

Fault Analysis and Controlling in Drone Control System

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Abstract: The most common use of motors for drones and unmanned aerial vehicles (UAVs) is to spin the propellers of multi-rotor drones so they can fly. Any aircraft or flying machine operated without a human pilot is called an unmanned aerial vehicle (UAV). Drone engines can also be found in other unmanned vehicle subsystems, such as camera and payload gimbals, flight surfaces, antenna rotators, and landing gear. The drive system of electric cars uses different electric motors. The performance of brushed direct current (DC) motors, induction motors, switched reluctance motors and brushless DC (BLDC) motors is compared according to the requirements of in-wheel motor technology under normal and critical conditions through simulation. This study shows that BLDC motors are the most suitable electric motor for a high-performance drone motor system. To investigate BLDC motor performance under different control algorithms, an accurate motor model is required.

Keywords: Fault analysis, Drone control system.

1. Introduction

The main goal of this project is to analyze the malfunctions and control of the drone system. Any aircraft or flying machine operated without a human pilot, these machines are called unmanned aerial vehicles (UAV). Drone engines can also be found in other unmanned vehicle subsystems, such as camera and payload gimbals, flight surfaces, antenna rotators, and landing gear. It can be controlled autonomously or remotely by a human operator using on-board computers and robots. The subject Fluid Dynamics plays an important role in the design and development of aircraft and drones. The subject deals with the principle of aircraft aerodynamics. This study shows that BLDC motors are the most suitable electric motor for a high-performance drone motor system. To investigate BLDC motor performance under different control algorithms, an accurate motor model is required.

2. Literature survey

A. Literature Survey on Drone Motor

The research work on this paper aims to develop an unmanned aerial vehicle means drone motor 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 up the

doors to more capable autopilot and pushed for more real time UAVs applications. A typical unmanned aircraft is made of light composite materials to reduce weight and increase maneuverability. This composite material strength allows military drones to cruise at extremely high altitudes. Drones are equipped with different state of the art technology such as infra-red cameras (military UAV), GPS and laser (military UAV). Drones can be controlled by remote control.

B. Literature Survey on BLDC Speed Controller

Focus: This paper aims to design and implementation of BLDC motor speed control based on the variation of POT. This project is mainly concerned on BLDC motor speed control system by using microcontroller PIC 16F877A. Motor speed can be controlled with variable POT, based on which the PWM pulse is generated. So, this programming device can be used to control any motor and their speed. The POT is used to give the speed range to the controller. The heart of the circuit is the POT and microcontroller which controls all its function. The PIC microcontroller has 10-bit resolution ADC, which is used to convert the POT's analog signal into digital. The speed of the motor is displayed on an LCD. In this project, PIC 16F877A microcontroller can control motor speed at desired range with variable POT and rotor position.

C. Literature survey on Electronic Speed Controller

The efficiency and torque of the motor have led to significant growth of advancements in power electronics and the usage of permanent magnets in the motors, which has added to the benefit of the motor being lightweight. It has been employed in drone applications because of this advantage. ESCs (Electronic Speed Controllers) are used to control the motor's speed by converting the DC input voltage from the batteries to a three-phase trapezoidal wave for the motor. In the aspect of the use of unmanned aerial vehicles (UAVs).

3. Parts to be Used

1) BLDC motor

The 3300mAh Li-Po battery is capable of a maximum continuous discharge of up to 35C, making this battery one of the most powerful Li-Po batteries in its class. It offers an excellent combination of weight, power and performance.

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It doesn't need long primers when new. Only the standard fee is required. Low self-discharge compared to nickel-based batteries; less than half as much. Low maintenance: There is no memory and no need for frequent discharge. Special cells are capable of delivering very high current to equipment such as power tools

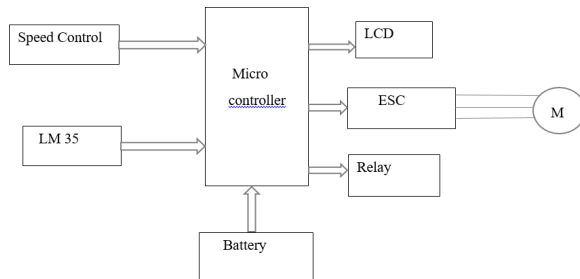


Fig. 1. Block diagram

2) Lithium Polymer Battery (Li-Po)

3300mAh Li-Po battery is Capable of maximum continuous discharge rates up to 35C, placing this battery among the most powerful Li-Po battery packs in its class! It offers an excellent blend of weight, power and performance.

Does not need prolonged priming when new. There is only a standard fee required. Low self-discharge compared to nickel-based batteries; less than half as much. Low Maintenance: There is no memory and no need for frequent discharge. Specialty cells are capable of supplying very high current to devices like power tools.

3) LCD16*2

LCD 16*2 is a type of electronic display that displays information and messages. As the name suggests, it has 16 columns and 2 rows, so it can display a total of 32 characters ($16 \times 2 = 32$) and each character will be created with 5×8 (40) pixel points. Therefore, 32×40 or 1280 pixels can be used to calculate the total number of pixels on this LCD.

16X2 displays mostly rely on multi-segment LEDs. The basic function of LCD is the transmission of light through modules from one layer to another. These modules will vibrate and align at a 90-degree angle to allow light to pass through the polarized film.

4) Switch

One of the most basic and frequently used electrical components are toggle switches, a type of electronic switch. Electronic switches control the on and off of electrical circuits by stopping or starting the flow of current.

5) Relay

One of the simplest parts is the power relay module. Nevertheless, they are among the most important. This is because it serves as a bridge between low and high-power digital circuits. They enable high power devices to be switched on and off using digital circuits and microcontrollers.

Relay modules, often known as power relay modules, are common electrical components. They are a key part of any home automation project. If you want to control motors or lighting circuits with a low-voltage microcontroller like an Arduino, you'll need a relay module. Relay modules are simple components. They basically work like switches. Two internal

metal contacts form a typical relay module. For the most part, these interactions do not overlap or make contact. But to complete the electrical circuit that allows current to flow, relays have an internal switch that connects these contacts.

6) ESC

An electronic circuit known as an ESC or Electronic Speed Controller is usually used to operate and control BLDC 3-BLDC stands for brushless direct motor, so it is obvious that these motors lack brushes, unlike brushed motors which depend on brushes. for commutation. Since there are no brushes, friction and other related inefficiencies are eliminated, allowing BLDC motors to operate at peak efficiency. Unlike conventional brushed motors, BLDC motors have a significant disadvantage in that they cannot be driven from a single supply, requiring the use of a 3-phase inverter.

7) Temperature Sensor LM35:

Temperature sensors, or LM35, are electronic devices that measure temperature before converting it into an electrical signal. Mechanical (thermometers), electrical (thermistor or thermocouple), or integrated circuit sensors are some examples of several sensor types (MCPXXXX, LMXX, or ADTXXX series).

8) Battery Management System

Infineon ICs and designs help you design a battery management system. Careful design considerations for charging and discharging processes while protecting the battery and monitoring the cells. They will support you throughout your proposal. Battery management systems (BMS) are electronic control circuits that monitor and regulate the charging and discharging of batteries. Battery properties to be monitored include finding out battery type, voltage, temperature, capacity, state of charge, power consumption, remaining operating time, charge cycles and some other characteristics.

4. Conclusion

1. In drone control system speed of BLDC motor is controlled with the help of ESC (Electronic Speed Controller).
2. Voltage of battery as well as temperature of motor and battery is displayed on lcd Microcontroller is programmed in a such a way that motor gets off when temperature is above sixty degree and voltage is below nine volts.

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