

Development and Control Design of Fire Fighting Uav

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Abstract—This project is to design and control a UAV to use it as a fire extinguisher. As we have seen in various accidental fires taking place at heights the fire fighters are failing to do their work or mission of extinguishing the fire efficiently. This drone which is going to be built can be used by the fire fighters as a tool to reach heights where their cranes or ladders cannot reach. This drone. The loss of human life and property will be cut down due to this drone. To make this possible we have made use of a PIXHAWK controller to control it. This UAV is going to be helpful in dangerous fire situation as there wouldn't be any human contact in it. To overcome the problem of high payload we make use of Octa-copter as it will be giving higher payload. The designing of UAV will be done using SOLIDWORKS and it will be analysed for various stresses and forces on ANSYS software. Here we are building a prototype which will fly up to a height of 15 to 20 feet with water supply from the ground.

Keywords—Controller, Drone, Fire, Payload, UAV.

I. INTRODUCTION

An Unmanned Aerial Vehicle (UAV) is an expression that identifies an aircraft that can fly without pilot; that is, an airframe and a computer system which combines sensors, GPS, servos, and CPUs. All these elements combined have to pilot the plane with no human intervention. Another usual definition is that of an aircraft which is capable to fly in an autonomous way and operates in a wide range of missions and emergencies that can be controlled from a ground base station. The UAV's size, type, and configuration could be different and depend on the actual application. There is no doubt today that a huge market is currently emerging from the potential applications and services that will be offered by unmanned aircrafts. More precisely, UAVs can be applied in so-called "D-cube" missions. Mission identified as Dangerous, Dirty, or Dull. If we pay attention to civil applications, a wide range of scenarios appear. For instance; remote environmental research, pollution assessment and monitoring, fire-fighting management, security; e.g., border monitoring, agricultural and fishery applications, oceanography, communication relays for wide-band applications. In general, all of these applications can be divided into four large groups: environmental applications, emergency-security applications, communication applications, and monitoring applications. Nowadays, and after many years of development, UAVs are reaching the critical point in which they could be applied in a civil/commercial scenario. However, we believe that there is a lack of hardware and software support to effectively develop such potentialities. Basically a UAV is automatically piloted by an embedded computer called the Flight Control System (FCS). This system reads information

from a wide variety of sensors (accelerometers, gyros, GPS, pressure sensors) and drives the UAV mission along a predetermined flight plan.

1.1 Fire Fighting Drone

In today's world with high skyscrapers there is a problem for fire fighters to reach such heights due to lack of equipment. We have seen various incidents that due to lack of equipment. There were many casualties and failure of firefighter to extinguish fire. To overcome the problem drone can be used as a helping hand or a part of firefighting tool to overcome fire by taking water pipe with it at height where the ladder or cranes of fire fighters can't reach thus we are designing a prototype on the experimental bases to reach up to the height of 15 feet.

1.2 Features

- This drone will be can be used as a tool by the firefighters.
- This drone as it is an octa-copter it will have high payload.
- This will save loss of human life as there is no human intervention.
- It will be easy to handle and operate it.

II. PROBLEM DEFINITION

2.1 STATEMENT

We have seen that due to various fire accidents occurring in industrial, commercial and residential buildings which are too high for the fire brigade or the fire fighters to reach there has been a considerable amount of loss of life and property. Due to technological advancements the heights of the skyscrapers or buildings is only increasing, on the other hand the fire fighters are lagging behind to carry on their motto or aim of extinguishing the fire when it comes to a height where they fall short of equipment's to reach such height.

2.2 OBJECTIVE

- To make a drone which can be used as a helping hand or equipment by the firefighters.
- To make the drone such that it will be able to carry the load of water with it to a great heights where the cranes or ladders of the fire brigade cannot reach.
- To study various programming language and apply it to make the drone work for fire extinguishing.
- To make the drone such that it can be controlled by any person i.e. easy to handle.

2.3 ASSUMPTIONS

As we are building just a prototype our assumptions are

- The drone will be restricted or will fly to a height of 15-20 feet.
- The force due to air is zero.

III. PROPOSED METHODOLOGY

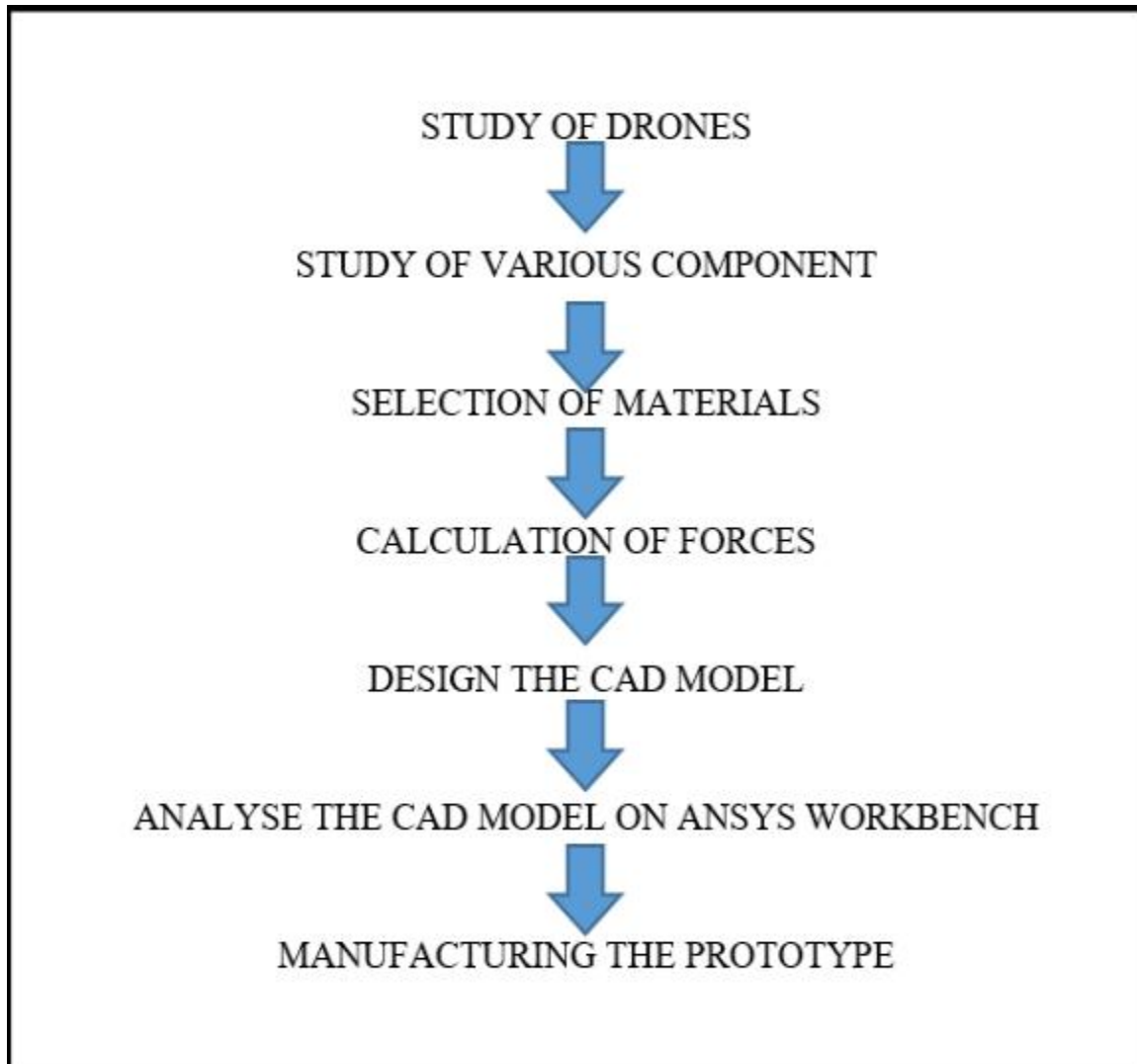


FIGURE 1:Flowchart of methodology

IV. CONCLUSION

We have successfully designed a drone that can be used by the fire fighters as an equipment for extinguishing fire. To do so we went through various research papers which helped us to understand which sensors to be used. As we know the main issue that comes across when it comes to drone is the flight time so to cut down this we have replaced the batteries with direct supply from the ground. We have designed an octa-copter as it has higher payload as compared to the quad and hexa versions. We have used various sensors for stabilization like the gyro sensor, PIXHAWK controller. We have even made various calculations of stresses and forces that will be needed to fly the drone. We also studied various motors and which motor will be applicable for our drone.

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