IOSR Journal of Computer Engineering (IOSR-JCE)
e-ISSN: 2278-0661,p-ISSN: 2278-8727,
PP 33-37
www.iosrjournals.org

Automatic target detection

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Abstract**:** *Now a days video surveillance system have an increasing demand in various fields such as defence and industries for security. Detection of moving target in initial stage and then performing various functions like detecting, classifying, and tracking targets embedded in a background scene. However, many problems are associated with real time detection and tracking of target such as illumination changes, ghost image, noise, etc. To overcome such problems of automatic target detection (ATR) a dwt based approach is proposed in this paper for real time detection and tracking of an object. An attempt has been made to develop effective real time object tracking system.*

Keywords; *ATR, feature extraction, DWT, object tracking.*

I. INTRODUCTION

ATR systems have two important aspects detection and tracking. Locating moving object in sequence of frame is called as object tracking. The tracking function can be performed by extracting features and detecting the object in sequence of frames. The steps required for successful implementation of an ATR task involves automatic detection, classification, and tracking of a target located in an image scene. In real time object detection and tracking system many problems are associated that makes this project challenging.

The discrete wavelet transform (DWT) has properties that make it an ideal transform for the processing of images encountered in target recognition applications, including rapid processing, a natural ability to adapt to changing local image statistics, efficient representation of abrupt changes and precise position information, ability to adapt to high background noise and uncertainty about target properties, and a relative independence to target-to-sensor distance.

In this paper, target detection is achieved by calculating cooccurrence matrix features from detail sub bands of discrete wavelet transformed, non-overlapping but adjacent sub blocks of different sizes, depending upon the target image. From these calculations seed window is identified with the sub block with the maximum of combined wavelet cooccurrence feature values (WCFs) then region growing algorithm is used to group sub blocks of target. the target is identified by a bounded rectangle.

To overcome problems associated with real time object detection method for detecting and tracking moving objects based on discrete wavelet transform and identifying objects by extracting their wavelet features is proposed in this paper. this paper target detection is done by extracting the discrete wavelet transform features and tracking is done by calculating the centroid of the detected object. Then target is highlighted by bounded rectangle.

II. DISCRET WAVELET TRANSFORM

Wavelets are functions generated from one single function ψ by dilations and translations. The basic idea of the wavelet transform is to represent any arbitrary function as a superposition of wavelets. Any such superposition decomposes the given function into different scale levels where each level is further decomposed with a resolution adapted to that level. The discrete wavelet transform is based on sub-band coding and is found to yield a fast computation of wavelet transform. DWT is simple to implement and reduces time. The discrete wavelet transform uses filter banks for the construction of the multiresolution time frequency plane. A filter bank consists of filters which separates a signal into frequency bands as shown in figure1. A discrete time signal x(n) is given as an input which is filtered by filters g(n) and h(n). They separate frequency content of input signal into frequency bands of equal width. The filters g(n) and h(n) are low pass and high pass filters respectively. At each level detail information is produced by high pass filter whereas the low pass filter produces coarse approximation associated with the scaling function. In the process of filtering 2 represents down sampling by 2. An image is decomposed into different levels using different frequency bands namely LL, LH, HL, and HH respectively. Detail images are represented by sub-bands labeled LH1, HL1 and HH1 where as approximation image by LL1.

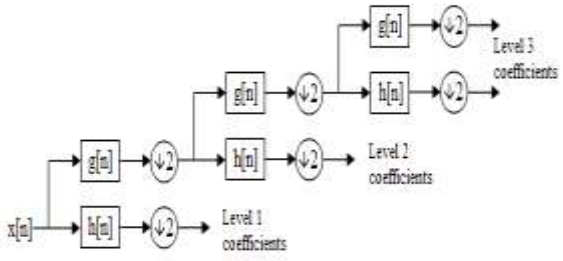


Fig1**:** DWT decomposition

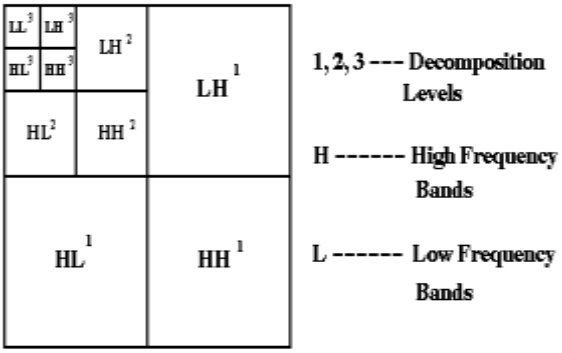


Fig2**:** Three level decomposition

III. TARGET DETECTION AND TRACKING SYSTEM

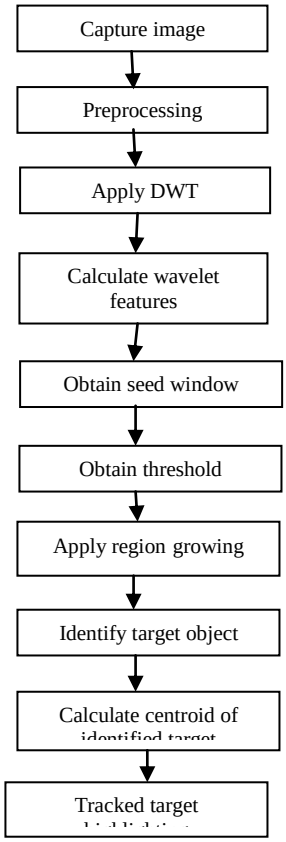


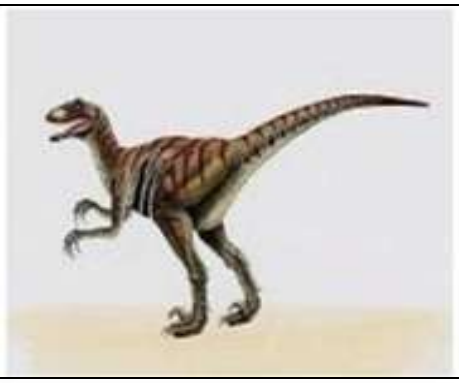
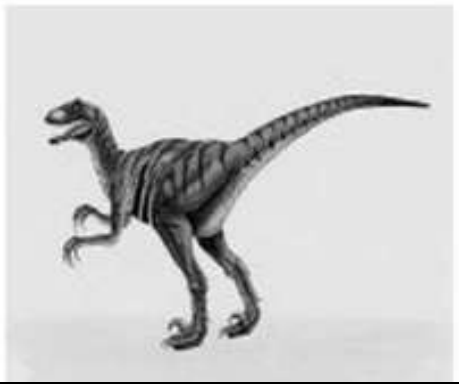
Figure 3: Flow chart of target detection and tracking

Image is captured using webcam and captured image is converted to gray scale for further processing to reduce the processing time as it has only one colour channel while RGB image has three colour channels. The captured

input image is divided into non-overlapping image blocks. Block size is important as it will affect tracking performance. Each block is taken from top left corner and decomposed by using either one level or two level DWT. The input image is decomposed using DWT into four non-overlapping sub-bands LL1, LH1, HL1 and HH1. Cooccurrence matrix for sub-bands of DWT is derived to find features such as contrast, cluster shade and cluster prominence are derived. Then the seed window is selected by calculating the wavelet features of different sub blocks having the maximum combined feature value is selected as seed window and seed window is used for Region growing. It is also classified as pixel-based image segmentation method since it involves the selection of initial seed points. The first step in region growing is selection of seed point. The initial region begins at the exact location of these seeds. The regions are then grown from these seed points to adjacent points depending upon predefined criteria. Depending upon the target image threshold is determined by finding mean (M) of first m% sub-image blocks. The window whose value is close to the maximum feature values will be merged with seed window. The process is repeated for all the blocks. The algorithm terminates if no window is merged from adjacent blocks. The target detection is then completed. Now by calculating the centroid of the detected object tracking is done. Finally tracked target is highlighted by bounded rectangle.

IV. Experimental Results And Discussion

In this paper the proposed algorithm has been implemented using MATLAB software and webcam. Developed algorithm captures sequence images using webcam and matlab is used to detect target and track object. A series of experiments have been conducted to detect the accuracy of the proposed method.

Sr.no	Steps
Input image	
Gray scale image	

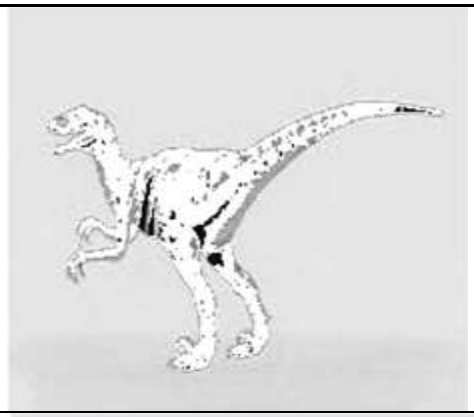
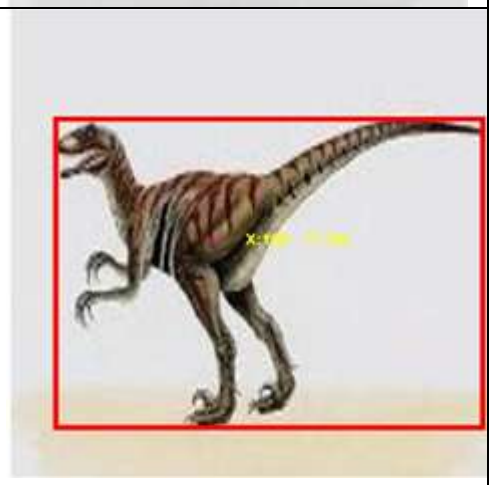
Region growing of target	
Selected object	

Figure.4: Steps in target detection and tracking

V. ONCLUSION

A real-time object tracking system using DWT is presented. Experimental setup shows that the system can deal with difficult situations such as ghosts and illumination background changes. Moreover, it can track object with long-duration and complete occlusion. While the system is highly computationally cost effective and accurate, future work includes developing a real-time high-level events understanding system.

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