Survey on Common Spatial Pattern Detection using Affine Transformation

Shashikala N[1], S. B Shivakumar[2], Ramesh[3]

[1]Shashikala N, CSE, SJM Institute of Technology, Chitradurga, India
[2]Dr. S.B Shiva Kumar, Principal and Head, Department of CSE, SJM Institute of Technology, Chitradurga, India
[3]Mr. Ramesh B.E, Asst Professor., Department of CSE, SJM Institute of Technology, Chitradurga, India

Abstract: ***In this paper we are identifying the frequently appearing object in a Image. The frequently appearing object is called thematic object. If an object appears many times in a Image, such objects are called thematic object. Identifying this frequently appearing object in a Image is helpful for object search and tagging of that object. To identify thematic pattern in the Image, give an theme as an input and then we try to find corner points of that theme by Harris corner detection algorithm. Later we can find the similarity between the themes by Euclidian distance measurement algorithm. We are mining the Image to identify the common patterns that appears frequently in Image. The proposed approach will help to identify the object even when there is partial occlusion and variation in the viewpoint.***

Keywords: Thematic Patterns, Point level Image, Key object, Image Content Analysis

1. Introduction

We are given with a collection of Images. In that we need to identify the object which appears frequently. This frequently appearing object is called thematic object [1] or key object. Identifying this key object is helpful for visual object search and detection [2]. By keeping this key object we can be able to retrieve all the Image frames which contain as key object.

Discovering objects in Image is a challenging task [3]. By discovering, we mean that the object can be a person, a car or a building. Without having any prior knowledge about the object type or its position, we would like to identify an object from a Image that occurs over a period of time. This is particularly challenging when the image sequence has low resolution and consists of highly cluttered background.

Object identification can be defined as [4] the process of segmenting an object of interest from a Image scene and keeping track of its motion, orientation, occlusion etc. in order to extract useful information.

For identifying this key object, we characterize each Image as a sequence of frames. We need to check whether this key object appears in the rest of the frames or not. It is not easy to identify whether that object is present in each frame or not, because the shape of the object may vary from one frame to another frame. The view point of the object may vary i.e. an object can be viewed from front view or from side view. Sometimes there can be partial occlusion of the object. In all such cases we need to identify the key object in each and every frame of the Image.

To identify this frequently appearing object we first convert the image into set of features. This feature vector is used for matching to find whether the object of interest [7] is present in the rest of the Image.

2. Literature Survey

To identify common visual patterns in the image, some previous work identify an image as a graph consisting of visual primitives such as corners, interest points.

Yang and Cohen [5] use affine transformation for object recognition. An object is recognized by affine invariants to establish the correspondence between the vertices of a test image with a reference image. The algorithm used in this will recognize an object that must be represented as polygonal outliners and also as a set of scattered feature points. It uses point matching approach for recognition. However, if the objects have different shape then they have identical convex hulls.

Ying Shan and Harpreet [6] use a histogram to solve sequence to sequence matching problem. It will identify an object in the presence of large appearance and pose variations and also background clutter. However this approach uses intensity profile feature. This method is not invariant to illumination changes

Liu and Chen [2] propose an approach for video object discovery, which extracts unknown object form video. This approach uses video data mining and object oriented nature for video content analysis. But this provides a rough position for the object of interest.

3. System Model

To find the object of interest in a given Image and to find its reoccurrences in the Image we use different modules. First is the *Feature extraction* which converts the image into a set of features or feature vectors which is used for further analysis. Next is the *Feature matching*, where the features extracted from the input image are matched with the stored template or reference model and a recognition decision is made.

All thematic recognition systems have to serve two distinguished phases. The first one is referred to as enrolment or training phase and the second one is referred to as the operational or testing phase.

First, we are given with a collection of T images D = {Ii}. We characterize every image Ii as a set of visual primitives as Ii = {P1….Pm}. These visual primitives are also called local invariant features. Each visual primitive is represented by P={x, y} which corresponds to a local image patch.

4. System Design

Here we are showing the different modules with their description.

A. Image acquisition module:

We can read the input Image by uigetfile command which allow us to browse the Image in which we are going to given as the input to the system. So we can get the Image by selecting it from database.

B. Image preprocessing module:

The size of the Image is verified and it is resized to 320x240 of frame size. These Images are sampled at 2 frames per second. So, in Image preprocessing step frames are extracted from the Image and they are resized if they are not of proper size.

C. ROI Selection:

ROI is nothing but region of interest. Careful selection of Image is essential for ROI analysis. If you select ROI's based on the activation during one condition and compare these activation levels in several other conditions, it is very likely that the condition you have used to select the ROI's will show the highest activation. If you select the ROI's based on task activation vs. rest, then you might miss regions which are activated specifically in one condition and not in the others. Selecting ROI's should be based on regions which are activated in any of the conditions. Selecting ROI's from an average group might lead to the missing of regions specifically activated in one of the groups.

D. Color conversion:

Color is the brains reaction to a specific visual stimulus. We can precisely describe color by measuring its spectral power distribution which leads to a large degree of redundancy. There are three basic quantities they are Radiance is the energy that flows from the light source and it is measured in watts. Luminance is a measure of energy i.e. what an observer perceives from a light source and it is measured in lumens. Brightness is a subjective descriptor which difficult to measure.

E. Canny Edge:

The purpose of edge detection [8] in general is to significantly reduce the amount of data in an image while preserving the structural properties to be used for further image processing.
The Canny Edge Detection algorithm has five steps:

1. Smoothing: Blurring of image to remove noise.
2. Finding Gradients: The edges should be marked where the gradients of the image has large magnitudes.
3. Non-maximum suppression: Only local maxima should be marked as edges.
4. Double Thresholding: Potential edges are determined by Thresholding.
5. Edge tracking by hysteresis: Final edges are determined by suppressing all the edges that are not connected to a strong edge.

F. Harris Corner Point Identification:

Harris Corner point detector [9] is a popular interest point detector. It has strong invariance to rotation, scale, illumination variation and noise. The Harris Corner detector is based on the local auto-correlation function. The local auto-correlation function measures the local changes with the patches shifted by a small amount in different directions.

Harris Corner Detector Basic Idea:

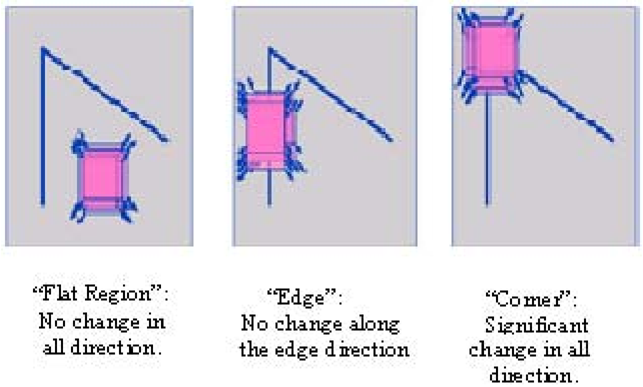

Figure 1

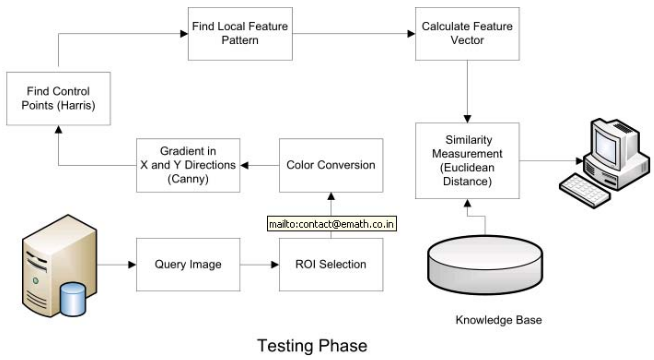

Figure 2

The above figure 2 shows the block diagram of our system. First we need to select the video from the database and required preprocessing is done. Next we need to select the region of Interest in that image (ROI). The image which we are selecting is invariant to color. So the color conversion is done. We are converting the color image to a Gray scale image. For tat image we are calculating the gradients both in X and Y direction. Canny's edge detection approach is applied here. We are calculating the control points or corner points by Harris corner detection algorithm. Later we get a local feature pattern. We are calculating the feature vector for that pattern. We are identifying the similarity between the images by applying similarity measurement algorithm such as Euclidian distance measurement algorithm. After identifying the similarity between the images we can easily tell whether the object of interest has reoccurred in the remaining frames of the video.In this way we can identify the frequently appearing image patterns in video.

The pseudo code for finding the corner points is shown below. The different steps such as reading an image as an input, the preprocessing steps are shown in below. The detection of edge is done by using built in cranny's edge detection algorithm. The number of corner points required can be specified by user. Finally the corner points can be detected by Harris corner detection algorithm.

```
%% Matlab Initialization
Clear all
% Reading an input image
[Filename pathname] = uigetfile ('*.jpg', 'Select an image',\Dataset');
imgBase = imread([pathname file name]);
%% Preprocessing
imgBase = imresize(imgBase,[512 512]);
[row col P] = size(imgBase);
Figure(1), imshow(imgBase);
%%ROI selection
imgObject = imcrop(imgBase);
iwba = double(imgobject);
%%Create grayscale version of each image for detecting local features
Imb = rgb2gray(imbrgb);
imgEdge = edge(imb, 'canny');
figure(2),imshow(imgEdge);
%%Detect Harris corner points
[xb,yb,strength] = harris(imb,topn);
Figure(3), imshow(imgobject);holdon;
Plot(xb,yb,'*r');
Hold off;
[xb,yb]
```

The below figures Fig 3.1 to Fig 3.4 shows the sample results to identify corner points. Fig 3.1 is the selection of image for identification of corner points. Fig 3.2 shows the Region of Interest (ROI) selection. Fig 3.3 shows the calculated Canny edge. Fig 3.4shows the identification of corner points by applying Harris method.


Fig 3.1

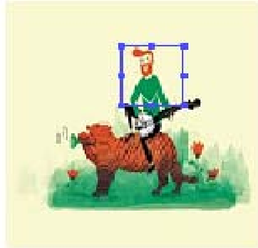
Fig 3.2


Fig 3.3

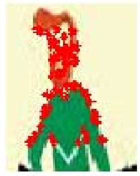
Fig 3.4

Figure 3

5. Conclusion and Future Work

In this paper, we are identifying the frequently appearing object in a Image. This frequently appearing object is also called thematic object. Identifying this thematic object is helpful for object search and their tagging. It is also helpful for Image summarization. Our approach will identify this frequently appearing object even in the presence of background clutters, partial occlusion. We are identifying the thematic object by considering the region of interest in the selected object. Then we are applying the Harris algorithm to select the corner points in the image. As future extension, the distance measurement algorithm for similarity measurement for the object will be presented.

6. Acknowledgment

Special thanks to SJM Institute of Technology for helping us in our work and supporting the research. Visveshvaraya Technological research centre are also helping us in this work.

References

[1] Junsong Yuan, Gangqiang Zhao, Yun Fu, Zhu Li, Aggelos K. Katsaggelos and Ying Wu, "Discovering Thematic Objects in Image Collections and Videos" IEEE Transactions on Image Processing vol.21, No. 4, April 2012.
[2] Davide Liu, Tshun Chen: "DISCOV: A Framework for Discovering Objects in Video", IEEE Transactions on Multimedia, Vol. 10, No.2, February 2008.
[3] David Liu and Tshun Chen: "A Topic-Motion Model for Unsupervised Video Object Discovery".
[4] Alok K. Watve: "Object tracking in video scenes".
[5] Zhengwei Yang and Fernand S. Cohen, "Image Registration and Object Recognition Using Affine Invariants and Convex Hulls", IEEE Transactions on Image Processing, Vol 8, No. 7, July 1999

[6] Ying Shan, Harpreet S. Sawhney, Art Pope: "Measuring the Similarity Of Two Image Sequences".
[7] David Liu, Gang Hua, Tsuhan Chen: "A Hierarchical Visual Model for Video Object Summerization".IEEE Transactions on Pattern analysis and Machine Intelligence vol 32 December 2010.
[8] John Canny: "A Computational approach to Edge Detection". Pattern Analysis and Machine Intelligence, IEEE Transactions on PAMI Nov 1986.
[9] Harris, C., Stephens: "A Combined Corner and Edge Detector", Proceedings of Alvey Vision Conference, 1988