



ALGORITHM FOR OBJECT RECOGNITION

Navjot Kaur¹, Someet Singh², Sheetal Kundra³

¹Computer Science Engineering Department, Punjab Technical University/ Sant Baba Bhag Singh Institute of Engineering and Technology, Jalandhar, INDIA

²Electronics and Communication Engineering Department, Lovely Professional University, Jalandhar, INDIA

³Computer Science Engineering Department, Punjab Technical University/ Rayat Institute of Engineering and Technology, Ropar, INDIA

Abstract: The proposed method is an object prediction algorithm using fuzzy that is computationally fast. To predict the partly cover and coupled objects accurately, a method of object prediction based on erosion is used to estimate values for reliant variables from previously unobserved interpreted values based on the variation in an underlying learning data set.

Keywords: Object recognition, Feature mining, Data Set, Prediction, Erosion.

I. Introduction

Object prediction represents an important field of predicting image objects, based on their shape information. Prediction of the partly cover and coupled objects accurately, leads to the reduced execution time and elapsed time. [7] Each image contains up to several hundred objects, which were manually arranged not to overlap or touch each other. The algorithm is divided into levels. In the first level threshold values for the image are defined. Morphological operation is applied on binary image to erode away the boundaries of regions of foreground pixels. [3] And in the second level features of the current object are matched with the preloaded features in data set. [8] The minimum equivalence distance to which the current object matched in data set is considered.

Structuring element consists of matrix of 0's and 1's. Morphological operations apply a structuring element to an input image, creating an output image of the same size. [10] Morphological operations affect the structure or object of an object. All these operations are applied on binary images.

The two principal morphological operations are dilation and erosion.

Dilation allows objects to expand, potentially filling in small holes and connecting disjoint objects. Structural element of S is applied to all pixels of binary image. [4]

Erosion shrinks objects by etching away their boundaries. When using erosion structural element also passes through all pixels of the image. [5]

The method of erosion for prediction of overlapping and connecting images is specially used in this algorithm to increase the efficiency and improve execution time. [6]

A fuzzy system is represented by if-then rules in the form:

If i_1 is $vi_1,1$ and ... and i_m is $vi_m,1$

then o_1 is $vo_1,1$ and ... and o_n is $vo_n,1$

Where m is input and n is output, r is fuzzy rules in the system. If a fuzzy system has n inputs and single output then its fuzzy rules can be of the form:

If X_1 is A_{1j} and X_2 is A_{2j} ... and X_m is A_{jm}

then Y is B_j

DATASET

It is a collection of data elements. The following name/value pairs are used when a dataset is constructed:

1. **V_Names:** This gives the variables with the specified variable names.

{name_1,...,name_m}

2. **O_Names:** This gives the n observations in A with the specified observation names.

{name_1,...,name_n} [1].

II. Experimental Stages

The techniques for prediction of the partially cover and coupled objects accurately, leads to the reduced execution time and estimate values for dependent variables from previously unobserved predictor values based on the variation in an database are used to predict the objects in the image.

Main focus is to predict the object by defining morphological operations which describe all boundary values of an object. Progressive accurate prediction of the object by efficient, accurate algorithm for linked objects in an image is the main consideration.

PROCESSING STEPS

STEP 1

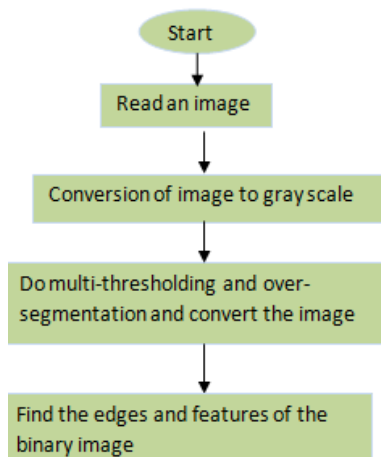
1. First step is to read an image and convert that image to gray scale image by defining multi-thresholding.
2. Do over-segmentation and convert the image to binary image.
3. Apply operations get the boundaries of regions of foreground pixels Thus areas of foreground pixels shrink in size.
4. Find the features for the current image.

STEP II

The features of the current object are matched with the previously estimated features in data set and minimum distance among the objects is considered.

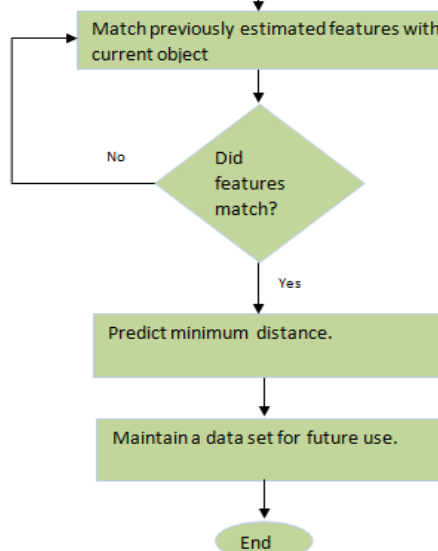
Flow chart for step 1:

Figure1 Processing Levels for Step 1



Flow chart for step 2:

Figure2 Operating Stages for Level 2



III. Algorithm

Detailed algorithm is described as,

1. Read an image.
2. Convert an RGB image to a gray scale image.
3. Define threshold value

New threshold is created that is the average of z_1 and z_2

$$N = (z_1 + z_2)/2$$

where, z_1 = average value of $\{f(x,y):f(x,y)>N\}$ and z_2 = average value of $\{f(x,y):f(x,y)\leq N\}$

4. Apply operation to find edges and boundary values for binary image.
5. Extract features.
6. Maintain a dataset of the predicted minimum distance of matched value.
 $dist = \sqrt{(m - x)^2 + (n - y)^2}$
 $min_val = \min(dist)$
7. Establishment of the prediction Table *oprtbl*.
8. Use table *objtbl* and *ttbl* for future recognition

table1 objtbl for the predicted time values

Image	Total Object	Circle	Rectangle	Triangle	Eclipse	Polygon	Irregular
1	11	1	1	2	2	1	4
2	13	1	1	1	1	1	8
3	17	2	1	2	1	1	10
4	15	2	1	2	1	1	8
5	15	2	1	2	1	1	8
6	13	2	1	1	1	1	7
7	16	2	2	3	1	1	7
8	17	3	2	3	1	1	7
9	22	3	2	3	1	2	11
10	15	2	1	1	1	1	9

The table1 above shows the number of objects per image.

table2 ttbl for the predicted time values per object

Total Object	T_c	T_r	T_t	T_e	T_p
11	5.661	5.277	2.499	2.875	5.716
13	7.317	7.200	7.575	7.410	8.754
17	4.645	9.277	4.896	9.562	11.13
15	4.123	8.121	4.678	8.459	9.768
15	3.983	8.913	4.330	8.508	9.373
13	3.476	7.562	7.294	7.427	8.343
16	4.750	4.405	3.264	9.681	10.61
17	3.162	4.677	3.251	9.950	11.79
22	4.113	6.016	4.201	12.75	7.144
15	4.047	7.950	8.293	8.511	9.422

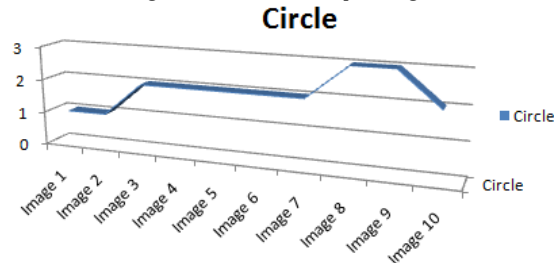
Where T_c , T_r , T_t , T_e , T_p is estimated time for per circle, rectangle, triangle, eclipse and polygon in image respectively. The table2 above shows the predicted values for time which may vary depending upon number of objects per image.

IV. Results

For the purpose of testing the Object Prediction algorithm, different input values are considered. Output surfaces of image with values for circle, eclipse, polygon, rectangle, triangle by taking number of objects per image.

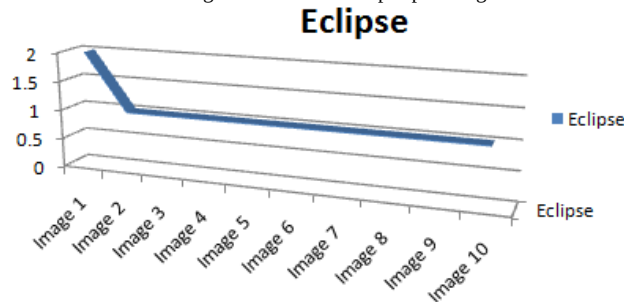
1. Result for circle per image:

Figure3 Result for circle per image



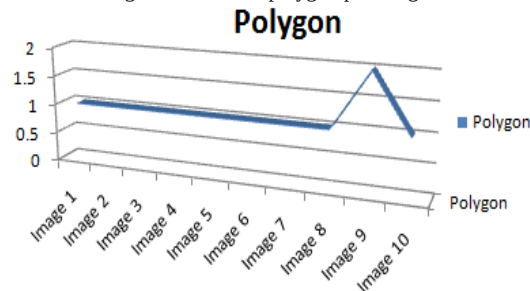
2. Result for eclipse per image:

Figure4 Result for eclipse per image



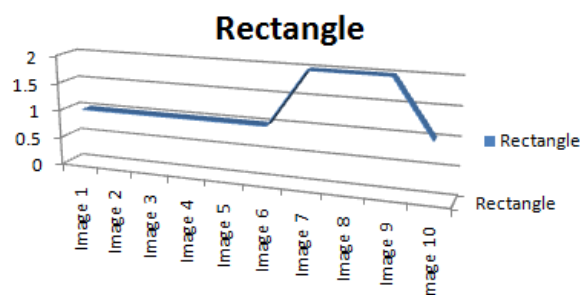
3. Result for polygon per image:

Figure5 Result for polygon per image

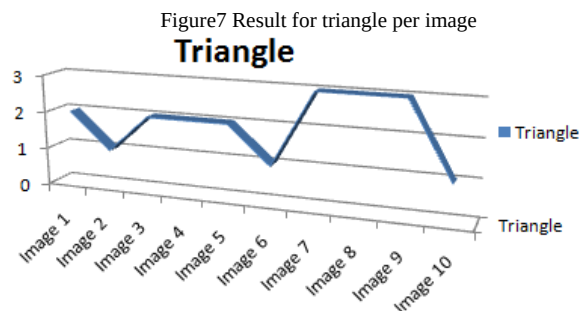


4. Result for rectangle per image:

Figure6 Result for rectangle per image



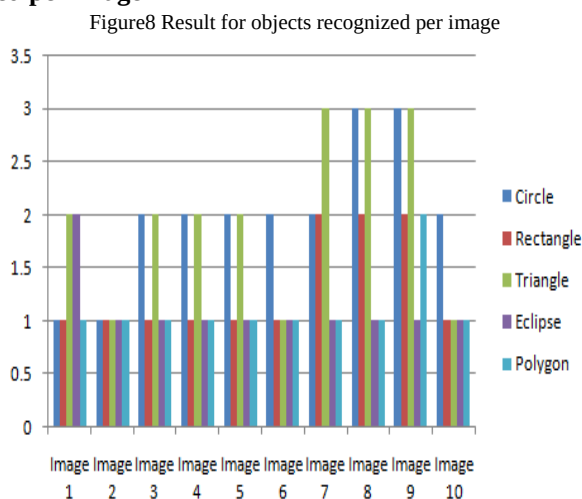
5. Result for triangle per image:



Combined result for objects recognized per image

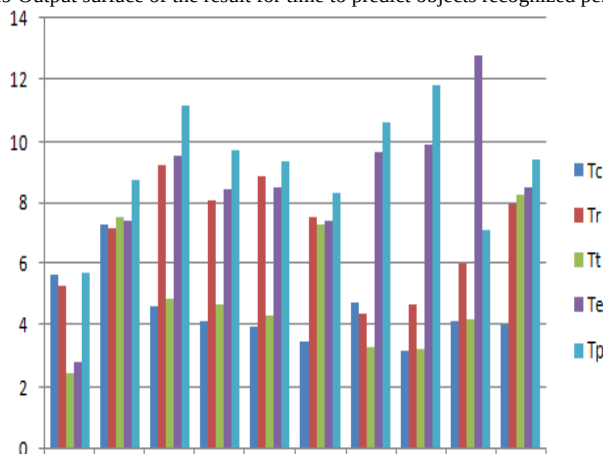
The number of objects per image can be any; here the considered objects per image are 5.

Result for objects recognized per image



Result for time to predict objects recognized per image

Figure9 Output surface of the result for time to predict objects recognized per image



V. Experimental Result

Technique is used to extract uniqueness in order to get the prediction characteristic of different objects per image. To find the correct recognition values for objects of image the predicted values are used to get the recognizable results, as shown in table 3. It can be seen that the correct recognizable rates of all objects exceed 90%, and the total correct recognizable rate amount to be 93.25%.

table3 the recognizable results of object prediction based on fuzzy method

Correct recognition number	Correct recognition rate (%)	Total recognition rate (%)
8.75	94	93.25
9.37	93.02	
9.76	93	
10.61	92.58	

VI. Future Scope

In this paper, a method to predict objects is proposed. This method recognizes the different individual and overlapping and related objects. The utilization of proposed method could be in robotics, in which robots are used to predict the objects which could remain unpredicted from human. This recognizable prediction method can reflect different objects correctly, so the total recognizable rate arrives at 93.25%.

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