any human intervention. The innovative WPT design is based on the use of a mechanical part of the drone, i.e., landing gear, as a portion of the electrical circuit, i.e., onboard secondary coil. To this aim, the landing gear is made with an

International Journal of Advances in Engineering and Management (IJAEM)
Volume 2, Issue 8, pp: 818-833 www.ijaem.net ISSN: 2395-5252

adequately shaped aluminum pipe that, after suitable modifications, performs both structural and electrical functions. The proposed innovative solution has a very small impact on the drone aerodynamics and the additional weight onboard the drone is very limited. Once the design of the secondary coil has been defined, the configuration of the WPT primary coil mounted in a ground base station is optimized to get a good electrical performance, i.e., high values of transferred power and efficiency. The WPT design guidelines of primary and secondary coils are given. Finally, a demonstrator of the WPT system for a lightweight drone is designed.



Block Diagram of a Proposed System design

When one motor is at fault or fails to operate in run condition then the multirotor will maintain good attitude and fly with good control and can return to the user safely.

4) Reverse Parking Beep Module

Parking sensors are proximity sensors for road vehicles designed to alert the driver of obstacles while parking. These systems use either electromagnetic or ultrasonic sensors.

Ultrasonic systems:

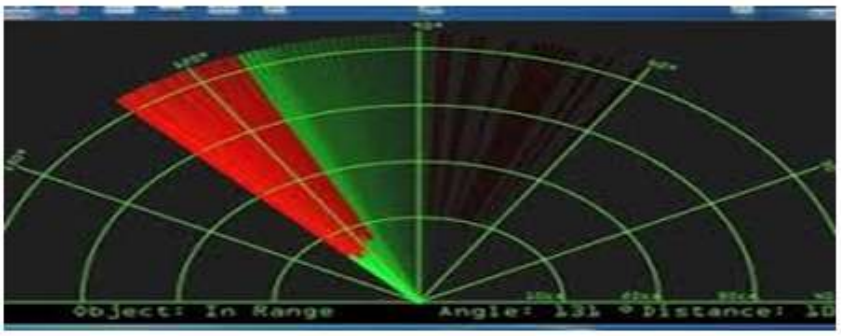
These systems feature ultrasonic proximity detectors to measure the distances to nearby objects via sensors located in front and/or rear bumper. These sensors emit which returns back by calculating the distance of the object near to the vehicle. As an ultrasonic sensor

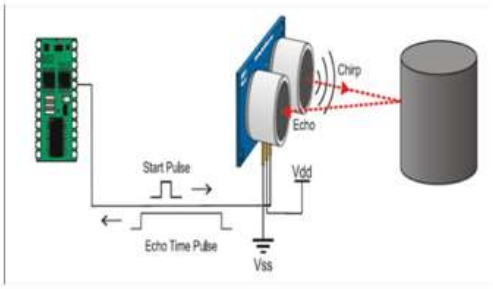
Relies on the reflection of sound waves, the system may not detect flat objects or objects soon near to it. The range of ultrasonic sensor varies from 2cm to 40cm in practical**.**

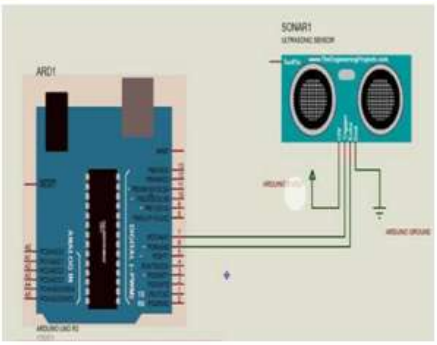
The HC-SR04 Ultrasonic sensor Module has 4 pins:

- **The GND of sensor is connected to the GND of Arduino.**
- **The VCC of sensor to the 5V of Arduino.**
- **Trig of sensor to pin 9 of Arduino.**
- **Echo of sensor to pin 10 of Arduino.**

International Journal of Advances in Engineering and Management (IJAEM)
Volume 2, Issue 8, pp: 818-833 www.ijaem.net ISSN: 2395-5252







5) 4 X Clockwise and 4 X Anticlockwise Propellers

For an octocopter to rise into the air, a force must be created, which equals or exceeds the force of gravity. This is the basic idea behind aircraft lift, which comes down to controlling the upward and downward force.

The spinning of the octocopter propeller blades push air down. . Therefore, as the rotor pushes down on the air, the air pushes up on the rotor. The faster the rotors spin, the greater the lift and vice-versa.

Octocopter Propeller Direction – Yaw, Pitch, Roll

Before delving into the octocopter motor and propeller setup, lets explain a bit about the terminology used when it is flying forwards, backwards, sideways or rotating while hovering. These are known as Pitch, Roll and Yaw.

Yaw – This is the rotating or swiveling of the head of the octocopter either to right or left. It is the basic movement to spin the octocopter. On most drones, it is the achieved by using the left throttle stick either to the left or right.

Pitch – This is the movement of octocopter either forward and backward. Forward Pitch is achieved generally by pushing the throttle stick forward, which makes the octocopter tilt and move forward, away from you. Backward pitch is achieved by moving the throttle stick backwards.

Roll – Most people get confused with Roll and Yaw. Roll is making the octocopter fly sideways, either to left or right. Roll is controlled by the right throttle stick, making it fly either left of right.

8 carbon fiber propellers are used in which 4 rotate in clockwise direction and the other 4 in anticlockwise direction. We are using eight 10-inch Propellers

6) Futaba T10J Transmitter and Receiver

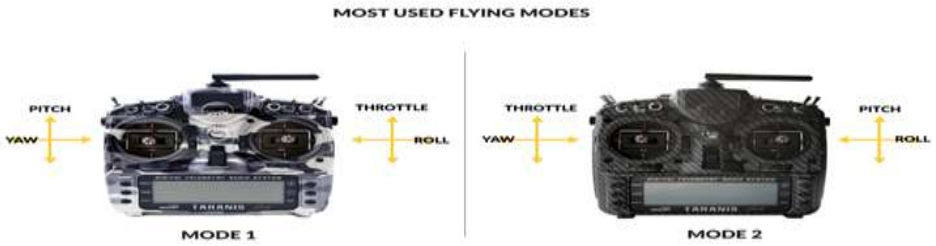
The 10J has a large backlit display, 30 Model memory, telemetry, and many popular features only found on more expensive radios. With all these features and a fantastic price, The Futaba 10J is a radio worth owning. The radio requires 4 AA batteries. All on-screen terms are spelled out on a backlit LCD screen. And everything is easily accessed and programmed with a jog dial and three buttons. Precision, Programming ease, Versatility

International Journal of Advances in Engineering and Management (IJAEM)
Volume 2, Issue 8, pp: 818-833 www.ijaem.net ISSN: 2395-5252

FPV Drone Radio Transmitter Modes

When purchasing an FPV Drone Radio Transmitter, We need to determine which "Mode" we would prefer to use when flying.

The mode determines aircraft movement assigned to a certain stick movement. There are 4 transmitter modes with Mode 2 being the most popular and is usually set as the default mode on most radios.



Different modes of Remote controller

Functions of Different channels
Channel -1: Back and Forth Movement of the Drone
Channel -2: Tilting in the Right or Left Direction.
Channel-3: This is responsible for the Up and Down Movement.
Channel-4: This is to turn left or right
The other channels are free to use
Channel-5: This is the flight mode switch
Channel-6: This channel is used to go back at Home
Channel-7: This channel is for IOC

Introduction to Tarot ZYX-M Assistant V1.64
Drive and assistant software Installation

1) Please download the drive and assistant software from Tarot official website: http:// www. tarotrc.com/

International Journal of Advances in Engineering and Management (IJAEM)
Volume 2, Issue 8, pp: 818-833 www.ijaem.net ISSN: 2395-5252

2) Run the drive installation program and follow the instruction to finish the procedures. Choose a corresponding drive file according to your PC system. Currently, this software only supports Windows System.

Flight Test and Flight Modes

There are four control modes supported by ZYX-M: Manual Mode, Attitude Mode, GPS Velocity Mode, and Autopilot Mode. You can enjoy various flight experiences with different control modes.

	Attitude Mode	GPS Velocity Mode	Manual Mode
Roll and Pitch Command Sticks	The midpoint of stick stands for 0°of the multi-rotor. Its endpoint corresponds to 35°of the multi-rotor.	The midpoint of stick stands for 0°of the multi-rotor. Its endpoint corresponds to 12 m/s of the multi-rotor.	Angular velocity controlled. The maximum angular velocity is 150°/s. No attitude angular limitation.
Throttle Stick & Altitude Locking	Center Throttle Stick to enter Altitude Holding. Push the throttle stick to upper end, the ascending speed is 6 m/s. when pushing the throttle stick to lower end, the descending speed is 3 m/s.		No velocity locking in vertical direction. Throttle Stick corresponds to motor speed.
Releasing Sticks	Attitude stabilization only, without position locking.	With the GPS, the position is locked.	
GPS Signal Lost	Attitude stabilization only, without position locking.	If the GPS has lost for 3 seconds, the Attitude Mode would be automatically entered.	
Yaw Stick & Yaw Angular Velocity	The maximum pan angular velocity is 150°/s.		

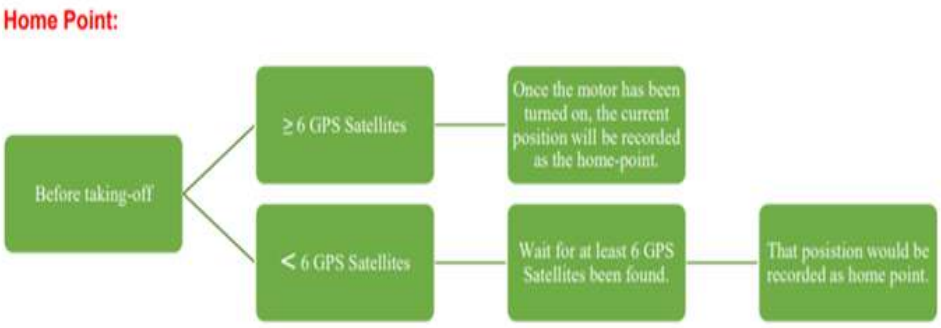
Advanced Functions

1. Failsafe If enough satellites have been found & compass work properly & Home Point has been recorded, if connection between Aircraft and Remote Controller breaks, Failsafe will be activated. Flight controller will take charge of the entire aircraft and control it back to the latest home point. If connection recovers during failsafe, the process will not stop until users cancel go-home at first place.

Compass Calibration and Finishing of Calibration

Compass Calibration

Finishing of Calibration



Points to be remembered before taking-off

International Journal of Advances in Engineering and Management (IJAEM)
Volume 2, Issue 8, pp: 818-833 www.ijaem.net ISSN: 2395-5252

Flight Limits

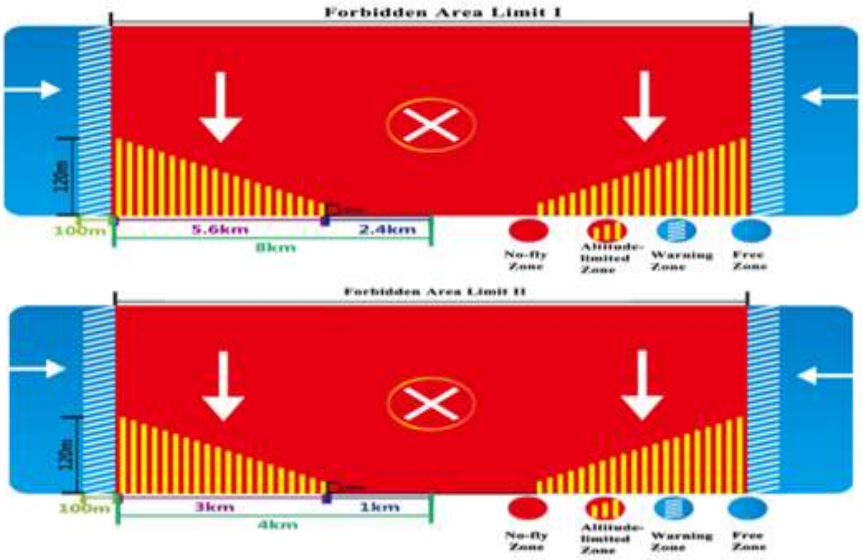
Forbidden Area Limit

1. There are three parts in the Forbidden Area Limit: No-Fly Zone, Altitude-Limited Zone and Warning Zone. Forbidden Area Limit I include main civil airports around the world, while Forbidden Area Limit II contains most utility airports globally. Their values are different, but limit logic works in the same way.

2. When GPS Module Data are available, Flight Limits only works in Attitude Mode and GPS Velocity Mode. 22

3. When entering Warning from Free Zone, Red Light in the LED Indicator flashes 10 times. If entering No-Fly Zone, you would lose control in throttle stick and the aircraft would decline in 3 m/s until landing or leaving Forbidden Area. If land within No-Fly Zone, you would lose all the control.

4. The aircraft can fly freely within Altitude-Limited Zone but cannot enter No-Fly Zone.



Octocopter flying in No-Fly Zone

Indicators

TAROT

LED Indicators

: Blink : On

1. Normal Status

LED Status	Descriptions	Reasons
No	LED Light is not blinking or constantly on.	Manual Mode
*1	Yellow Light blinks once per second slowly.	Attitude Mode
*1	Green Light blinks once per second slowly.	GPS Mode
*10	Green Light blinks 10 times quickly.	IOC Records.
*20	Green Light blinks 20 times quickly.	GPS is OK.
	Yellow Light is on.	Compass Calibration. Please rotate the aircraft horizontally.
	Green Light is on.	Compass Calibration. Please rotate the aircraft vertically.

International Journal of Advances in Engineering and Management (IJAEM)
Volume 2, Issue 8, pp: 818-833 www.ijaem.net ISSN: 2395-5252

Attentions during Flight

Please ensure that:

1. You have correctly mounted the multi-rotor.
2. All the connections and wiring are in great conditions.
3. All the components have powered up.
4. The parameters have been correctly set in the assistant software.
5. GPS signal is great; otherwise, drift might occur during hovering.
6. Before taking off, please turn on the transmitter and then power on the multi-rotor.
7. After landing, please power off the multi-rotor, and then turn off the transmitter.
8. During flight, if Low Voltage Alarm is on, please land your multi-rotor as quickly as possible.

Restriction to be followed during flight

1. DO NOT fly in strong magnetic area!
2. Within the 10 seconds after the system has powered on, please DO NOT move the multi-rotor or sticks. Wait for initialization

Software Code for Ultrasonic Sensor Module

```
constint pingPin =7;// Trigger Pin of Ultrasonic Sensor
constint echoPin =6;// Echo Pin of Ultrasonic Sensor

void setup(){
Serial.begin(9600);// Starting Serial Terminal
}

void loop(){
long duration, inches, cm;
  pinMode(pingPin, OUTPUT);
  digitalWrite(pingPin, LOW);
  delayMicroseconds(2);
  digitalWrite(pingPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(pingPin, LOW);
  pinMode(echoPin, INPUT);
  duration = pulseIn(echoPin, HIGH);
  inches = microsecondsToInches(duration);
  cm = microsecondsToCentimeters(duration);
Serial.print(inches);
Serial.print("in, ");
Serial.print(cm);
Serial.print("cm");
Serial.println();
  delay(100);
}

long microsecondsToInches(long microseconds){
return microseconds /74/2;
}

long microsecondsToCentimeters(long microseconds){
return microseconds /29/2;
}
```

VI. RESULTS

Development of unmanned aerial vehicle (UAV) and micro aerial vehicle (MAV) are getting high encouragement. Since the application of UAV and MAV can apply to variety of area such as rescue mission, military, film making, agriculture and others. Thus, air transportation is made easier to the society. With the design of octocopters, the 8 propellers attached to it can exceptionally reach vey great heights or elevations. The speed of octocopter is much faster when compared to other drones. Its ability is not only restricted to air, but also extend to other two modes of transportation like water and terrain .It is supported by multiple suspensions and shock absorber to stabilize the overall copter ride and prevents an excess of body lean roll in one particular direction. Provides much more resistance to winds and heavy rains, thus improving the stability of the copter. Safety matter a lot, where we can still fly the octocopter even when two motors are damaged. Improves repair time by eliminating the use of copter survey. Since the size of the octocopter is much bigger when compared to other drones, we can incorporate multifeatured into the copter like stereo cameras, IR cameras, 360-degree cameras, LIDAR. Also helps to capture the best aerial footages using the add ones. At times of emergencies, these can aid by airlifting people from one place to other, helps to survey faster, and provides assistance in reaching out to people faster by delivering foods. Fire department can also use this to map the spread of wildfire. This can also act as an air ambulance which can save time to help in transplantation of organs to faraway places, thus by helping to extend its features in medical fields. Bio metric or fingerprint sensor is installed to provide greater security for the copter. This copter may be driven from inside or can be operated from outside through radio remote controllers.

VII. CONCLUSION

In the present situation, the future of transport will make more use of the airspace. So, we are trying to shape this idea into reality. So, from a developing point of view, we are trying to create a door to door connectivity through the octocopter which delivers food, postal letters, medicines etc. from one click through the phone. For this the technology incorporated would be Vertical Take Off & Landing. It can also be

incorporated with still more advanced and heavier motors to lift and carry even more greater loads. Adding another concept to this which is commonly known to all of us is rental vehicles. Upon future work, we can also incorporate this as an air taxi or a rental copter by which people can enter an onetime password sent to their smart phone by the copter rental company and the customers can travel to their destination place easily. This avoids traffics on road and the customer can easily save much more time than the other modes of transport. At times like COVID-19, where people are afraid to deliver food hand to hand, we can make the best usage of octocopters in delivering more food to people at the same time and also ensuring them a zero contact delivery of foods. And also, at times of lockdown where transportation of materials like Agricultural yields, pharmaceutical medicines, where they need to be transported from one corner of the country to another, octocopters can play a wide role in helping them.

ACKNOWLEDGEMENT

I take this golden opportunity to thank our HOD, Dr.Pramila Manohar, Electronics and Instrumentation Engineering, RIT andproject coordinator Dr. M.K.Pushpa Associate Professor, Electronics and Instrumentation Engineering, RIT for letting me precede the idea of Octocopter.

I am very thankful to our Associate Prof., Dr. H.S.Niranjan Murthy, Electronics and Instrumentation Engineering, RITfor the constant support and guidance he has given throughout this process. I wish to express my heartfelt gratitude to the project panel for their constant support and benevolence.

I would also like to thank all the faculty members of the department for helping me in this project.

REFERENCES

[1]. Early in helicopter development,"multi-rotor" was used to refer to helicopters with two rotor assemblies

[2]. "AeroQuad - The Open Source Quadcopter". Archived from the original on 2012-01-03. Retrieved 2012-01-05.

[3]. "Multicopter Table". multicopter.org. Retrieved 30 June 2015.

[4]. "FrontPage - UAVP-NG - The Open Source Next Generation Multicopter". uavp.ch. Retrieved 30 June 2015.

[5]. "FrontPage - UAVP-NG - The Open Source Next Generation Multicopter". uavp.ch. Retrieved 30 June 2015.

[6]. "DIY Drones". diydrones.com. Retrieved 30 June 2015.

[7]. OpenPilot Archived 2011-05-27 at the Wayback Machine Open source UAV autopilot for multirotors

[8]. "How to Pick The Best Multirotor Frame". My First Drone. Archived from the original on 3 April 2014. Retrieved 30 June 2015.

[9]. "Octo Quad". ardupilot.org. Retrieved 30 December 2019.

[10]. "ALMA Filmed with Hexacopter". ESO Announcement. Retrieved 6 September 2013.

[11]. "German multicopter makes first manned flight". sUAS news. 1 November 2011. Retrieved 3 Nov 2011.

[12]. "Volocopter: 18-propeller electric helicopter takes flight". CNN news. 27 November 2013. Retrieved 2 Dec 2013.

[13]. "New Aircraft Arises from Germany". Sport Aviation: 14. January 2012.