

# Implementation of Arduino based Hand Motion Control Drone

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**ABSTRACT:** Drones or Quadcopters, They are generally controlled by joysticks, embedded computers, remote controllers, android applications etc. With these techniques, few significant issues arises regarding with the flight control of drones including the range, control, propulsion etc. In this study, we propose the use of hand gestures to control the flight of drones. We have used an Arduino UNO in the hand glove (Transmitter), for the memory allocation of the control of drone. With the help of embedded programming, we have created a simple control interface, which helps us in the formation of different features like, flight in X,Y plane take-off and landing can be in same plane, as it is built in the simple control interface, it's also very easy to use and operate.

**KEYWORDS:** Simple Control Interface, IR Sensing, Obstacle Detection, Auto-Pilot.

## I. INTRODUCTION

A drone is one of the most complex flying machines because of its versatility in the performance of any type of aerial task. Generally drones are equipped with four rotors, with a camera, and a receiver. Such drones are normally used in the surveillance, photography etc.

The primary aim of Hand Gesture Controlled Drone is to remove the weighted Radio-Controller. A glove (Transmitting Circuit) is generally used instead of the Radio-Controller, which can be worn in the hand and is used for controlling the drone, its movement, flight etc.

In the transmitter, we have used an arduino uno for the peripheral memory allocation or simply we can say, for the storage and installation of the interface. The interface is designed in such a way as the drone is able to flip, accelerate within micro seconds etc. The uno is further directed into Sensor (MPU 6050) and then to the flight controller (APM).

In the drone or quadcopter, we have used four rotors aligned diagonally like as other drones. All the rotors are subjected towards the centre of the frame, and are connected to the receiver board. For obstacle avoidance mode, we have used Infra-Red sensors with the motors. Our interface deals with the simple computing operation, which helps us to identify the battery usage, OA mode (Obstacle Avoidance) through the LED pattern implanted with the receiver.

## II. LITERATURE REVIEW

Not much work has been done in designing and building the hand gesture controlled drone using Interface designing. But because in this research paper, we are epically focusing on the motion control or hand gesture (Bhattacharya *et al.* (2012)). There have been many questions regarding with the motion control or gesture control using computational operations and interface designing which have been left unanswered like at what parameters do the drones can be operated by the user using their hand? How they can be flipped by triggering? How they can be Auto-Piloted? Etc. In this paper, we describe the results of the study of motion and gestures of drone from end user as follows: Given a task to perform with the device (e.g. flipping the drone about 360° at its initial flying plane with a trigger from the transmitter, high speed acceleration in micro-seconds, obstacle detection, stable flight etc).

The results of the study yields a specific research contribution to motion gesture design i.e. user can operate the drone by wearing a glove in hand, and by switching on the transmitter and receiver (drone), the communication sets up. With one trigger from the transmitter, the drone takes-off and then further controlled by the user's hand motion.

## III. BLOCK DIAGRAM

In the formation of Transmitter, we have used;

- Arduino UNO
- MPU6050 Gyro with Accelerometer Sensor

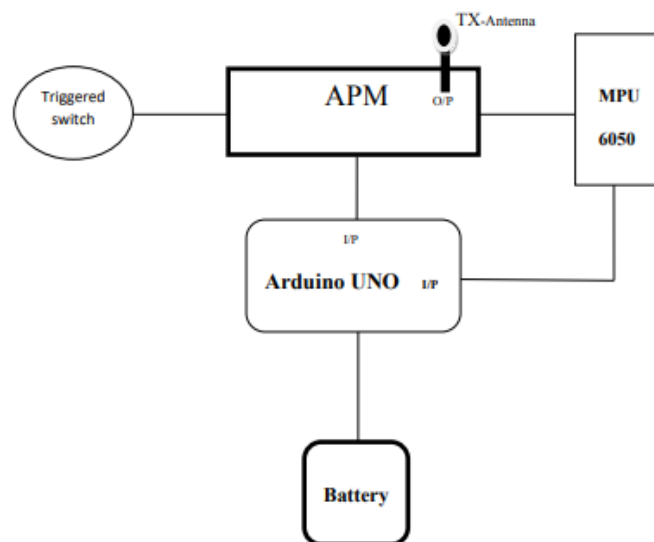
- Triggering Switch
- Li-Po Battery (550mAh)
- Flight controller (APM)
- Glove
- Jumper Wires

In the formation of Drone, we have used;

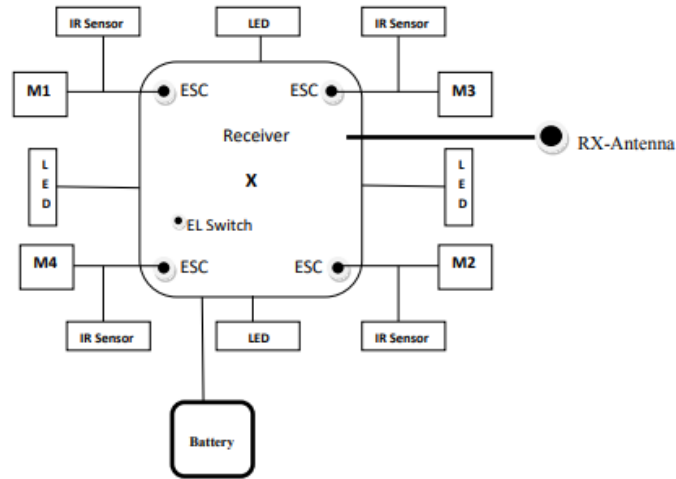
- Motor (BLDC)
- Electronic Speed Controller (ESC's)
- Infra-Red Sensors
- Receiver Circuit
- Li-Po Battery (1100mAh)
- Propellers
- LED strips
- Jumper wires

For designing the control interface, software we have used;

- Embedded C, and Arduino IDE, C++



Block Diagram of Transmitter



Block Diagram of Receiver

#### IV. WORKING AND FUNCTIONING

After switching On the transmitter and receiver, communication sets up between the drone and transmitter. One trigger from the transmitter, leads the drone to take off.

For 360° flip at the initial flight plane, another trigger is required and the drone backs to its initial position itself. As the Interface is based on computing operations, we notify that user’s hand should be stable during the flight test for the stable flight and respectively according to the user.

For obstacle avoiding mode, we have used IR sensors in our drone. We have to trigger twice from the transmitter as we have instructed our UNO through the code. The triggering operation for the OA mode can be further altered from the code of instructions.

Suppose our drone is flying at the height of 5fts and in that same abscissa and ordinate, we have to fly it more above 5fts. For this, we have to hold and press the trigger and keep our hand towards the sky. Similarly, for landing the drone in that same plane, we have to hold and press the trigger and keep our hand towards the land.

As the interface is designed by the computing operations, we have featured our drone with Stable flight, and Self flight or Auto-Pilot. The more our hand is stable, our drone will also be. This results our drone flying in a particular plane with more stability.

Sometimes due to miscommunication within the transmitter and receiver, generally drones flies off or can be damaged if collides with any other object (Bird, Building etc). As we have discussed about the OA mode, the collision rate reduces very much and our drone itself came into auto pilot mode and can fly within the networking range of the transmitter.

Still if feels that its inconvenient for us to control the quadcopter, we have given an EL switch on the receiver which stands for Emergency Landing. Long press the EL switch and it will help us to land our drone in the same plane where it was flying earlier. This EL switch helps us to reduce the Rpm’s of our motors and gives us a safe landing. The LED strips we have used, work as an indicator for low battery, OA mode, Auto-Pilot mode, etc.

#### V. RESULT

The quadcopter results with the accuracy in the flips about 360°. Drone performs this operation amazingly and back to its initial phase after the flip. It also clarifies the control, or the commands given and received by the transmitter and receiver respectively. The maximum flight range is about 200fts in the ordinate plane and also 200fts in the abscissa plane.



Serial No.	Reading From Drone		Reading From Transmitter
	X Plane $\uparrow$	Y Plane $\rightarrow$	Wrist Movement
01)	5feets	5feets	0°
02)	50feets	50feets	30° - 60°
03)	100feets	100feets	60° - 75°
04)	150feets	150feets	75° - 90°

Table 4.1 the flying statistics of drone and transmitter

Serial No.	Reading From Drone		Reading From Transmitter
	X Plane $\downarrow$	Y Plane $\leftarrow$	Wrist Movement
01)	150feets	150feets	<90°-75°
02)	100feets	100feets	70° - 60°
03)	50feets	50feets	60° - 30°
04)	5feets	5feets	0°(Ground)

Table 4.2 the landing statistics of drone and transmitter

While the flight, in same X and Y plane wrist position varies from 0° to 90° and during the landing, wrist positions from 90° to 0° until the drone landed safely.

## VI. CONCLUSION

This is a small effort made in the field of quadcopters and one of its most popular applications of gesture and motion control. But now operating a gestured and motional drone is more easy and convenient. This paper also shows our vision of introducing hand gestures controlled operations in the drones like the alignment of camera for vision and surveying in various fields like agriculture, armed forces which would be much more user friendly and flying them would be more easy and convenient.

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