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Robust Method for Feature Object Tracking and Recovery using Phase co-orelation

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*Abstrac*t- **Many algorithms are proposed regarding objects recognition and tracking as this is very important problem in computer vision. Most of existing approaches make a simple assumption about initializing the object to be tracked. The binary classifier only has to discriminate the current object from its surrounding background can lead to tracking failure without a recovering. The robust method simplifies recovery problem and also accelerates it in terms of execution time, and enhances performance in terms of accuracy. In this technique the compressed image is divided into overlapping blocks of fixed size. These blocks are sorted using lexicographic sorting and duplicated blocks are identified using Phase Correlation as similarity criterion. The real time learning ability by virtue of which algorithm adapts to the changes in the form, orientation, view point of object which is being tracked and stores those in database further reference . Complex object can be learned and the object is initiated automatically at its first appearance. Moreover, the distinct advantage is we can almost completely make sure that the object is always detected and tracked when it appears; the abruption is also detected and failure will be recovered by re-detecting the object. In the intensive set of experiments on challenging data set for several applications, we demonstrate the out performance of our framework over very recent proposed approaches.**

Key Words- **Robust Method; Phase co-orelation**

I. INTRODUCTION

The aim of an object tracking is to generate the trajectory of object overtime by location its position in every frame of the video. Object tracker may also provide the complete region in the image that is occupied by the object at every time constant. In its simplest form, tracking can be defined trajectory of an object in the image plane as it moves around scene. The task of detecting the object and establishing correspondence between the object instances across frames can either be performed separately or jointly. In the former case possible object regions in every frame are obtained by means of an object detection algorithm, and then the tracker correspond objects across frames. This data must be processed quickly due to the dynamic real-time nature of the input in order to generate quick responses. In order to generate quick responses, the intensive and dynamic image-processing algorithms used must be able to load and run quickly. While software realization of such algorithms simplifies the user task to implement them, it tends to run slower than its hardware counterpart. In the latter case, the object region and correspondence is jointly estimated by iteratively updating object location and region information obtained from previous frames. Difficulties in tracking object can arise due to changing appearance patterns of the object and the scene, no rigid object structures, object-to-object and object-to-scene occlusions, abrupt object motion, and camera motion. Online feature selection the tracking problem can considerably be simplified and therefore the classifiers can be quite compact and fast. However, using on-line adaptation suffers from drifting problem due to accumulated error occurs when the tracker is continuously updating its representation. Moreover, severe occluded object will be loosed without any recovering strategy. In order to solve the problem, we propose to incorporate an object detector into the online adaptation tracking mechanism. The object detector is a strong detector learned prior by a new active learning algorithm which allows fast learning object representation and gives high detection accuracy. Visual content can be modeled as a hierarchy of abstractions. At the first level are the raw pixels with color or brightness information. Further processing yields features such as edges, corners, lines, curves, and color regions. A higher abstraction layer may combine and interpret these features as objects and their attributes. At the highest level are the human level concepts involving one or more objects and relationships among them. Object detection in videos involves verifying the presence of an object in image sequences and possibly locating it precisely for recognition. Object tracking is to monitor objects spatial and temporal changes during a video sequence, including its presence, position, size, shape, etc. This is done by solving the temporal correspondence problem, the problem of matching the target region in successive frames of a sequence of images taken at closely-spaced time intervals.

II. REPRESENTATION OF IMAGE CO-ORELATION

A. Phase Correlation

This is a method of image registration. This can be used for template matching. The ratio R between two images ‘img1’ and ‘img2’ is calculated as follows:

$$R = \frac{F(img1) \times conj(F(img2))}{\|F(img1) \times conj(F(img2))\|}$$

where ‘F’ is the Fourier transform, and ‘conj’ is the complexconjugate.

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The inverse Fourier transform of 'R' is the phase correlation .Figure. 2 shows phase correlation between two blocks. Template matching is the classification of unknown samples by comparing them to known prototypes or templates. Here we consider applications in image processing where the templates and samples are digitized image. Phase correlation provides straight-forward estimation of rigid translational motion between two images, which is based on the well-known Fourier shift property: a shift in the spatial domain of two images results in a linear phase difference in the frequency domain of the Fourier Transforms (FT). Given two 2D functions g(x,y) and h(x,y) representing two images related by a simple translational shift a in horizontal and b in vertical directions, and the corresponding Fourier Transforms are denoted G(u,v) and H(u,v). Thus, $H(u,v) = G(u,v) \exp\{-i(au + bv)\}$ (1) The phase correlation is defined as the normalized cross power spectrum between G and H, which is a matrix:

$$Q(u,v) = \frac{G(u,v)H(u,v)^*}{\|G(u,v)H(u,v)^*\|}$$

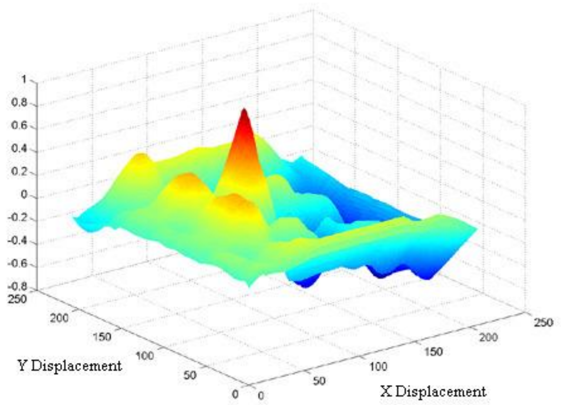

Fig 2. Phase Correlation between Two Blocks

B. *Algorithm*

1. Start
2. Read database image for reference.
3. Initialize camera.
4. Initialize serial port in MATLAB to 9600 baud rate and 8 bit data.
5. Capture photo from camera.
6. Apply image preprocessing
   a. Image filtering.
   b. Contrast stretching.
7. Apply phase correlation between database image and image captured from camera.
8. Find the location of database image into real time image captured image.
9. Keep track of the moving object under consideration.
10. Learn and store different shapes or gestures made by object being tracked.
11. Add these newly learned gestures to main database.
12. Send coordinates of object being tracked to microcontroller via serial port.
13. STOP is no desired object is found in Image.
14. Go to step 5 to repeat tracking process.

I. Experimental Setup And Results

A. Hardware Construction

This camera as sensor is interfaced to PC by USB cable. Mat lab code running on PC will capture sequence of images. First of all object to be tracked is fed to mat lab code using database. Mat lab code will identify object using identification method like Phase correlation from currently captured frames and will start tracking object. Mat lab code will find co-ordinates of object and it will send it to microcontroller via serial communication. For our project we have chosen a microcontroller which is having inbuilt PWM module. PWM is used to control direction and angle of rotation of servo motors. One servo motor will control camera view in X- direction and another will control in Y—direction. So by using servo mechanism our system will try to keep the object to be tracked in the center of image that is being captured from camera. While tracking the given object, the system will learn different appearance (form) of the object and save those as database. This feature will enable the system to track object even though object are lost

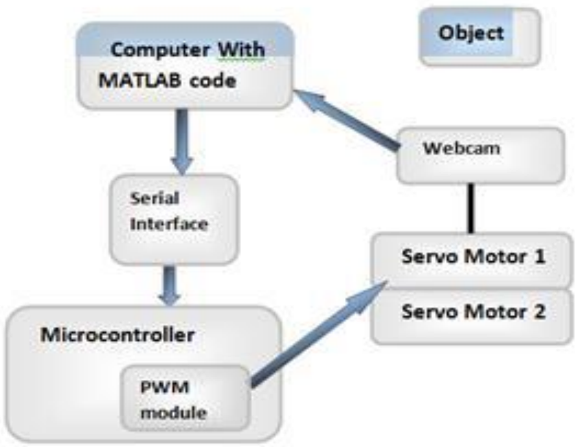

Fig 3. Block Diagram

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B. Servo Motor Mechanism

Two servo motors, one responsible for motion of cannon in X-direction and other in Y-direction together decides angle of projection. Angle of rotation of servomotor can be changed by changing width of PWM signal fed to motor. 89v51RD2 microcontroller with inbuilt PWM module is used in prototype system. The results obtained after Image Processing are fed to microcontroller which in turn controls firing angle and time for projectile

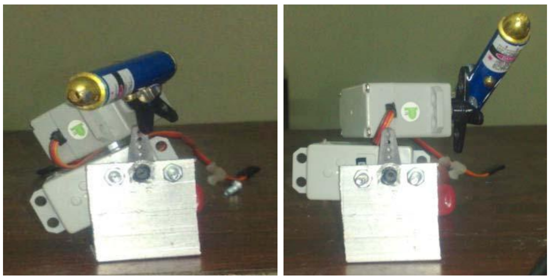

Fig 4. Servo motors mechanism for deciding angle

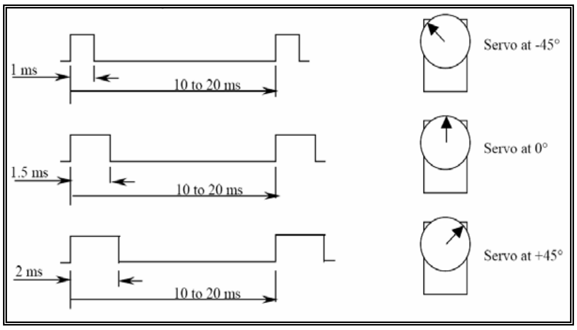

Fig 5. RC Servo Operation

C. Results

Based on the robust phase correlation techniques presented in this paper, we have developed standalone MATLAB software. A series of images from different sensor platforms or with different spectral bands have been exploited to examine the accuracy and robustness of the proposed phase correlation based techniques. An example of the experimental results is presented here.

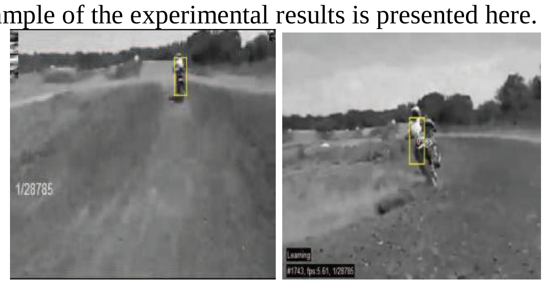

Fig 6. Single Bounding Box Defining The Object Location Our System Tracks And Detects The Object In Real Time.

III. CONCLUSION & FUTURE WORK

Our algorithm has lower computational complexity that means this is optimized version of the algorithm proposed in since exhaustive search for identical blocks is performed only on the image at the lowest resolution. This algorithm works even for the images where the attacker has made detection more difficult by applying noise and JPEG quality level changes. Although duplicated regions with rotation through angles and scaled regions cannot be detected. In addition to this, the same can be extended to work on by implementing it using FPGA**.** For future work, we will further investigate the generality of the proposed system. We plan to extend our framework to track multiple objects in more complex environment and even tracking with moving or multiple cameras, or tracking objects in unconstrained videos, for example, video obtained broadcast news network or home videos.

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