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GPS Surveillance Drone For Flood Management System

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Abstract- This UAV drone which can be operated manually as well as automatically with GPS fixed to it in order to locate the victims isolated during flood. Eye of the drone spans in about a 10km radius from the operator. It is capable of delivering supplied weighing minimum of 1.5kg (upto 2kgs) to the people who are in need of it. Proper packaging and delivering system is followed.

Keywords: drone, autopilot, artificial intelligance, GPS, Pixhawk, Arduino, UAV, open CV, fire alarm ,mission planner

1. INTRODUCTION

The major disaster like floods causes more losses such as damage in roads, stagnant waste water and affect many livelihoods and huge economical loss due to no transportation, no supply of their needs and sudden contact to help, etc. The floods are occurred due to heavy rainfall continuously so, the rain water mixes with muddy wastes and blocks the underground pathway of roads, paths, bridges and they remain stagnant.

In order to tackle that disaster like flood we need to take some preventive measures and to be prepared. For that issue this project will help to get the people and supply their needs from certain distance in that flood by operating the Autopilot drone by Machine Planner (helpful in Post disaster phase). In many floods the people are not able to come out due to high water stagnant in their places. This prototype will help them to supply kits and their needs easily.

2.OVERVIEW

As we can see people who are affected by flood are really helpless. In some areas they are not getting sufficient food or medicine to fulfill their daily requirements. Many people get into danger and there is a chance that they might not be able to get any help so the surveillance drone gets them the help they need.

3. SYSTEM CONFIGURATION

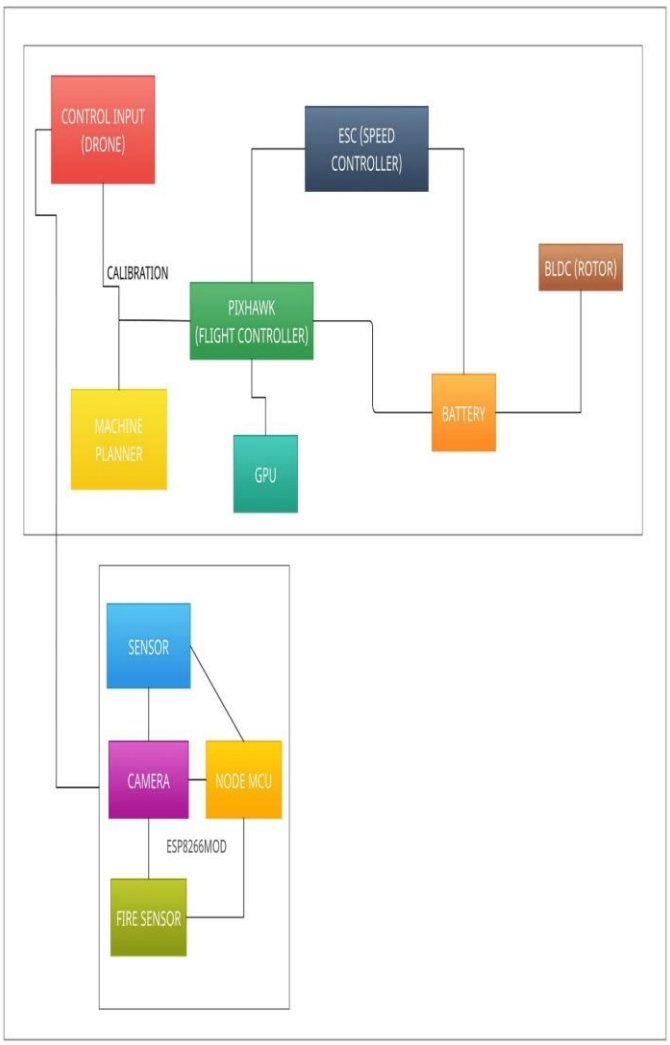
3.1 Hardware Requirements:

PIXHAWK CONTROLLER

Pixhawk Is A Flight Controller Which Can Be Controlled Manually or Controlled in Autopilot Mode. This Autopilot Mode of Pixhawk Can Be Achieved by An Open-Source Software Called Mission Planner.

ESC (Electrical Speed Controller)

An electronic speed control or ESC is an electronic circuit that controls and regulates the speed of an electric motor. It may also provide reversing of the motor and dynamic braking. Miniature electronic speed controls are also useful in radio-controlled models that are powered electrically. An ESC Controller is a device that regulates the power of an electric motor; allowing it to throttle from 0% to 100%. There are two styles of Electronic Speed Controller, with Brush and Brushless.



FLAME DETECTION SENSOR

Flame Detection Sensor Module is sensitive to the flame, but also can detect ordinary light. Usually used as a flame alarm. Detects a flame or a light source of a wavelength in the range of 760nm-1100

nm. Detection point of about 60 degrees, are sensitive to the flame spectrum.
GPS Module (UBLOX NEO 7M)

Ublox Neo 7M GPS module that includes an **HMC5883L digital compass.** The new Ublox **NEO 7 series** is a low power GPS , with high sensitivity and it has 56 channels and outputs position updates at 10Hz. . This GPS module also comes with a plastic case that is moulded which keeps the module protected from the elements making it ideal for it to be used in your Quadcopter or aircraft.

3.2 Software Requirement:

Mission Planner:

Mission planner is a ground featured open-source software that enable us to locate the exact location of a Rover or Copter which is connected to it.
ARDUINO.CC:

Arduino is an open-source prototyping platform used for building electronics projects. It consists of both a physical programmable circuit board and a software, or IDE (Integrated Development Environment) that runs on your computer, where you can write and upload the computer code to the physical board

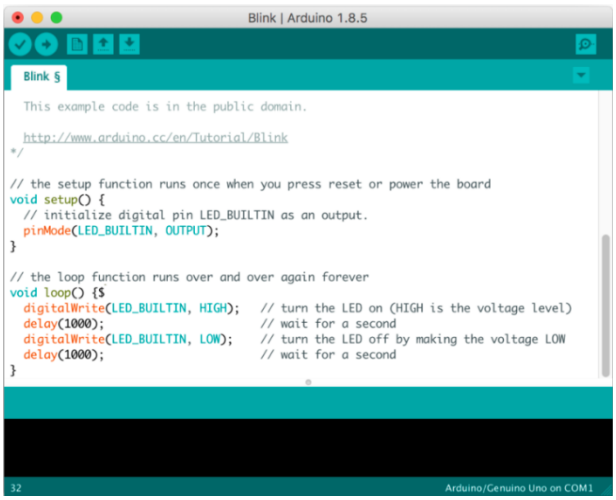


Fig.2. Block of the drone system

4. IMPLEMENTATION

4.1 Working

As shown in the diagram Pixhawk will be connected to the ESC and Motors (BLDC's) will be connected to the Battery. At first the Pixhawk will be connected to the mission planner through USB cable and will be trained for sending information. The camera present here will be able to find or detect human face so that we could analyze that they are in need of something or not. Flame Detection Sensor Module is sensitive to the flame, but also it can detect ordinary light. Usually, it's Utilization is for Fire alarm system. It detects a flame or a light source of a wavelength in the range of 760nm-1100 nm(approx.). Detection point of about 60 degrees, are sensitive to the flame spectrum.

As seen in the above flow chart after programming the drone it is given some locations points for surveillance so that it is ready to check a particular area autonomously. After analysing a particular

area, it gives some information through camera. Through camera we can mark the exact location and we can provide necessary needs during flood. And also, if there is any fire the flame detecting sensor senses the fire and reports it so that we can save the area at the earliest before it spreads big.

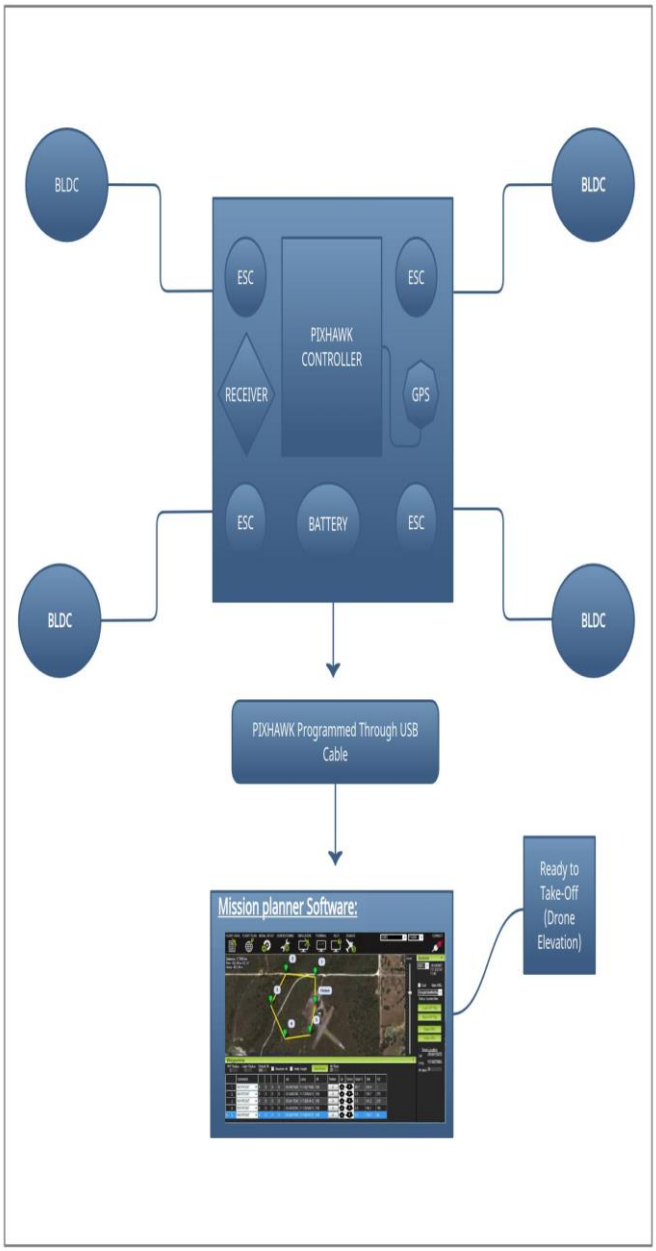


Fig.3. Blueprint of the drone

- 4.2 THE IMPLEMENTATION PROCESS CONSISTS OF TWO PARTS:
  - 4.2.1.PIXHAWK
  - 4.2.2.MISSION PLANNER

- 4.2.1.PIXHAWK
- Pixhawk Is A Flight Controller Which Can Be Controlled Manually or Controlled in Autopilot Mode. This Autopilot Mode of Pixhawk Can Be Achieved by An Open-Source Software Called Mission Planner.

- In Our Project We Have the Notion of Connecting A Drone to The Pixhawk And Connect the Pixhawk To the Mission Planner Software Through USB Cable.

- 4.2.3.PIXHAWK SPECIFICATIONS:

- **Processor**

- 32bit STM32F427 Cortex-M4F (opens new window)core with FPU
- 168 MHz
- 256 KB RAM
- 2 MB Flash
- 32-bit STM32F103 failsafe co-processor

- **Sensors**

- ST Micro L3GD20H 16-bit gyroscope
- ST Micro LSM303D 14-bit accelerometer / magnetometer
- Invensense MPU 6000 3-axis accelerometer/gyroscope
- MEAS MS5611 barometer
- **Interfaces**

- 5x UART (serial ports), one high-power capable, 2x with HW flow control
- 2x CAN (one with internal 3.3V transceiver, one on expansion connector)
- Spektrum DSM / DSM2 / DSM-X® Satellite compatible input
- Futaba S.BUS® compatible input and output
- PPM sum signal input
- RSSI (PWM or voltage) input
- I2C
- SPI
- 3.3 and 6.6V ADC inputs

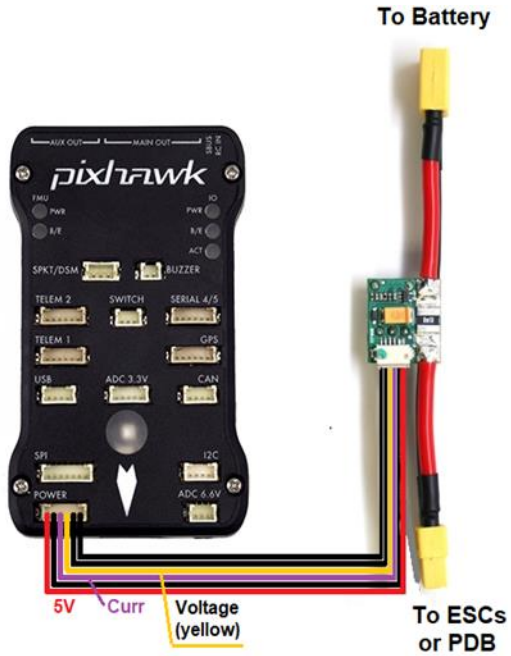


Fig.4. Pixhawk with speed controller

- 4.3.MISSION PLANNER:
- 4.3.1. Introduction

Mission planner is a ground featured open-source software that enable us to locate the exact location of a Rover or Copter which is connected to it.

Fig.5. Pixhawk with gps module

Fig.6. Specifications in the mission planner

Fig.7. Window of the drone status

4.4.FEATURES OF MISSION PLANNER:

When the Particular Rover or Quadcopter (Type of Drone) Is Connected This Gives Each and Every Single Information About the Drone's:

- Battery Status
- Groundspeed
- Airspeed
- GPS Reported Altitude in Order to Avoid Collision or Collapsing with Buildings or Mountains
- Direction of Heading and Present Path of Heading
- Mainly Latitudes, Longitude and Altitude

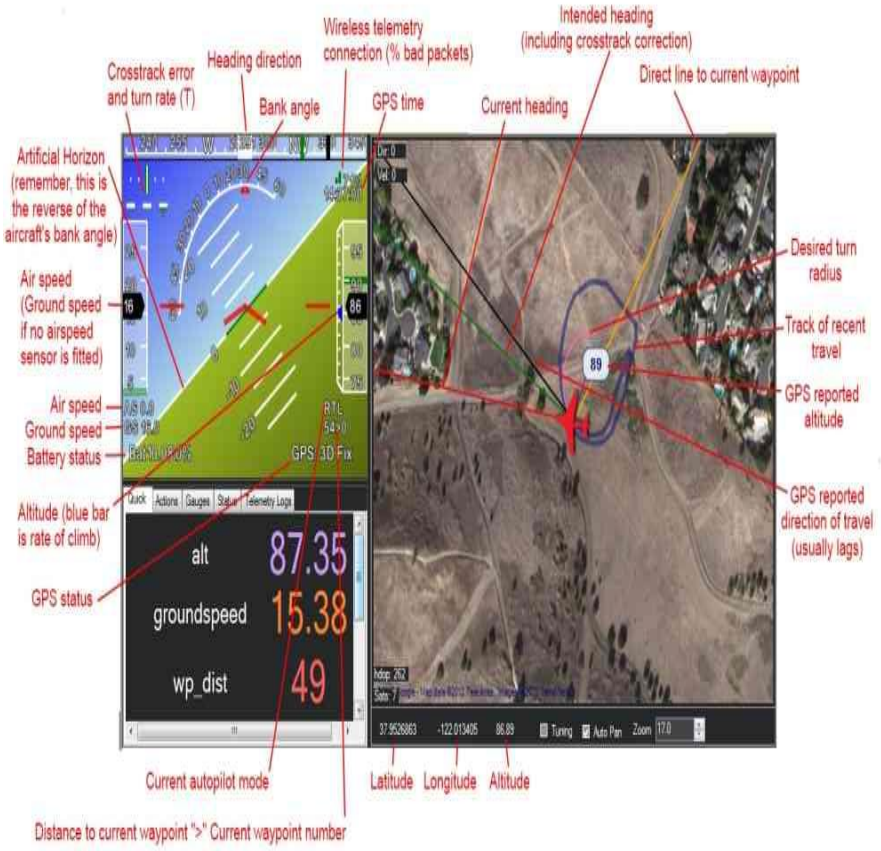


Fig.8. Window of the landing status

REPRESENTED NUMBERS TO GIVE THE SPECIFICATION OF COPTER" S FUNCTIONING:

- 1-Air speed (Ground speed if no airspeed sensor is fitted)
- 2-Cross track error and turn rate (T)
- 3-Heading direction
- 4-Bank angle
- 5-Telemetry connection link quality (averaged percentage of good packets)
- 6-GPS time
- 7-Altitude (blue bar is rate of climb)
- 8-Air speed
- 9-Ground speed
- 10-Battery status
- 11-Artificial Horizon
- 12-Aircraft Altitude
- 13-GPSStatus

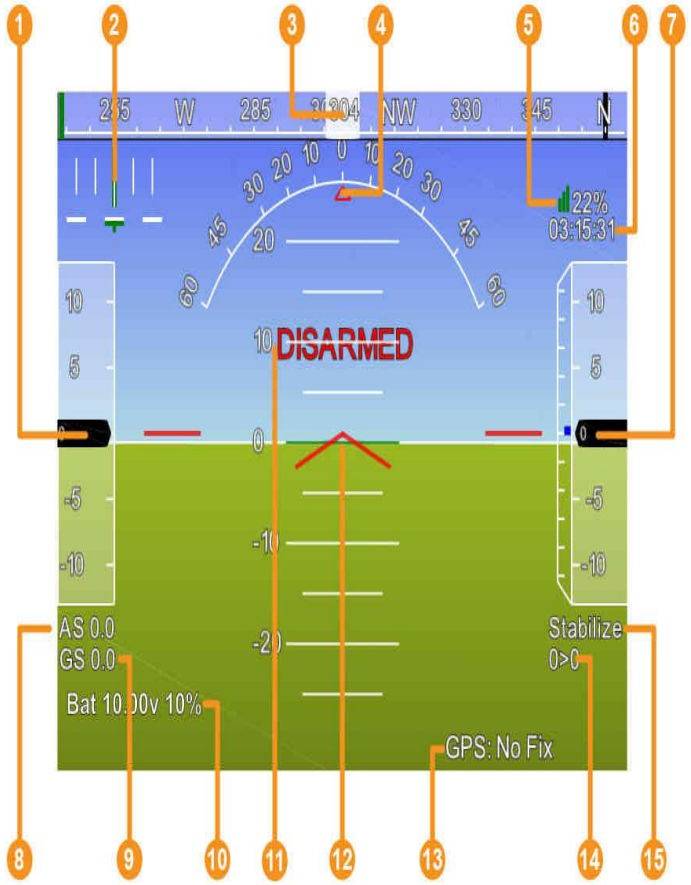


Fig.9. Feedback of the drone

5. CONCLUSION AND CHALLENGES FACED

We faced many challenges while testing our prototype:

- Accurate location coordinates cannot be provided by the GPS module.
- Signal transmission can be weakened by buildings, tunnels and weather conditions.
- The emergency response time should be reduced.

6. PROBLEMS ADDRESSED BY GPS SURVEILLANCE DRONE

- Delivering necessary requirements to people in a crisis.
- Detecting the people in danger who are unable to call for help

7. APPLICATION

Our proposal can be used to deliver foods, medicines and other essential things after the disasters like earthquake, floods etc. It is an autonomous drone, so we need to give just the initial and delivery place. And it also has the sensor for detecting human who are Blocked in buildings or flood-Zone. It needs very less manpower to work.

Even our proposal is useful in many ways, it also has some limitations. The cost of Pixhawk is higher. Need of Battery and power consumptions is higher. Chance of damage or crash landing is possible. Replacement of components is difficult.

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