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BORDER SECURITY USING COMPUTER VISION

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Abstract - *The aim of this work is to design the automated security in order to detect, track and destroy the target for surveillance operation. The system can be operated in two modes, in which the target can be tracked automatically by using microcontroller based system. On other hand, the system can also be controlled manually in which the user has right to select the target and performs shooting if necessary. Computer vision is closely linked with image processing, as the computer must interpret what it sees , and then perform appropriate analysis or act accordingly. The process starts by processing the video signal on computer by using the video camera, then the target is selected which can be tracked further by using different image processing techniques. After selection of target, the microcontroller unit takes the decision to shoot any unauthorized person or activity within its range. The gun is mounted on a tripod stand and its movement is controlled by using the stepper motor. Once the target is selected it can be tracked by moving camera and gun. The basic purpose of this automatic gun targeting system is to secure the border using automation and this will reduce the human efforts.*

Key Words*: *Computer vision, target selection , target tracking, automatic gun .

1.INTRODUCTION

Now a days security is the major issue for all over the world. Security is major factor in order to protect vulnerable and valuable assets such as a person, dwelling, community and nation from any harm. The International security issues are also very important, especially border and coast security to any country. The mankind of national security agencies, maritime security organization, military forces and other forces sacrifice their lives to protect their country people. The lives of soldier are also very precious like other lives. So by using advance technologies, the forces can protect their nation supremely with minimum life losses. In this modern era, computer base security equipment's are very popular among forces because they are more advance and safe for themselves. For example drone technology the "unmanned aerial vehicle" which is controlled automatically by computer is very popular these days. In this technology, the target is selected and hit by using computer based algorithms including image processing techniques. As real time image and video processing for object detection and tracking has many important applications in the field of computer vision. A very highs possible to identify three key steps in video analysis: detection of interesting moving objects, tracking of the detected objects from frame to frame, and analysis of the object tracks to recognize their behavior and targeted object accordingly. Another existing example of automatically aimed weapon is the sentry gun which aims and fires the targets which is selected by its sensors Another existing application is "Air Defense Gun" which is mounted on the device at the top of the army tank which automatically tracks and shoots low flying a Object detection with a camera is a revolution in image processing which itself has applications in various civilian and military fields. These applications include air traffic control, navigation system, error tolerant systems, judgment problems, inspection, target analyze, command and control, sensor management and weapon assistance.

1.1Motion detection:

Motion detection in sequel images is nothing but the detection of the moving object in the scene. In video supervision, motion detection refers to the capability of the surveillance system to detect motion and capture the events. Motion detection is a software-based monitoring algorithm which will signal the surveillance camera to begin capturing the event when it detects motions. In motion detection, a camera fixed to its base has been placed and is set as an observer at the outdoor for surveillance. Any kind of small movement with a level of tolerance it picks is detected as motion. There are typically three approaches to moving object detection- Temporal differencing, Averaging and Optical flow. Temporal differencing is very adaptive to changing environments, but generally does a poor job of extracting all relevant feature pixels. Averaging provides the most complete feature data, but is extremely sensitive to dynamic scene changes due to lighting and extraneous events. Optical flow algorithm can be used to detect independently moving objects in the presence of camera motion; however, most optical flow computation methods are computationally complex, and cannot be applied to entire frame video streams in real-time without specialized

hardware. The Average image subtraction method is been utilized in this paper for motion detection.

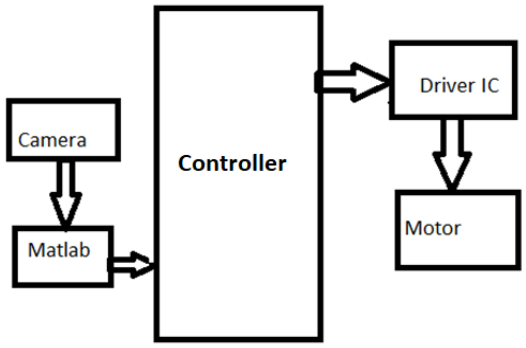
1.2 Motion Tracking:-

The object tracking is done after object detection. This function gives the intelligence to the camera. An enemy entering into cameras visual range will always be followed by the camera after detecting it. This feature is called motion tracking. This is carry out by mounting camera on motors to ensure its movement in the direction of motion of the intruder. The object motion tracking depends on the efficiency of motion detection. To attain real time motion tracking the motion should be detected with least possible time lag.

1.3 Problem faced in Real time environments:

In video motion detection is fundamental in many autonomous video surveillance strategies. However, in outdoor site where inconsistent lighting and unimportant, but distracting, background movement is present, it is a challenging problem. In present real time environment where scene is not under control situation is much worse and noisy. Due to environmental changes light may change anytime which cause system output less meaningful to deal with. Late has produced several background modeling techniques,on basis of image differencing, that exhibit real-time performance and high accuracy for certain classes of scene.Where the environmental changes introduces unpredictable variations in both lighting and background movement.

2. OVERVIEW OF SYSTEM IMPLEMENTATION



In this system has various functional blocks with each block having its specific function. Above shown all these blocks together help the system to operate. We have a Camera, a computer, a motor and a controller in the system.(Fig.1) shows the system overview.

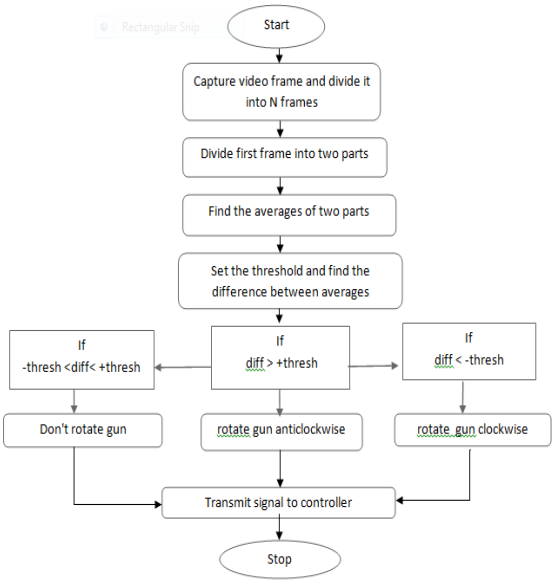
To apply the image processing we have used a simple algorithm which is efficient for the specific system conditions.

The conditions required for this algorithm are
(1) Presence of a single object
(2) Large contrast between object and the surroundings.
(3)Background should be plane and constant (no moving components other than object).

When these three conditions are satisfied then our algorithm is efficient and easy to implement. The algorithm is presented in the flowchart as below:-
We capture the image with the help of camera and then these visual inputs are sent to computer for processing. The software MATLAB is used for image processing.
The inputs from camera are continuous. At the start a particular time interval is defined for generating frames called as frame interval. So, instead of processing the visual inputs continuously we process these frames. The frame is nothing but an image. This image which consists of pixels is divided into two parts. Averaging is performed on both the parts and then the difference of these two averages is computed. This difference is scaled down by using a scaling factor which depends on the conditions in which system is operating. The movement of the gun is proportional to the value of this difference. A threshold value is determined depending on the operating conditions of the system.

Thus we get three conditions:-
- If difference> + threshold…….gun rotates anticlockwise
- If difference < - threshold…….gun rotates clockwise
- If - threshold < difference < + threshold …..do not rotate

3. SYSTEM FLOW AND WORKING:



The software execution is done on the images of resolution 160x120. The capture image is divided into two parts of resolution 80x120 each. The sum of intensities of all the pixels in a particular part is called average of that part. Thresholding is simplest method of image segmentation, user can choose a threshold value known as manual thresholding or the thresholding algorithm can compute an value automatically known as automatic thresholding.

CASE 1: when the threshold condition is - threshold< diff < + threshold, it indicate presence of object at median. Then controller takes an action " don't rotate the gun".

CASE2:-When the threshold condition is diff> + threshold, it indicate presence of object at right. Then controller takes an action "rotate gun anticlockwise" .

CASE 3:- When the threshold condition is diff< - threshold, it indicate presence of object at left. Then controller takes an action "rotate gun clockwise".

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4. CONCLUSION

In this paper, a new method is purposed to detect motion using the subtraction algorithm. Project proposes the sampling by calculating the intersection of number of background subtracted frames which are sampled over a period of time .A video monitoring & detection system was thus developed successfully. The system mainly provides an efficient method for surveillance purpose and aimed to be highly beneficial for military.

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