Building Smart Drones with ESP 8266 and Arduino

Make Human Life Easier with Drone

Requirements Analysis Document (RAD)

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1 Introduction

1.1 Purpose of the system

To build Smart Drones with ESP 8266 and Arduino by providing step-by-step tutorial for the high school students, which includes the whole process of assembling and building the drone with the Component list, Calibration, Assembly, Drone Building documents with the software and code used to control and fly the drone.

1.2 Scope of the system

This project creates a platform to learn about unmanned aerial vehicles such as a quadcopter. This expands the scope of the computer engineering education to include the control and the understanding of the mechanical components. The quadcopter opens up the possibilities to broaden the understanding and applications of control systems, stabilization, artificial intelligence and computer image processing as it applies to the quadcopter.
Drones are basically used for doing something where humans cannot go or carrying out a mission that is impossible for humans. Drones are used mainly by military men, scientific research, agriculture, surveillance, product delivery, aerial photography, recreations, traffic control, and of course, for terrorist attacks and smuggling drugs.

1.3 Core System Functionalities

- Connecting the ESP8266 to the Arduino board Details about the ESP8266 module.
- Coding for the ESP8266.
- Controlling the ESP8266 from a smartphone.
- Calibrating the drone after connecting the ArduPilot.
- Configure GPS with your ESP8266.
- Building a Follow Me-type drone by using a smartphone.
- Building a Mission control Drone to fly in an area and collect data and make more efficient by implementing some sensors.
- Building a Drone to take selfies and videos.

1.4 Objectives and Success Criteria of the Project

The success of the application depends upon meeting the following core set of objectives:

- The design of a Follow Me drone which follows a device or an object; the device can be a phone or a device with some sensors that continuously communicate with the drone to get the right position.
- The design of a mission control drone which aims to reach target places and return to its initial position along with its route monitoring.
- The design of a drone for aerial photography and videography.

2 Problem statement

Now-a-days it is very easy to purchase a drone from the market but the real challenge is to build it. Assembling the drone requires lots of technical knowledge with equal amounts of patience. Apart from the fun and joy, it is to watch a drone fly it has many applications which helps us solve many problems and eases our work. Carrying goods from one place to another without any human interference is what we have always wished for and who wouldn't want a machine to take pictures along its time of flight.
The solution to all these problems is to make a drone which has a GPS and camera installed in it. It can carry commodities and take selfies, videos of the surroundings.

3 Proposed System

After analyzing the existing system, the following solutions are proposed:
Drone helps in following any device which is linked to it and can be used to travel to the target location. Capturing photos and videos from the drone is also an additional benefit which can help in capturing some scenes which are not capturable by any human.

3.1 Functional Requirements

This section provides a functional overview of the system.

ID	Requirements	Priority
F-01	Components have light weight frame, minimum battery voltage.	High
F-02	All components should be compatible with each other.	High
F-03	Components should be calibrating in right way for stable flight of drone.	High
F-04	All the components should be properly assembled.	High
F-05	Propellers should be balanced and unbroken for safe fly of drone.	High
F-06	Follow me drone should keep certain distance between smart phone and Drone.	High
F-07	Mission control drone have a target to reach and come back at staring point from which it started to fly.	Medium
F-08	Selfie and video drone takes a picture and sends pictures back to the smart phone or laptop.	Medium

3.2 Non-functional Requirements

ID	Requirements	Priority
N-01	*Guidelines:* Step by step tutorial have all the guidelines to build and fly the drone.	High
N-02	*Supportability:* Drone will made from ESP8266 and Arduino.	High
N-03	*Reliability:* It should have good quality and calibrated components. Testing should be done before any fly of drone happens.	High
N-04	*Range:* Drone should not fly over certain range.	Medium
N-05	*Perimeter:* Drone cannot fly in busy traffic areas.	Medium

4 Performance Constraints

- **Battery:** Battery will be charged at last 20 minutes of drone fly.
- **Drone with Camera:** Environment should be clear and have enough visibility to take photos.
- **Path for Drone:** Choose path should be clear and cannot have any obstacle.
- **Usability:** To fly drone requires knowledge of establishing connection between smart phone and drone and give proper direction to drone from the remote controller/ transmitter.

5. Milestones

Tentative milestone and deadline for developing the project are given below.

Documents	Due Date
Project Website	3rd September, 2019
Finalizing Components, Requirement Documents and First Presentation	17th September, 2019
Ordering of Components	24th September, 2019
Design Documents	1st October, 2019
Calibration and Design Presentation	8th October, 2019
Assembling	22th October, 2019
Final Report Outline and Finish Building of Follow Me Drone	5th November, 2019

Code Development and Fly drone, Poster Presentation	12th November, 2019
Testing of Follow Me Drone	19th November, 2019
Final Presentation	3rd December, 2019
Final Report	10th December, 2019