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# Object Detection Using Point Feature Matching Algorithm

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**Abstract**

Object Detection plays a significant role in areas of computer vision and image processing in order to analyze images and extract meaningful data from them. Object detection basically involves the process of identifying specific object in an image or video. It is the field that has been widely used and researched because of its various application and widespread usage. In this paper, an algorithm is presented for object detection based on point feature matching. Point Feature Matching works as an effective method to help detect a specific object in a cluttered scene. This method can be used to detect single objects in any given scene. This object detection method is most effective for objects showing non-repeating texture patterns, which gives rise to exclusive feature matches.

**Keywords;** *Computer Vision; Image Processing; Object Detection; Point Feature Matching*

## I. INTRODUCTION

Image processing is a method in which certain operations are performed in an image, in order to get an improved image or to extract some meaningful information from it [1]. Digital image processing is widely used for various fields and applications such as remote sensing, photography, medicine, film and video production, security monitoring. New innovative technologies have been rapidly progressing in the fields of image processing, especially in object recognition domain.

Object detection is a process in which specific objects are identified in an image or video sequence. Any object in an image contains many features which have interesting points on the object. A "feature" description of the object can be provided based on the above extracted points. This extracted description from a training image can then be used to identify the object, while making an attempt to locate the object in a test image containing many other objects [2].

## II.METHODOLOGY

The object detection system usually comprises of the following steps as shown in fig 1. below [3].

1. In the first step, required input image is obtained from the dataset. The image acquisition process can be either manual or can be obtained from the internet.

2. The second step comprises of pre-processing which involves noise removal from the image. It also converts the image from RGB to grayscale.

3. In feature extraction step, a set of characteristic features are extracted from the object. These features can further

be used to train the model to help identify specific objects in the given image.



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4. In detection, the result of the previous stages are combined to determine whether the input image contains object of the given class.

5. The final output basically comprises of detecting target objects in the specified scene.

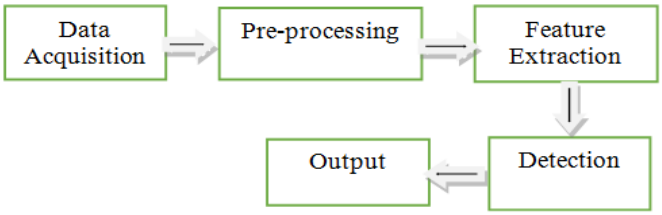


**Fig 1. Block diagram of object detection system**

## III. PROPOSED ALGORITHM

In this paper we will be demonstrating Point Feature Matching Algorithm to detect specific objects in a cluttered scene. The steps involved are as follows:

Step 1: Read a set of input images.

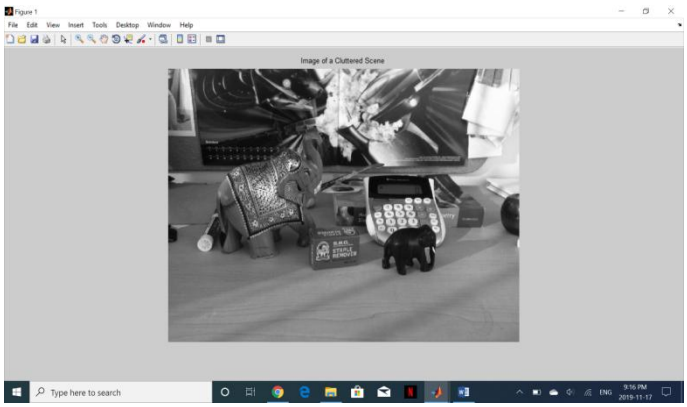

**Fig 2. Target Image**

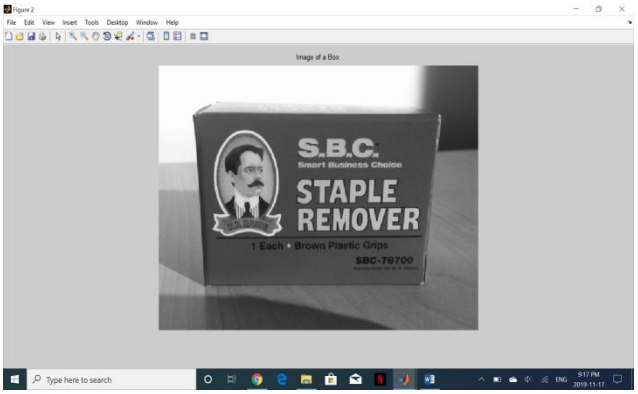

**Fig 3. Reference Image**

Step 2: Detect Feature Points from the Image

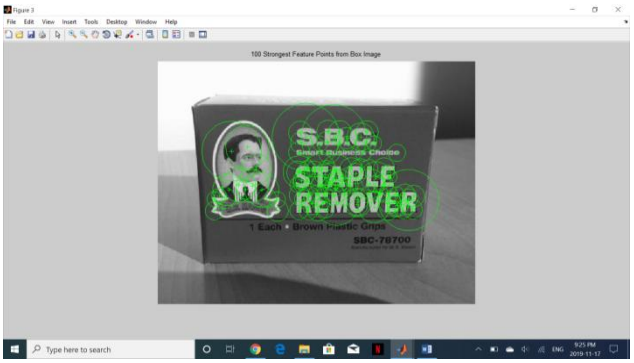

**Fig 4. 100 strongest feature points from the reference image**

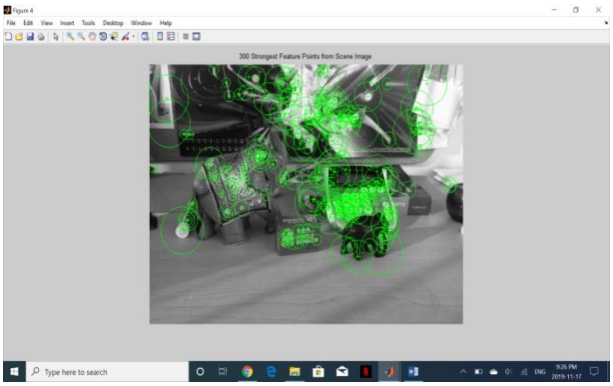

**Fig 5. 300 Strongest feature points from target image**

Step 3: Extract Feature Descriptors from the Image

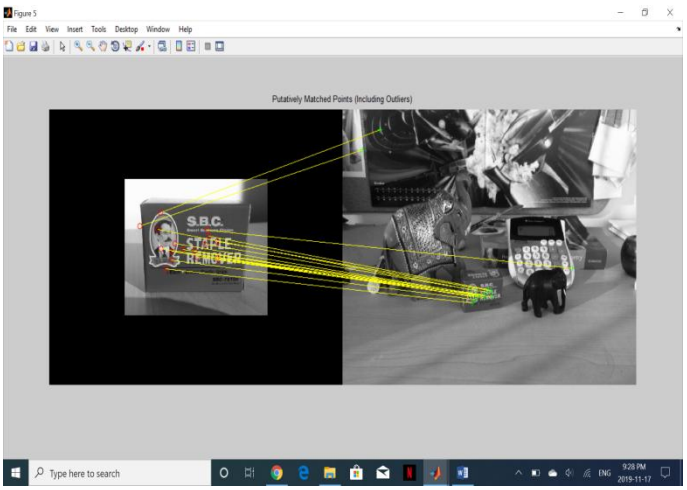

**Fig 6. Matched points (May Include Outliers)**

Step 4: Locate the Object in the Scene Using Matched Points



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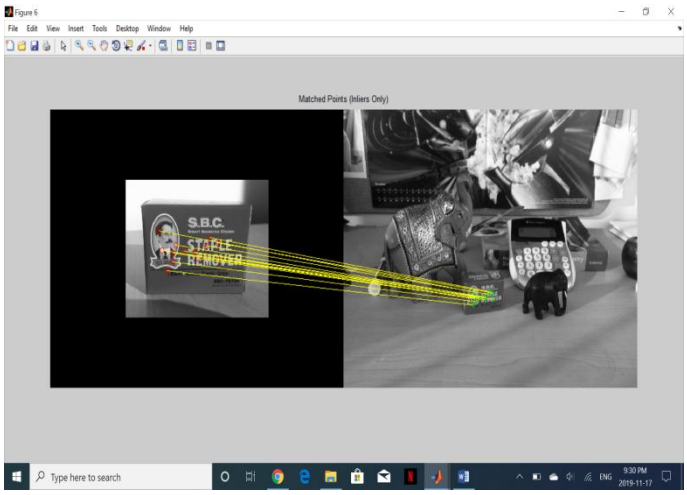


**Fig 7. Matched points (Inliers Only)**

Step 5: Display the detected object

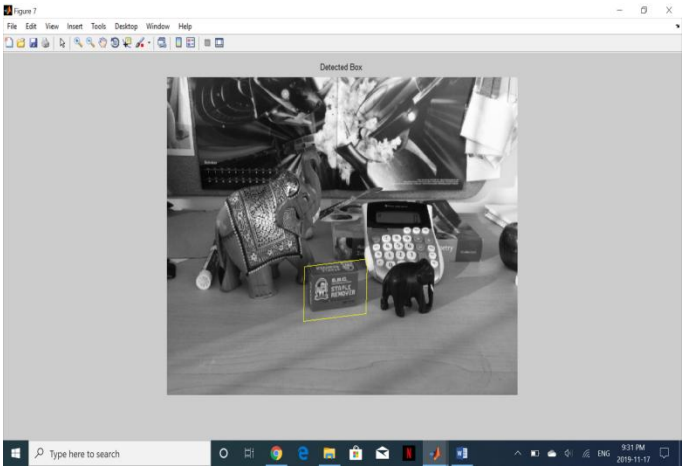


**Fig 8. Detected Box in the Target Image**

Step 6: Detect another Object from the Target Image

Detect a second object by using the same steps as before.

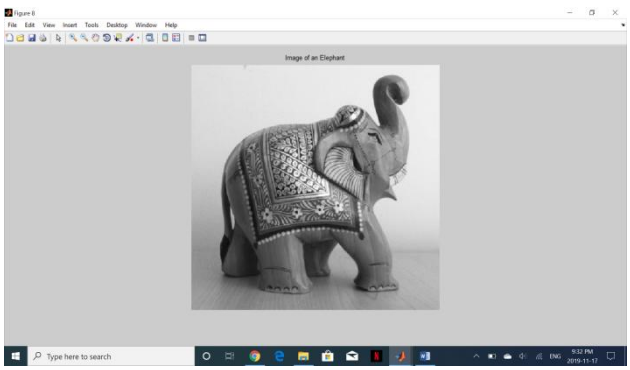


**Fig 9. Image of an Elephant**

Detecting and visualizing feature points.

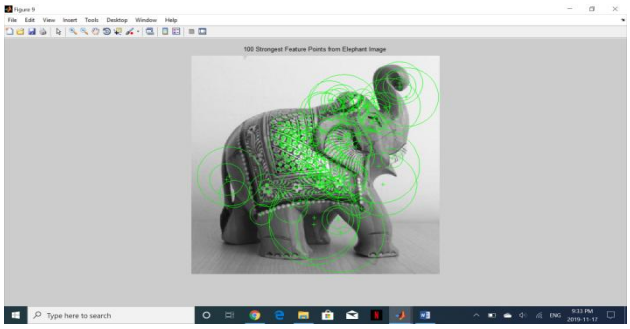


**Fig 10. 100 Strongest feature points from Reference Image**

Extract feature descriptors from the image.

Display putatively matched features.

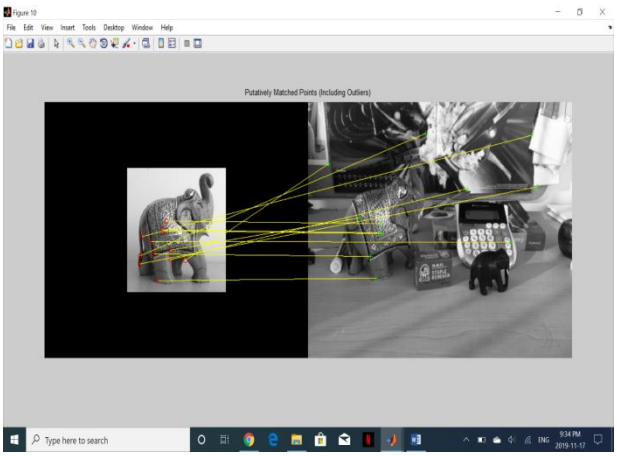


**Fig 11. Matched Points (May Include Outliers)**

Estimating Geometric Transformation and Eliminating Outliers.

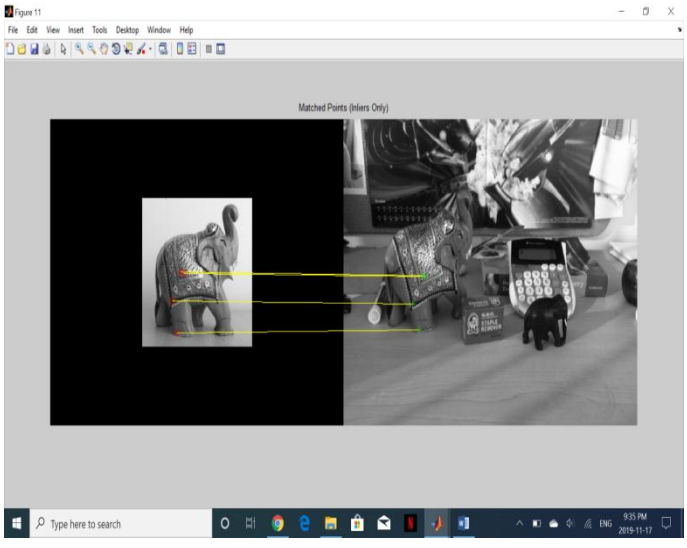


**Fig 12. Matched points (Inliers only)**



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Display Both Objects.

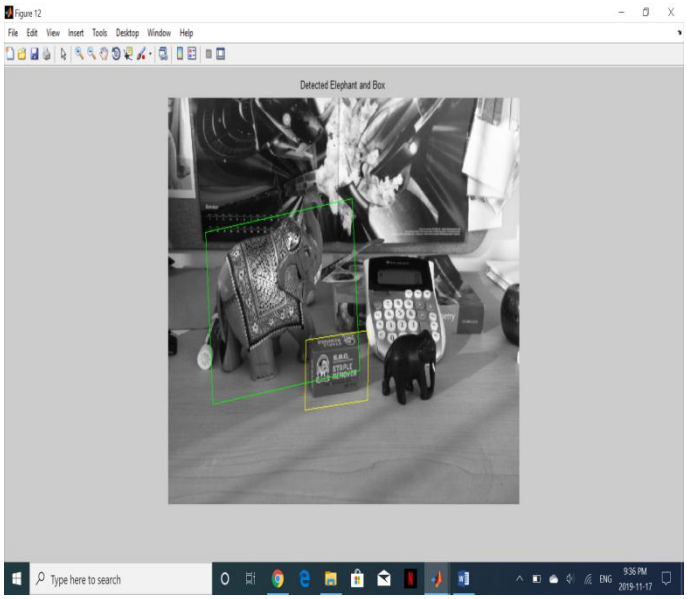


**Fig 13. Detected Elephant and Box**

## IV. RESULTS AND DISCUSSION

| Steps | Result Obtained |
|---|---|
| 1. Read images | At first the target and reference images were loaded. |
| 2. Detect Feature Points | Firstly, 100 strongest feature points were extracted from the reference image. Then 300 strongest feature points were extracted from the target/scene image. |
| 3. Extract Feature Descriptors | After matching all the feature point, lines were drawn to the matched points. (These matched point may include outliers.) |
| 4. Locate the Object in the Scene Using Putative Matches | The specified object in the scene was then located using only putative matches. This also helped remove outliers in the matched points. |
| 5.Display the detected object | The matched points were finally transformed to the target image, which in turn showed the location of the reference image in the target image. Features were matched in the images and the specified object was detected in the scene. |
| 1. Detect another object | Likewise, the second object was detected using the same steps as mentioned above. |

Table 1. Results

## V. CONCLUSION

Since the detection results acquired using any technique basically relies upon the type of input image, information of the image as well as the level of noise in an image, it is inappropriate to expect one strategy to be superior to the next. For the work demonstrated in this paper, Point Feature Matching method proved to be quite effective in detecting the specified objects in the cluttered scene and it also gave good detection results. As new innovation develops, more sophisticated techniques can be used for object detection in such a way that they deal with occlusions and luminous effects and are capable of providing better results. In the future, algorithmic techniques can likewise be improved if we work upon reducing their complexities.

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