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AUTOMATED QUADCOPTER USING ANDROID CONTROLLING SYSTEM

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ABSTRACT

This research paper focused on develops an automated quadcopter operated by android system. We operate quadcopter using Graphical User Interface and commands given by user via wireless communication system. Quadcopter is an aerial vehicle that is lifted and propelled by four motors which is operated by user. We found that smaller UAVs (Unmanned Aerial Vehicles) can serve more tactical operations like finding a village, searching an enemy location. It is mainly used in military for surveillance and reconnaissance. We mounted a camera on quadcopter which will take the photographs from environment and live streaming is done with the help of laptop. We will use android based software which will enable us to control the quadcopter by sending the commands to it from our android or smartphone.

Keywords – Android Controlling system, UAV, Quadcopter.

I.   INTRODUCTION

Quadcopter also called quadrotor is a VTOL (vertical take-off and landing) rotary UAV. The first term Quadcopter is used by the French engineer Étienne Oehmichen in 1924. Today quadcopters are small in size, electrical and used in many applications such as in mining detection, aerial photography and surveillance. Quadcopters have two configuration designs, first is plus configuration (+) and second is cross configuration(X). In our project we will use the cross configuration(X) as it handles the more payload.

Also we use smartphone to operate the quadcopter. Smartphone is working on Android operating system as it is most widely used operating system, so we choose the android operating system which will control the quadcopter through graphical use interface and users commands.

II.   BACKGROUND

1] Android Phone:- Smartphone or android phone is used to transmit the signals for operating the quadcopter. Signals are used to provide the velocity to quadcopter, angle by which it is fly successfully and height of quadcopter from ground level.

2] Laptop:- We use laptop as database for storing the photographs taken by the quadcopter and also used for live streaming done by the camera mounted on system.

3] **Circuit Board**:- The function of circuit board is to transmit the data from the smartphone to signals for the motor controllers. We use the Arduino board in our project.

4] Motor Controller:- The motor controllers read the signal from the Arduino board and generates three phase current for the brushless motors.

5] Rotors :- The rotating armature of motor or rotor are the actuators on the quadcopter. When rotating they give thrust to quadcopter.

6] Power Supply :- Power supply to this system is divided into two parts, first is power is supply to smartphone by its own battery (LiPo) and second is power supplied to motors of quadcopter by the power supply unit(PSU)or battery.

III.   PROBLEM FORMULATION

The main goal of our project is to create and implement automated quadcopter which operates on android device or smartphone. In this research, to solve above problem the full automated system of Quadcopter is design and construct and to develop an android application which will work as a joystick for a quad copter and also give live streaming of camera mounted on quad copter.

IV.   SYSTEM DESCRIPTION

The system description is divided into two parts.

1] Smartphone and laptop characteristics

We will use the LG's Nexus 4 as a smartphone and Laptop to operate the quadcopter system. The specification of this android phone is as follows:-

Dimensions	133.9 x 68.7 x 9.1mm (5.27 x 2.70 x o.36in)
Weight	139 g (4.90 oz)
Display	4.7 inches(~68.3% screen to body ratio)
CPU and GPU	Quad core 1.5 GHz Krait Adreno 320
Sensors	Accelerometer, Gyro, Proximity, Compass, Barometer
Network	GSM/HSPA/LTE
Launch	October, 2012
Memory	16GB, 2GB RAM
OS	Lollipop 5.1.1
Battery	Non-Removable Li-po 2100 mAh
WLAN	Wi-Fi 802.11 a/b/g/n, dual band, hotspot DLNA
Connectivity	Bluetooth – v4.0, A2DP USB- MicroUSB, v2.0(Slimport)

Laptop Characteristics:-

- 250GB HDD
- 4GB RAM
- GPS Device
- WiFi / Bluetooth

2] Arduino board characteristics

The Arduino hardware and software was designed for artists, designers, hobbyists, hackers, newbies, and anyone interested in creating interactive objects or environments. Arduino can interact with buttons, LEDs, motors, speakers, GPS units, cameras, the internet, and even your smart-phone or your TV. This flexibility combined with the fact that the Arduino software is free, the hardware boards are pretty cheap, and both the software and hardware are easy to learn has led to a large community of users who have contributed code and released instructions for a huge variety of Arduino-based projects.[7]

V.   PROPOSED METHODOLOGY

We divide our project in two phases. In first phase we understand the quadcopter structure modelling and the second phase is the construction of quadcopter is done. In this phase we will testing the quadcopter components to minimize the accident risks occur while flying the quadcopter. The reason of checking the all assembly will reduce the cost of components.

Steps Used in Methodology:-

Step 1- Assembling the various components

In first step, we will assemble the all components to form a quadcopter. Also we fix the Arduino board to quadcopter.

Step 2- Create android Application

In second step, we create an android application, in which Graphical User Interface is developed for controlling the system. GUI is useful for navigation, to provide velocity to quadcopter, etc.

Step 3- Creation of socket programming

In this step, we create socket programming to transmitting the signals from smartphone and receiving the data from quadcopter in the form of images or video taken by the system.

Step 4- Store the data obtained by system

In last step, we store the images or aerial photographs from system in laptop. Also live streaming is store in laptop.

 FLOW CHART

The flow chart of automated quadcopter is shown in figure. The design of quadcopter is divided into two steps. In first step all components are assembled and in second stage we design the graphical user interface (GUI).
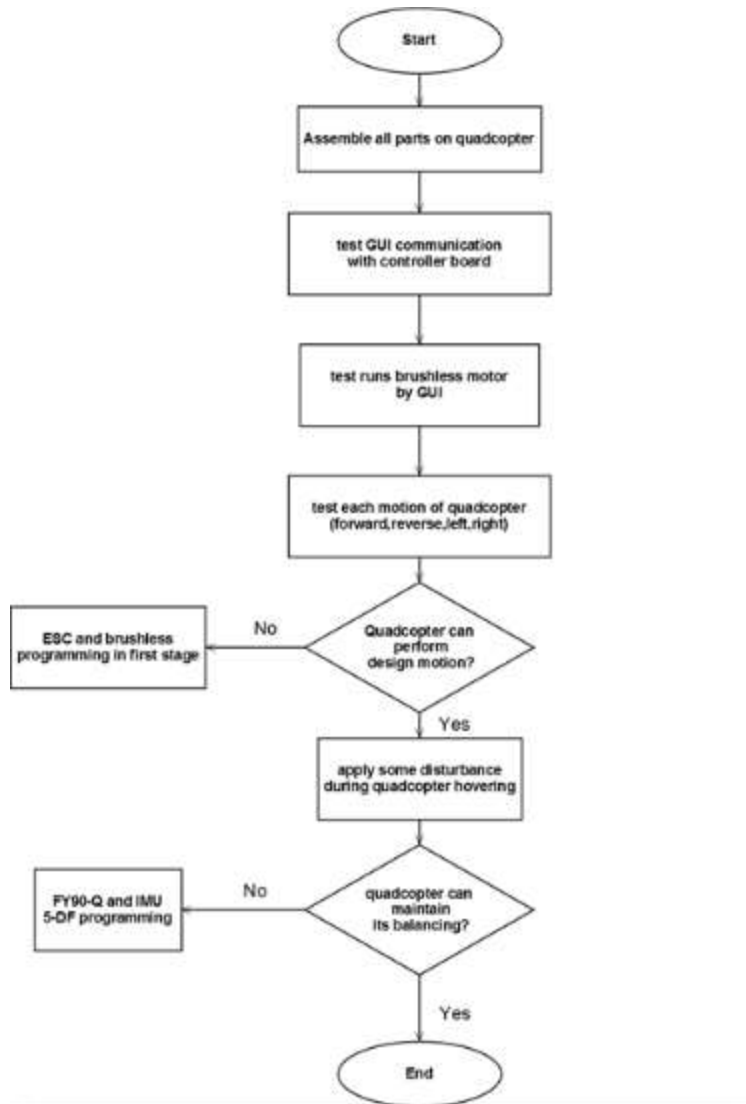
Fig 1. Flow Chart of Quadcopter Design [2]

VI.   ARCHITECTURAL DESIGN

We will create a mobile application which is android based for controlling quadcopter. In this application we create some buttons that provides the navigation to our system. For connection between quadcopter and application we will use socket programming. Laptop is used for storing the aerial photographs taken by quadcopter and for live streaming. In this context laptop is also used for database which stores this information.
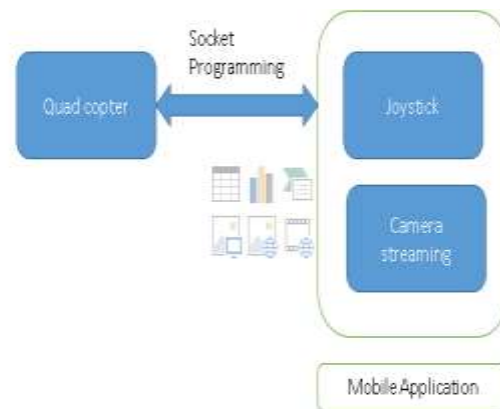
Fig 2. Architecture Design

VII.　MOTIVATION

Quadcopters are used in different fields such as surveillance, reconnaissance, scientific exploration & small items transportation. Quadcopters blades consume less kinetic energy as result they reduces the damage. The main use of quadcopter is in military to locate enemy position in unknown environment means in jungle or in some dangerous situations. All previous implemented quadcopters are almost operate via remote controller, but we proposed our quadcopter which will operate by an android smartphone. As we are using the smartphone, this will reduce the quadcopter system cost.

VIII.　CONCLUSION

From this research we will propose the solution to our system that it operate on commands given by user from smartphone. The quadcopter also captures the photographs from environment and user gets the live video streaming from quadcopter that will shown to user on laptop. We will use the java programming for graphical user interface. Also we will improve the efficiency of our system by sending the voice commands to quadcopter via smartphone. (if it is possible for us)

IX.　REFERENCES

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