

Interest Point Detection – A Computer Vision Approach

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ABSTRACT

This paper describes a complementary mechanism that attempts to represent the Interest points (key points)[7][9][10] by a few of the intrinsic parameters in a rotation, scale and translation invariant manner. The parameter for this mechanism of finding interest point is that, the feature points or interest points[7][9][10] correspondences when the shapes of interest are each defined by a single, closed contour and the binary shape we obtained through segmentation represents some real-world object, which was sampled and binarized, and it is that object's identification that we want to estimate. That means by joining those key points, an image can be extracted. Corner is so special since it is the intersection of two edges; it represents a point in which the directions of these two edges change. Hence, the gradient of the image (in both directions) have a high variation, which can be used to detect it.

Keywords

Computer Vision, Object recognition, Image matching, Contour Tracing, Interest Point detection.

1. INTRODUCTION

Computer vision[1][2] is using a computer to capture and analyze images, also called "machine vision" (MV), there are numerous applications of computer vision, including robotic systems that sense their environment, people detection in surveillance systems, object inspection on an assembly line, image database organization and medical scans. In computer vision [1][2], object recognition is one of the vital task of finding a given object in an image or video sequence. Humans recognize a multitude of objects in images with little effort, despite the fact that the image of the objects may vary somewhat in different viewpoints, in many different sizes, scale or even when they are translated or rotated. Objects can even be recognized when they are partially obstructed from view. This task is still a challenge for computer vision systems in general. Henceforth, Image matching or comparing images in order to obtain a measure of their similarity, is a fundamental aspect of object and scene recognition. Image matching [8] can be defined as "the process of bringing two images geometrically into agreement so that corresponding pixels in the two images correspond to the same physical region of the scene being imaged". The goal is to detect objects in images using a single model and identify correspondences between the image and the model. Contour is used as token for image-model shape matching. In this paper a technique is proposed to

find the points of interest viz. key points[7][9][10], which are mandatory for the representation of the contour. The contour information represents an extremely important and sensitive information for the human-visual system, being thus also of great importance in the image coding context. Finally the performance of the proposed algorithm is assessed by taking different images as input.

2. LITERATURE REVIEW

2.1. Contour tracing

Contour tracing[3][4] is a technique that is applied to digital images in order to extract their boundary, also known as border following or boundary following. The boundary of a given pattern P is the set of border pixels of P. A digital image is a group of pixels on a square tessellation each having a certain value. A tessellation is created when a shape is repeated over and over again covering a plane without any gaps or overlaps. There are some considerations which are as follows: 1, in which case we'll consider it a "black" pixel and it will be part of the pattern, or 0, in which case we'll consider it a "white" pixel and it will be part of the background. The need is an ordered sequence of the boundary pixels from which the general shape of the pattern can be extracted. The contour of the image will be more than one pixel thick, So thinning is performed. And If an image is seen in the computer i.e. in raster scale, the straight line will not appear as just like exactly the straight line like real plane, There will be Stair case[5] effect, Because of that effect the calculation of Key Points may not be accurate. So smoothing is done by Converting the image from Raster Scale to Real Plane.

2.2. Harris Corner Point Detection

Harris [6] is one of the widely used corner detection algorithms which is based on intensity and considered a gray scale image. A small window image patch is swepted along the right direction [5] of the image. According to the change in intensity of the image, corner point is detected. If the window image patch is flat then all shifts will result in only a small change. If the windowed patch is a corner or isolated point, and then all shifts will result in large change. A corner can thus be detected by finding, when the minimum change produced by any of the shifts is large.-

2.3. Problem Definition-

The problem is categorized into two phases i.e., Phase I

&

Phase II

2.3.1. *Phase I:* The goal is to trace the contour to extract their Boundary pixels.

2.3.2. *Phase II:* The goal is to find the Interest Points by utilizing the boundary pixels.

3. PROPOSED WORK

3.1. Proposed Algorithm for Interest Point Detection

1. Begin Algorithm key point detection.
2. Considering the second point p2 as the start point.
3. Repeat step 3 to 4 for each point in the ordered set points until we reach the next point as the start point.
4. Find the angle between the two straight line formed by joining the adjacent points p1 and p3 with p2.

5. The deflection angle thus considered by taking the absolute value of the acute angle in an array. Find out the standard deviation of the angles and considered the result as the threshold value.

6. Considering the p1 point as the starting point.

7. Repeat step 8 to 10 for each point in the ordered set points until we reach the next point as the start point.

8. If the deflection angle of the point is greater than the threshold value then store the point as a key point.

9. If key point = p2 then set p1 to p2, p2 to p3 and p3 to the next point.

10. If p2 is not a key point then set p2 to p3 and p3 to the next point, keeping p1 unchanged.

11. End

4. RESULT ANALYSIS

4.1. Comparative Result

Table 1: Ground Truth VS Proposed Algorithm

GROUND TRUTH	GROUND TRUTH	EXPERIMENT	EXPERIMENT
X1	Y1	X2	Y2
50	80	50	82
53	92	54	92
73	113	72	117
54	182	54	180
51	200	49	201
19	216	21	216
20	250	20	250
22	242	21	240
7	276	8	272
15	282	13	283
24	290	25	290
34	288	36	291
43	292	39	292
54	288	53	288
44	275	44	272

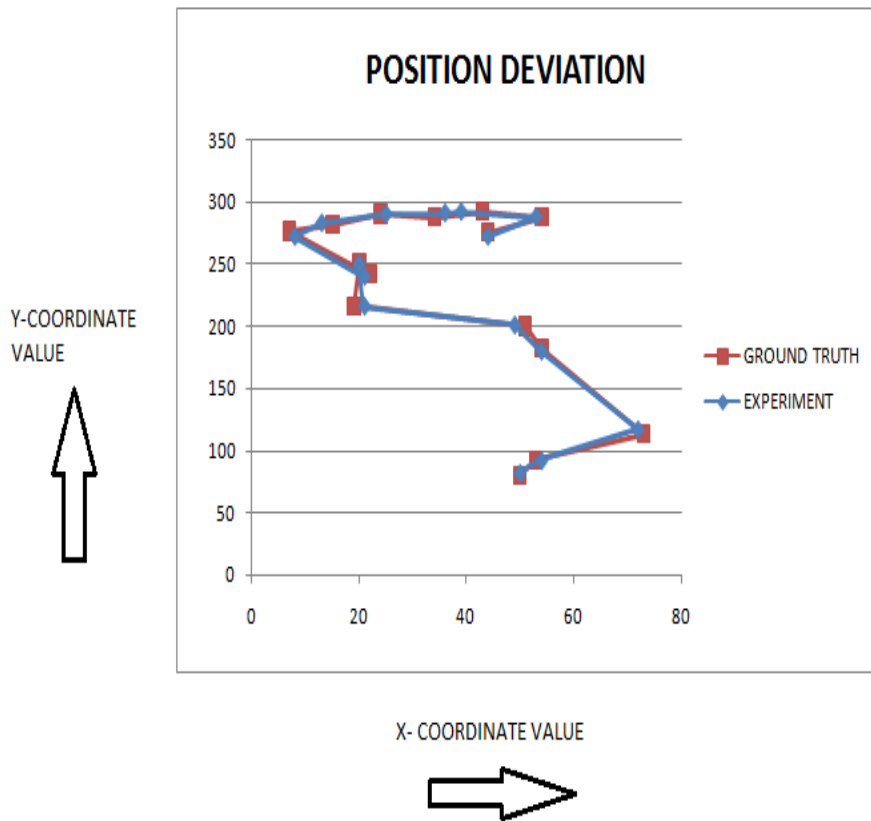


Figure 1: Key Point position deviation of Proposed Algorithm

4.2. Analysis Of Parameter Values

Table 2: NUMBER OF BOUNDARY POINTS - Data Sets

NO OF BOUNDARY POINTS	PERFORMANCE IN PERCENTAGE
10	100
20	99
30	99
40	98
50	98
70	97
100	97
150	94
200	92
250	90
300	89
350	89
400	88

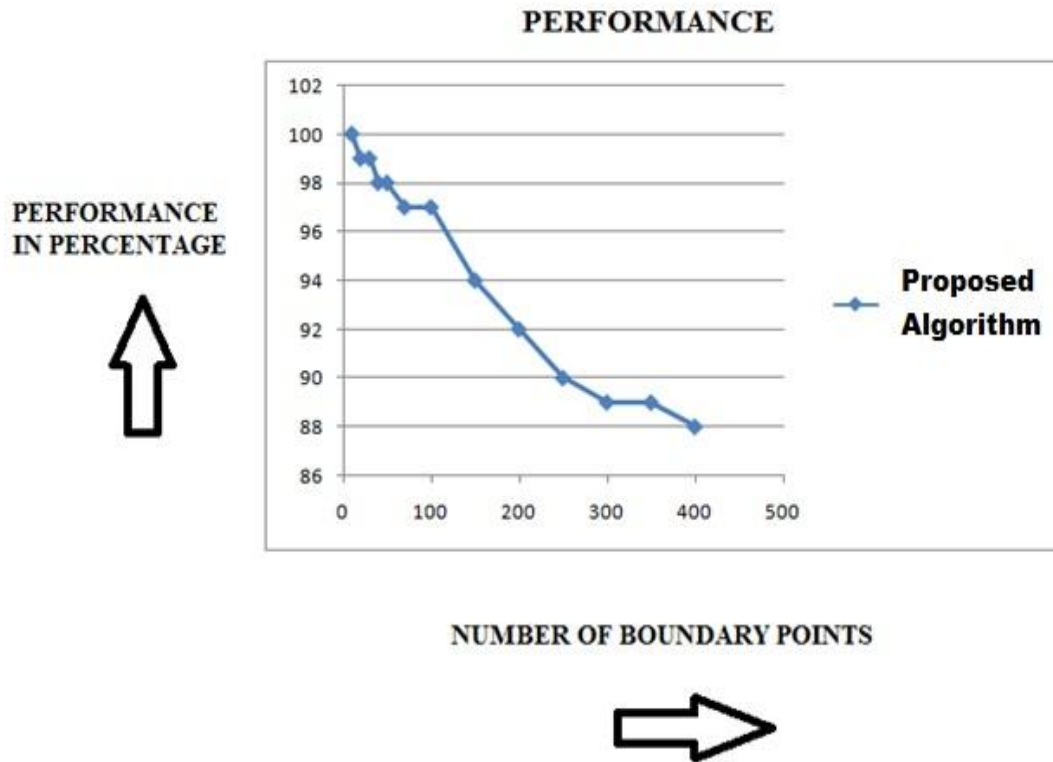


Figure 2: Performance in percentage: Proposed Algorithm

5. CONCLUSION

This work has been accomplished to find the key points [7] by which a contour of the image can be extracted. So, to find the interest points [7] first the contour is traced to get the ordered pair of pixels. The analysis reveals that the selection probability of this algorithm is good enough to determine the point as a key point. Although the selection probability decreases when the deflection angle increases, still it provides a better probability of selection. This technique has an advantage of good recognition accuracy rate and it's a lossless technique for matching [8].

6. REFERENCES

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