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Micro Aerial Vehicle Image Capture and Enhancement

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Abstract

Micro aerial vehicles finds variety of applications. One among it is image and video capturing and surveillance. The images captured from the micro aerial vehicle will be of distorted in the form of blur, brightness change, overlapping due to un-stabilization of vehicle and restricted range of camera. For effective use of the image capture for practical applications the image need to be further processed and enhanced. The main objective of this paper is to enhance the quality of images acquired using Micro aerial vehicle. In this paper, the images captured using onboard camera attached to Micro aerial vehicle. After flight duration of 1-2 minutes the images captured are copied to personal computer. We will capture 4-6 images using Micro aerial vehicle. These captured images used as sample images. we are going to make use of the image enhancement code for these images. Making use of mat lab tool does further analysis and enhancement. The camera used for capturing images is VGA camera. Because of its low cost and portability.

Keywords*—X drone G-shok, wireless 2.4Ghz micro camera, acquiring images, distorted images, mat lab, enhancement of images.*

I INTRODUCTION

Now a days the applications of Micro aerial vehicles growing rapidly in the field of surveillance and monitoring and etc. Some of the scenario's listed below gives the importance and application of Micro aerial vehicle

1. National Disaster Response Force (NDRF) used its domestic made Unmanned Aerial Vehicle (UAV) in order to locate the students missing turn washed away in Himachal Pradesh's(HP) Beas suddenly opened catastrophically high due to abrupt release of water from the dam used to produce 126 MW hydropower project of HP. The main challenge faced by the rescue team of NDRF is that the quality of image acquired by the UAV is not clear enough ready to use in addition to the GPS connectivity issues in the extreme topographical conditions. These challenges are quite visible and publicly presented in [1].

2. An unmanned aerial vehicle (UAV) was also brought here to help provide real-time images of the entire surface of river between the accident site (Shalanala village) and Pandoh dam.

3. The indigenously developed unmanned aerial vehicle called Netra is used by NDRF, in many rescue operations. For example, to carry out the surveillance and monitoring of landslide disaster happened at Malin in Ambegaon taluk and is the second time that the elite forces uses modern technology for rescue efforts.

4. In another instance, drones are widely used by the law enforcement authorities for crowd monitoring and control, for example Ghats monitoring during Godavari Pushkaralu happened at Godavari river basin.

From the above mentioned scenarios 1 to 4, it is clearly observed that UAVs are playing an important role in the resume operations, surveillance, crow monitoring and control and lot more other applications. However during visual capturing of images and due to un-stabilization of aerial vehicle, very restricted range of digital camera yields the captured images as blurry, rolling, shutter (shakhy images), Reflected image, Image Scattering etc. Many of these phenomena is very well documented in [4]. All the images captured by UAV is one or the other way suffers serious defects and this motivates the author to restore the image by using the image processing techniques.

In this paper we will be capture images using onboard camera attached toa Micro aerial vehicle called as X drone G-shok. After acquiring images, the images, which have distorted due to some issues, will be enhanced by making use of image enhancement code and mat lab.

In this paper we are going study about

1. Micro aerial vehicle i.e X drone G-shok,

2. Onboard camera attached to X drone G-shok and its calibrations.

3. Acquiring images using micro aerial vehicles

4. Enhancing the acquired images.

II METHODOLOGY

We are going to capture or acquire the images using the Micro aerial vehicle that is X drone G-shok with on board camera attached to it. Next, the acquired images can be copied into a pc. After identifying the distorted images they can be enhanced by using image enhancement code in mat lab tool.

1. Micro Aerial Vehicle (Xdrone G-shok)

Xdrone G-shok is a kind of MAV and is a subset of UAV classified under the category of autonomous vehicle. Miniature version of the said vehicle is made available as small as 15cm and comes with an ultra focus tuned Camera is used in this work.

Figure_1. X Drone G-shok

The salient features of X Drone G-shok are 6-axis gyrostabilizer, launch through capability, 2.4GHz control, dual mode of operation, long range, operating at various speed levels like, low, medium and high, ability to work in indoor and outdoor environments.

The main functions of X Drone G-shok are to move up in air, to move down in the air, to make forward as well as backward turns, turning left, turning right, and hovering in specific location and flip over. To fly, up and down, go forward and backward, turn left and right, side flying, hover and flip over. Status of these X Drone G-shok has a LED light for indication.

This X Drone G-shok is battery operated which is rechargeable. The battery for X done G-shok is ＋3.7V 580mAh Li-poly with protection board. Charging time is about 60-80 minutes. Flight duration of X drone G-shok is up to 10 minutes after fully charged the battery.

This X Drone G-shok has a transmitter for the operation. It requires 4 *AA batteries.

Figure_2. 2.4 GHz control transmitter

The above transmitter has camera and video buttons on it through which we can set mode of camera as still camera to capture images and other one is for video recording [2,3,4]. Also it has two joysticks for motion of drone. Using the left joystick we can fly drone up and down, rotate left and right sides. While using the right joystick we can move the drone forward and backward directions, and sides also. Along with these transmitters has auto trim buttons through which we can fly vehicle without joysticks.

2. ONBORD CAMERA ATTACHED TO MAV

We are using a VGA (video graphics array) camera for capturing the images. This has RGB color filter for images. The camera is installed at the bottom side of X drone G-shok

Figure_3 VGA camera

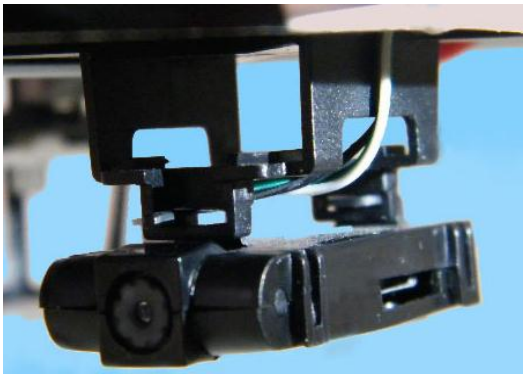

Figure_4 installation of camera

In figures 3,4 we can see the on board camera and installation of camera. The camera portion has a slot for memory card, which is used to store the captured images.

Camera specifications follow as

1) It's a 0.3 Megapixel camera
2) Image resolution is 640X480 mega pixel.
3) The image size in inches 3.2"x2.4"
4) The images will be stored in the JPEG format.
5) Camera has a flexible to flip around 45 degrees

3. IMAGE AQUISATION

We obtain or acquire the images during monitoring or surveillance using on board camera attached to X drone G-shok.

Using the wireless 2.4Ghz transmitter and antenna attached on board to the drone, camera will function and acquire the images. As we said earlier the transmitter has two separate buttons for still images and video recording as we press the these buttons after battery connected to the MAV the still images or videos gets captured or recorded and stored automatically into the memory card.

Some of the images captured by X Drone G-shok are

Figure_5 clear image

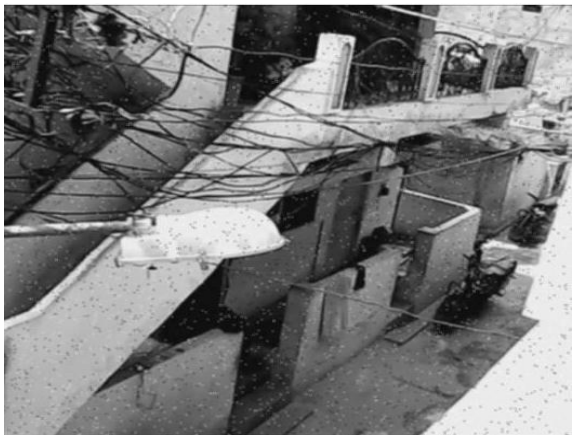

Figure_6 noisy image

Figure_7 blur image

Figure_8 low contrast image

From the above given four figures the last four i.e figures 6,7,8 got distortions compare to figure 5.The distortions in the images are brightness change and blur shaking, noisy. These distortions occurred due to the un-stabilization of vehicle and lighting effect.

The images 6,7,8 are gray scale images of original colored captured images. Sometimes the same problem may arise while performing the monitoring and surveillance or in any rescue operations in real time as we mentioned in introduction.

So for the effective and practical use of the captured images while performing some functions like Surveying and rescue operations those distorted images has to be “enhanced” for further applications

4. ENHANCING THE ACQUIRED IMAGES

This is final part of the experiment. Till now we have learned about the Micro aerial vehicle and camera attach to it, and now how to capture the images using the X drone G-shok

After capturing, the images that are stored in memory card should be copied into a personal computer. For this process we have special USB cable provided by the X Drone G-shok.

After identifying the distorted images we have to do the enhancement to improve the quality of images.
Making use of the image enhancement code and mat lab will do further enhancement.

IMAGE ENHANCEMENT

There are various methods and steps are available for enhancing an image and are subset of image processing techniques specifically for digital images. The image enhancement is carried out using various filtering techniques available in the MATLAB codes and remove noise, sharpen or brighten and making an image easily accessible to identify key features to used for monitoring purpose. MATLAB is a tool for technical computing it integrates the programming, computations and visualization, where normal user can imagine and solve the problems in terms of simple mathematical expressions. The present work utilizes various filters of MATLAB functions like wiener filter, medfilter, imfilter, deconvwnr filter and etc. In addition to this MATLAB can be further used for signal processing and communications, Control system image and video processing system development along with application in test and measurement, computational finance & biology support.

III RESULTS

As mentioned above by making use of MATLAB lab and Image enhancement code the restoration or reconstruction of images has completed. The restored or reconstructed images are given below

Figure_9 deblurred image

Figure_10 improved contrast image

Figure_11 denoised image

IV CONCLUSION AND FUTURE SCOPE

From the experiment results, we concluded that the Micro Aerial Vehicle image capture and Enhancement is good and preferable for those who wants to make use of Micro Aerial Vehicles for monitoring, surveillance and some rescue operations and different applications. If they identify the issue of distortion or any disturbance in the images they can easily overcome the issue and make benefit of time and money. We have been performing studies in order to clarify the video distortions too using some appropriate methods and causes for disturbance in video capturing. These are future works.

V REFERENCES

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