Remote Area Emergency Deliveries using Drones with Camera and GPS Assist

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Abstract

Nowadays, Unmanned Aerial Vehicle is mostly used for surveillance and reconnaissance by military and law enforcement agencies around the world. This paper describes an efficient system of using the UAV for delivering payloads to remote areas in case of any emergency when normal transport methods will not be efficient and effective. With the help of an omnidirectional camera, a GPS sensor and a few other instruments, it is possible to send drones to make a fast delivery. The paper describes how the drones can be used in the emergency situations for delivery operations to remote areas. The omnidirectional cameras allows it detect obstacles in all directions and the GPS allows it to deliver in shortest time with a shortest path. Using OpenCV image processing, we can take the input from the camera, process it, and can take actions as the output.

Keywords-*Image Processing; GPS; omnidirectional camera; Unmanned Aerial Vehicle;*

1.INTRODUCTION

The Drone nowadays are used for filmography and fun purposes only. The long range drones can be used for remote area delivery purpose which reduces the time consumed and people working for delivery. The emergency delivery in a remote area is based in the time factor only. The more time consumed the people will be in more dangerous situations. The Heavy Unmanned Aerial Vehicle attached with the 360 degree camera and a GPS Sensor can lift heavy goods to be transported faster. The onboard Raspberry pi will run the program and process the input from the sensors eliminating the need of a remote control thus increasing the range of delivery.

An omnidirectional camera is able to perceive image from all directions and create a wide angle view that is similar to that of a VR. The UAV will be able to detect any obstacles from any directions with an omnidirectional camera. The real time feed can be relayed to the user to take actions in an ambiguous situation.

Figure 1: Omnidirectional view from a drone

2.BACKGROUND INFORMATION

Drones have been proven to be a source of fun and recreation, but they have the potential to provide a wide range of benefits to the delivery operations. These are mostly used in the military operations and commercial purpose only.

A. Problem statement

The disaster management are of two types :

1) Pre Disaster Management

2) Post Disaster Management

This paper deals with the both Disaster Management which involves the delivery of rations and equipment necessary in pre and post disaster management. The delivery of these payloads to remote areas takes an enormous amount of time and planning due to transportation limitation. The main research objective is to find how the delivery drones can be used in disaster management of remote areas. During a disaster like earthquake the areas affected need the rations, med kits, tools and equipment necessary to perform search and rescue missions. The key Factor which involves the lifesaving is time. The work must be done efficient to save time and therefore people's life.

FIGURE 1: DELIVERY DRONE IMAGE

For example, Horsefly Drone can lift up to 4.5 kg. A 4.5 kg package can easily contain small ration, med kit, water bottle and essential tools. Multiple drones can be used to perform wide range delivery or to deliver more quantity or to perform both tasks at the same time.

3.SYSTEM DESCRIPTION

3.1 SYSTEM ARCHITECTURE

The system architecture into two main parts the UAV and the omnidirectional camera. The UAV is attached to a GPS system which make it operable for long range. A lightweight omnidirectional camera like Samsung Gear 360 can process image from all direction. Tools like OpenCV can process the input from the camera and detects any obstacles that might be encountered by the drone.

FIGURE 2 : OMNIDIRECTIONAL CAMERA

3.1.1 UAV SYSTEM DESCRIPTION

The UAV is built on a large frame with control board of 4 rotors. The purpose of the control board is to stabilize the aircraft during the flight. The signal from the gyroscope inputs the information to the integrated processor and sends out a control signal to the electronic speed controller and control the speed of the rotor. The UAV is built with a GPS unit also to send and receive the locations and directions backward and forward direction. The operating frequency is set to maximum Hertz to get the clock rate highest and the processing to a minimal amount of time. The accelerometer measure linear acceleration of the device. The LIS302DLS is a 3 axis based accelerometer operates in two models to measure 2g and 8g with 100 and 400 mhz.

3.2.2 Comparison between Quadcopter and others

The main difference between a quadcopter and a helicopter is the number of blades used for the lift. A helicopter mechanism is extremely difficult to build and work properly, whereas quadcopter are pretty simple. A helicopter produces all the lift needed which is equal to its weight with one blade. As a result the total mechanism is quite complex. On the other hand the stability of the quadcopter comes from the four motor with their blades and it's quite simple to understand. The Electronic speed controller and the flight controller draws less voltage from the battery and makes the power distribution system more dependable. The ESC uses a PWM signal coming from the flight controller to create an average voltage /current to control the speed of the motor. The stronger the signal the more current passes through the ESC.

4.IMAGE PROCESSING SYSTEM

4.1 Frame work

The algorithm is designed too automatically design to scan the entire area analyze the thermal images using the OpenCV pattern recognition algorithm. The open computer vision is an open source program which consists of facial recognition and object recognition algorithms for target detection. When the image and given a template is created from asset of sample image called training set and those consolidated images forms a matrix to be followed. When the GPS co-ordinates are uploaded the threshold is only set for the highest values only then when the sensors find the appropriate match the alert message will be sent the admin.

Analyzing algorithm.

- To convert and analyze an image into a dampener the system has to convert the image into grey scale and reduce the pixel size of the image.
- Remove the background and store only the spike that appears in the grid.
- Compare the consecutive images and pick the appropriate location of the required pattern.
- If the pattern matches the original template then perform the task the system is trained to do in that situation.

The number of images samples improve the accuracy and location of the pattern.

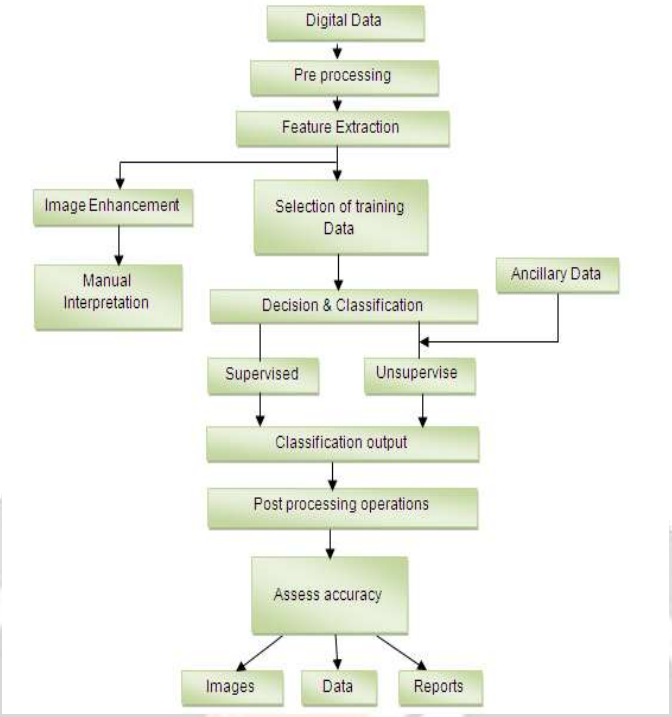

FIGURE 3 : FLOW DIAGRAM

The UAV will be fixed with a fuel gauge IC which keeps track of the charge state of the battery. The coulomb counter algorithm calculates the current shunt with an amplifier and measure the consumed current and sums it over time and compares it with the battery capacity. An additional coulomb counter is impedance tracking in which the fuel gauge tries to measure the battery's impedance. The fuel gauge usually has its own temperature sensor to compensate for various temperature related effects. The mapping of the temperature gauge with the discharge and converting into percentage will give no of hours in the air. When any overload or malfunction occurs the landing process can be automatically initiated and circumcised.

5.Prediction Algorithm

The idea is to obtain the standard edge detection to sort the important edges and create a template that is used to compare with the current image given. The initial segmentation consists of forming the seed region and structure. A subsequent region growing stage assigns the pixel stage and unable to pixel one of the region until the segmentation is complete. An Artificial Neural Network can be used for the classification of the set based on the input. It means that the number of input nodes is equal to number of the considered features. An ANN functions based on the number of neurons connected to the central network. In the case of prediction algorithm the images with accurate temperature gradient and taken and named with the index values. Now when the neuron receives the signal as the input the focused task is initiated and the hash values are assigned into a data structure and a hash table is created with every input the data is mapped with the concurrent index.

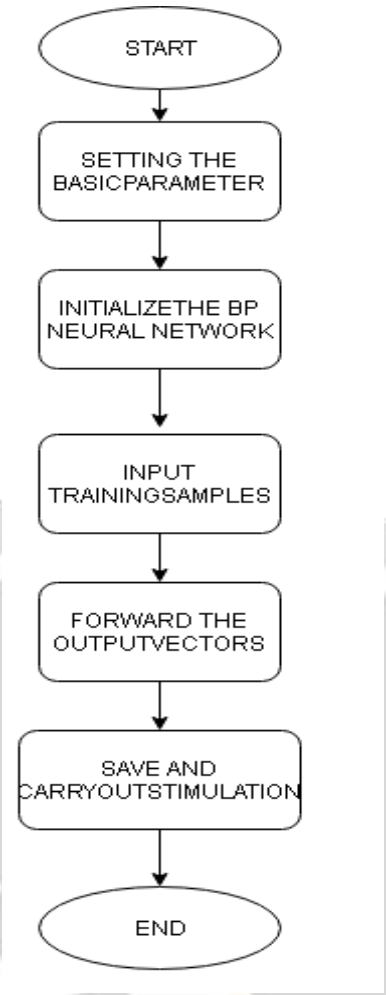

FIGURE 4 : PROCESS DIAGRAM

The basic parameter are “37 c to 45 c” and the patterns are classified into 4 colors such as Gray scale, Arctic, Lava, and Rainbow.

FIGURE 5 : OBJECT RECOGNITION

In the case of night vision the image will be available in green color but the disadvantage of the night vision is that when it is pointed to thermal radiation it scrambles the display due to chronic effect. But in the case of thermal cameras a special lens is fitted in the frontal lobe to filter the image and create a vector that has the

scale co-ordinates to form the matrix array. The displacement of the above shown image is seen in the case of the radiator machine which show selective colors in the Rainbow filter but in other weather conditions the sensor pick up different gyroscopic values and change the frame into Arctic or Lava. The pattern recognition algorithm will convert the image form RBG to grey scale. In case of chemical company there exist a very effective and extensive internal network of thermograph users in additional to several reasonable and size infrared thermography programs. This network mainly through the use of heat sensing, shares experiences, significant findings and new procedures also. One method to enhance this decision making process is to develop a weighted assessment matrix, taking into account variation factors which should be considered when determining the severity of the finding and the action required. Although you must modify or develop a matrix to meet your needs is an example of weighted assessment matrix. The maintenance required will develop on the analysis of the source of the elevated temperature and can vary from completed replacement to retorquing and terminations. Any equipment or object where temperature pattern or level indicate equipment condition is a good application for Infrared thermography. It is essential in being able to safety collect useful data and accurately interpret the data gathered.

6.Conclusion and Future work

This paper describes a system to help people during disaster using Infrared Thermography with the help of computer vision. The prediction algorithm analyze the images taken by the FLIR camera and send it to the user. It is capable of analysis the system using thermal sensors and FLIR cameras M500. This system makes use of a microcomputer to run a detection algorithm using a low cost thermal sensor and GPS module. The system proved that it is possible to detect life using a thermal sensor and GPS on an airborne platform, and send the detected data (images, GPS location) wirelessly to a GCS to be analyzed. The predictive mobile application has been integrated to this system to show potential uses for the system in Disaster, Rural environments or search and rescue remote sensing. In future a higher resolution thermal camera can be utilized to improve upon the thermal imaging and make it possible to distinguish between different environments and metals also.

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