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IMPLEMENTATION OF VOICE ACTIVATED AUTONOMOUS QUADCOPTER

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ABSTRACT

Voice Activated Autonomous Quadcopter controlled by Radio frequency communication. The purpose of this project to explore the available technologies to control quadcopter by using enhanced voice command. Voice command data are converted into to integer number from 0 to 255 both significantly increase the Human and quadcopter interface. Algorithm written inside flight controller allows to receive voice command and motion sensor data through Radio Receiver and concerted to achieve an aim or deal with respective command. This project is broken in to 2 tasks: Implementation of Voice Recognition and voice command conversion and Design of Autonomous Quadcopter.

KEYWORDS: Natural language command (NLC), inertial measurement unit(IMU), Kalman filter.

I. INTRODUCTION

Over the past ten year, technology world changing from how to transform the manual control of quadcopter to Automated. quadcopters are controlled manually by changing input PWM signal of each actuators. while controlling manually human errors may cause problem in application field like safety and security, threat comes from sources like terrorism and other illegal activities remote control quadcopter is an unmanned battery powered flying device that is controlled by an operator on the ground. Quadcopters have been successfully deployed by Army, Navy and Marine units in safety and security because of its fully autonomous features like altitude hold, position hold, path tracking, Surveying & Mapping, Aerial imaging. Combination of natural language command i.e. voice recognition makes control on quadcopter more effectively. Voice recognition is the capability of a machine or program to receive and perform dictation, or to understand and carry out spoken natural commands

II. SYSTEM ARCHITECTURE

For better comprehension of the overall system implementation, figure 1 illustrates on how deferent system components works together as one independent system.

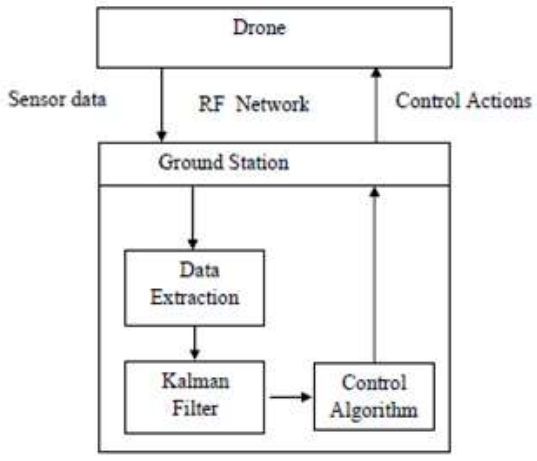

Figure: 1 Autonomous outdoor flight systems

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There is a centralized ground station, runs the code in an infinity loop. The sensor data are required to send over a communication channel that has established with the quadcopter over a wireless network on every cycle. With the presence of data available in the centralized ground Station, the KF algorithm is executed. The results of the KF state estimation will be used for calculate the necessary control actions. Finally, the appropriate control action command is send to the quadcopter over the RF network.

III. VOICE RECOGNITION

To recognize natural language, Android Meets Robots Smartphone application is used. App uses android mobiles internal voice recognition to pass voice commands to Quadcopte Google speech recognizer is used and converted text is transmitted over Bluetooth to ground station. Figure2. Shows voice recognition by using smart phone.

***Figure2**: voice recognition*

IV. GROUND STATION

Ground station convert received voice command by using HC-05 Bluetooth module to data packets format. Packets are transmitted through nRF24l01 RF module.

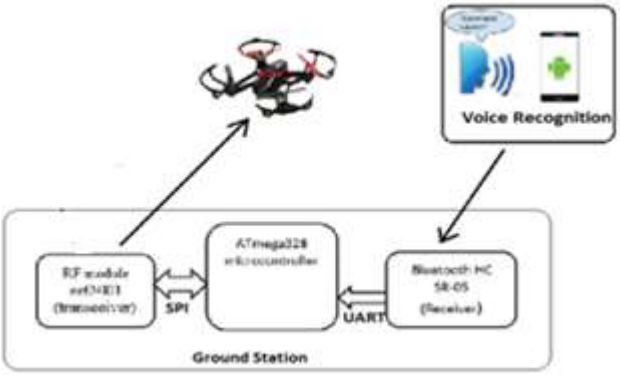

Figure3: ***Ground Station***

Following figure4 Shows nRF24 Shock Bust packet structure.

- 1 byte of preamble.
- 3-5 byte of access address.
- Variable size of payload from 1-32 bytes.
- 2 byte of CRC.

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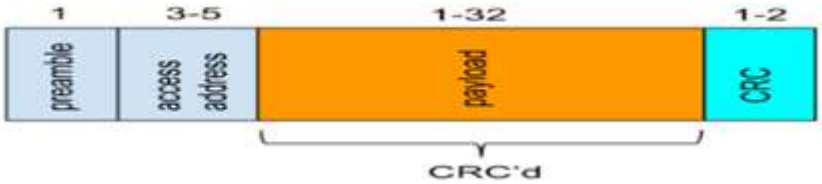

Figure4: Bust packet structure

V. DESIGN OF AUTONOMOUS QUADCOPTER

Whole quadcopter system is controlled by ATmega2560 microcontroller with co-controller ATmega328. RF module nrf24l01 is used as receiver for packets from ground station. RC receiver receives PWM or PPM signal from RC remote for manual controlling. MPU6050 sensor along with magnetometer and pressure sensor BMP180 form the ten degree of freedom system (10 DOF). Output of 10 DOF sensors input for ATmega2560 through I2C protocol. ATmega2560 with 10DOF form flight controller which gives position and direction feedback in form PWM to four actuators. Figure 5 Shows block diagram of Design and implementation of quadcopter.

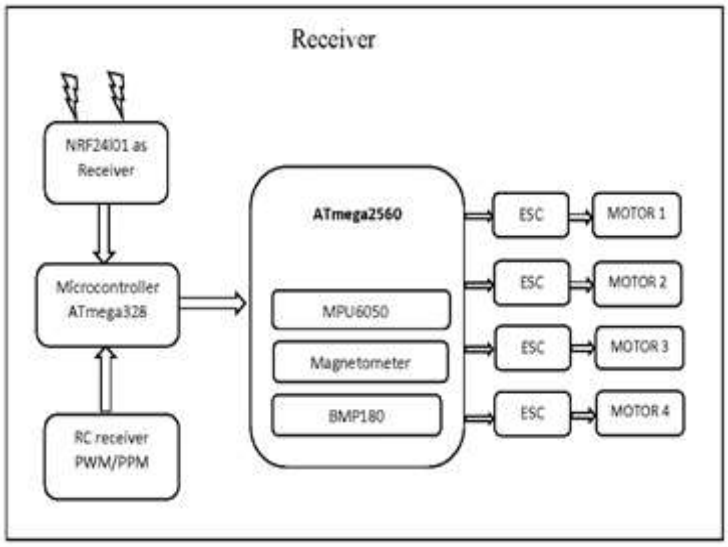

Figure5: block diagram of Design and implementation of Quadcopter

VI. EXPERIMENTAL RESULT

PWM values of Radio channel 1 and Channel 2 changes with respective voice command. Figure6 below shows PWM value of pitch and roll i.e. channel 1 and channel 2 changes according voice command like left, right, forward and backward.

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Figure5 : PWM value chnages with voice command.

VII. CONCLUSION & FUTURE SCOPE

Natural language like voice command makes the improvement in controlling quadcopter. This paper represent Implementation of voice activated quadcopter with help of smart phone. Further improvement and enhancement can be done on this project. One of the modules that can be enriched on is the obstacle detection system. Due to time constraint and limited prior knowledge of Java, the obstacle detection module is still under development and explores the possibilities of developing a good obstacle detection module for the flying quadcopter

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