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Design the Surveillance Algorithm and Motion Detection of Objects for Moving Vehicle Using Camera Vision in Unmanned Aerial Vehicle

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Abstract – *The conventional surveillance systems along the borders suffer from continuous human involvement which sometimes turnout to be risky. As the technology is advancing at a rapid rate, many new methods of surveillance systems can be introduced for efficient results. The involvement of drones is one such kind of thing. UAV can be remotely controlled to achieve all the necessary information without needing to be present at the location. The present idea deals with the analysis of the imagery captured by a drone in surveillance. This provides a great indication of what is actually going along the boundaries of a country.*

Key Words: **UAV, Camera, Surveillance, Open CV, Motion Detection.**

1. INTRODUCTION

UAV's are generally known for their dull, dirty and dangerous roles. Surveillance is one such activity which requires a continuous operation over wide area. When assigned to humans they might or might not cover a large area at a certain time. The same activity along the borders may also sometimes be dangerous. Employing the aerial robots in such areas not only increases the efficiency but also decreases the risk factor. Thus drones play an important role as they can be controlled from a distant place and achieve more information than to a person present at that place. Here the present idea concentrates on the analysis of the imagery captured by a surveillance drone to get information. The area to be monitored will be fed to the drone. The drone collects the imagery and transmits to a ground control station where the processing of the imagery is carried out. Here we are using tools like Open CV and python on ubuntu 16.04 platform.

1.1 Problem Description

To reduce the human loss and effort UAV based surveillance can be used as surveillance is a continuous operation sometimes the official or the authority may get tired of doing the same duty so in order increase the efficiency of the task, an aerial robotic system or an UAV can be added to the force. As the UAV's cannot carry high resolution cameras as of satellites due to payload and endurance concerns a suitable image processing of the received data may make the objective easier to collect various data.

The problem statement is split as follows:

1. Surveillance carried out on a predefined area.
2. Send the collected imagery to the ground station.
3. Detecting the moving and stationary objects.

2. RELATED WORK

The development of unmanned aerial vehicles (UAVs) has been growing significantly over the last decade. UAVs have been expanding from military applications into civilian purposes like aerial photography, field surveillance, and disaster relief. However, most are often found to be expensive and difficult to deploy. To address these issues, this proposed project sought to implement a lightweight drone capable of performing surveillance while communicating in to the user.

Previous work details the efforts of creating a stable system that combines a small and integrated control structure.[1] Two tasks are given to the processor. First one is ground motion estimation and second task is target detection and tracking. Tracking is made simpler by assuming the color and the size of the target or object. The target standard specification parameters are stored. When capturing the video simultaneously the coding will change the original images into gray scale image. The target identification parameters like size, color are preloaded before the integration.

The main problem to solve when trying to detect moving objects from a flying UAV is to separate the changes in the image caused by the movement of the vehicle from those caused by dynamic objects.[3] Although this problem is not limited to aerial vehicles, it represents an additional difficulty with UAVs since they have more degrees of freedom. The main part of the methodology consists of comparing an artificial optical flow based on the movement of the camera with the real optical flow, and tracking the discrepancies. The core of algorithm is the calculation of an artificial optical flow and its comparison with the real optical flow. The extrapolation of the information obtained using this set is enough for detecting and tracking moving objects in the whole image. Based on an image sequence the algorithm provides a list of dynamic objects with several associated characteristics such as position, size, velocity and color.

In the application of aerial photography, object detection and tracking are essential to capturing key objects in a scene.[2] Object detection and tracking are classic problems in computer vision. A Fast RCNN is a Fast Region-based Convolution Network method (Fast RCNN) for object detection.

Background subtraction is the most widely used technique for object detection. The goal is to leave only the foreground objects of interest by subtracting the background pixels in the scene. [4] The initial phase of the background model until the background pixels are stable is simple temporal frame differencing.

3. METHODOLOGY

The methodology followed in the present title is to fly an UAV with all the required optical and other sensors interfaced to it for serving the purpose of surveillance. May it be along the border or any pre-defined area that will be fed in to the UAV. The UAV carries out the operation at regular intervals and collects the data that is to be transmitted to the control/ground station. The ground control staff will analyze the details or the data to process it further so that the necessary operation/action could be taken. The image data is fed to open cv, the inbuilt function get the frames. The individual frames are subtracted from the reference background to separate the foreground. The subtraction depends up on the threshold value which discriminates background from object . The value of threshold can be changed accordingly.

$$P[F(t)] = P[I(t)] - P[B]$$

Where:

P [F (t)] - resultant image

P [I (t)] - Current frame

P [B] - Background

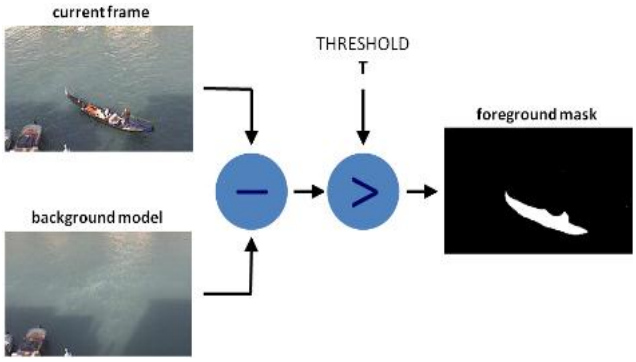

Fig-1: Example of background separation

The background is assumed to be the frame at time *t*. This difference image would only show some intensity for the pixel locations which have changed in the two frames. Though we have seemingly removed the background, this approach will only work for cases where all foreground pixels are moving and all background pixels are static.

A threshold "Threshold" is put on this difference image to improve the subtraction.

$$[P [F (t)] - P [F (t+1)]] > Threshold$$

This means that the difference image's pixels intensities are threshold or filtered on the basis of value of Threshold. The accuracy of this approach is dependent on speed of movement in the scene. Faster movements may require higher thresholds.

Components used:

1. Ubuntu 16.04.
2. Open CV.
3. Python 2.7.

4. RESULTS

The input fed to the algorithm is a video which later to be transformed in to a gray scale. Based on the threshold value the output generated was able separate the foreground and background successfully and the difference in the position of the pixels was found.

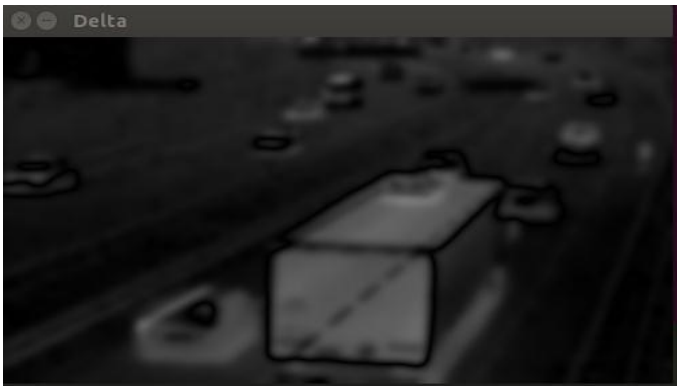

Fig- 2: Delta image

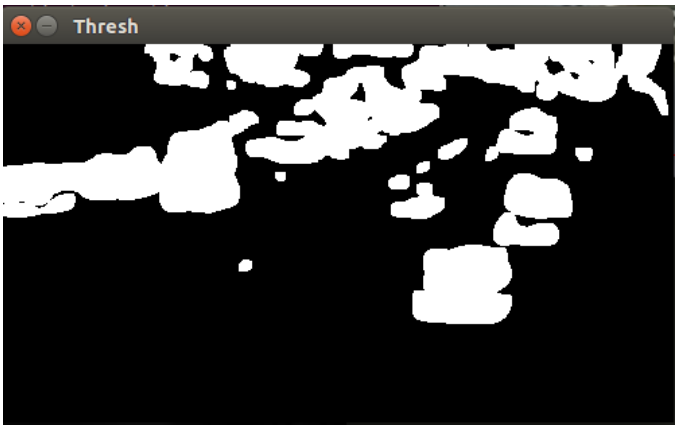

Fig- 3: Threshold image.

Here the white area determines the pixels movement of the moving objects. This is based on the threshold value.

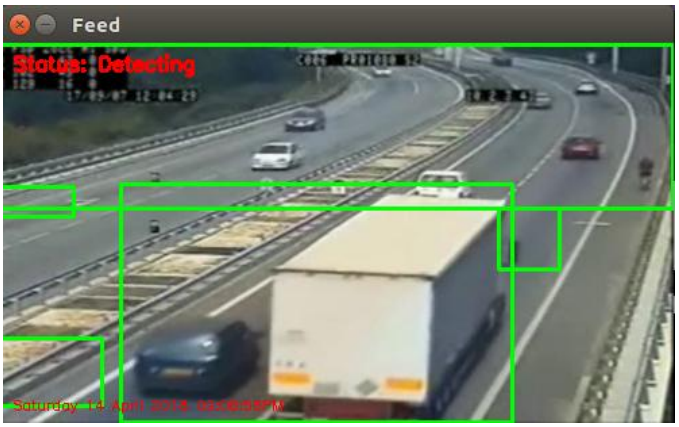

Fig- 4: Final image frame detecting the moving vehicles indicated by forming contours.

Table -1: Indicating the variation of minimum limit for threshold values

Threshold	Accuracy in detection (%)
5	15%
15	30%
20	55%
25	75%
20	65%

The threshold values above 25 are proven to be good but are making the algorithm aggressive by detecting every object in the frame. So the optimum value of the threshold was found to be 25. The output of the threshold image is given to be binary that is the reason why the threshold image is appearing only in black and white. The maximum value is set to 255.

5. CONCLUSION

Motion detection in a video stream is achieved by employing foreground and background separation technique.

6. FUTURE SCOPE

As the motion is detected, the future work will be to determine the detected object type or to classify the object. Having this kind of a system on board of an UAV will reduce the reaction time, and can use a satellite link for better communication

REFERENCES

[1] Prasanna Linci.A , Ms.Vinyojita Mohan raj, "Target Identification and Tracking using UAV,"

[2] Song Han, William Shen, Zuozhen Liu "Deep Drone: Object Detection and Tracking for Smart Drones".

[3] Gonzalo R. Rodrıguez-Canosa, Stephen Thomas, Jaime del Cerro, Antonio Barrientos "Real-Time Method to Detect and Track Moving Objects from Unmanned Aerial Vehicles Using a Single Camera".

[4] Shreyamsh Kamate, Nuri Yilmazer "Application of Object Detection and Tracking Techniques for Unmanned Aerial Vehicles".

[5] Jia, Z, Balasuriya, A, Challa, S. "Sensor fusion-based visual target tracking for autonomous vehicles".

[6] Zhang, H.Y. M, "Multiple Moving Objects Detection and Tracking Based on Optical Flow in Polar-Log Images."

[7] Miller, A, Babenko.P, Hu, Shah, M. "Person Tracking in UAV Video"

[8] Huang, C.H, Wu, Y.T, Kao, J.H. Shih, Chou. "Hybrid Moving Object Detection Method for Aerial Images"