

Bacterial Foraging Optimization with Multilayer Neural Network using Shape Based Object Detections in Digital Images

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Abstract: Over past few decades, object recognition and tracing is an essential area of research. Object detection and tracking become important because of adjustment in movement of object and change in size of scene image, change in look of object and illumination modifications. Generally the selecting of features plays an essential role in detection of object. Object detection and tracking are used in various real time applications areas like as vehicular object observation, video investigation and so forth. Hence, to overcome the problem of tracking and detection of object reliant on motion and look of object. Various algorithms concentrate on detection algorithms to clear the object image. Along with that, also other techniques related to data about figure, color, smoothness of object and so forth. In this research, technique using Scale Invariant Feature Transformation (SIFT) algorithm for extraction of features in three stages which are: - (i) Elimination (ii) Dispersal and (iii) Reproduction. Extraction of feature component through uploaded image and converted gray scale image to smooth image. In addition, extraction of key point features through SIFT algorithm. After that, selection of features had done using BFOA approach. Along with that, matching of key points was done. In classification and selection of features shape based object had done using multi perceptron neural network approach (MPNN). Experimental analysis based on parameters (i) MSE (ii) FAR (iii) FRR (iv) Accuracy Rate and (v) Success Rate and Comparative analysis with various methods. In experimental analysis using BMLNN method to improve the success rate and accuracy rate value is 89.3% and Simulator using MATLAB 2016a.

Keywords: Object detection, Multi perceptron neural network, Scale Invariant feature transformation, Object observation

I. INTRODUCTION

Object Detection is technique for the recognition of the occurrence of the group of classes in an image from unique picture. Object detection approach is utilized as the recovery of images, safety, medicinal and protection system. The recognition of the objects is the identification of the image and changing the context of the image. Visual object detection method depends on computer visualization and image processing technique that cope up with detection of the group of class like as constructed buildings, social beings in digital pictures and moving objects. Shape is an essential technique for the features of objects of image. The main objective of the shape is to determine the features of the shape of an object image. Shape describes the increasing of the internal class difference and decreasing the external class that is accessible to distortion rate. Shape object detection is done on the basis of the shape of the object if the image. A fixed shape contains the features present inside shape, so that there is presence of fact that has the equivalent displacement to every adjacent border of the shape. Various facts is the central portion placed inside circular figure. Radius symmetrical feature is detection of the fixed figure. In shape object detection, every border of the pixel points that have displacement related to gradient selection. Pattern of the shape are considered from the group of the pictures. Shape is recognized as the synthesis of the pattern formation from the database pictures. Extraction of features of the shape determines the edges of the overall patterns. Detection of an object can be done through characteristics of shape. During lightning situations, features (Color and consistency) of shape may change. Shape of two objects can be easily differentiated deprived of any extra data. Global feature acts as shape of an object for detection of various shape of an object. Various shapes may be line, polygon, circle or some irregular shapes. Some of the techniques in object detection are: Template -based, color-based, shape-based, local and global feature based. In template based matching there is searching of the minor portion of picture where matching is done with template picture. In this method, template pictures for various objects are placed. Templates are matched for recognition of object of internal picture. Templates are utilized to recognize fonts, numbers, body and so forth. In template matching, one pixel match to other pixel, feature of one picture matched to sub pictures. Color based matching, presents data for data detection. Object detection method used to match picture related to color histogram. Shape-based characteristics used for detection of objects of actual pictures. Shape based approach determined the pattern like as circular, rectangular and triangular. In local and global based features, detection of object and classification of object like as target and background image.

In existing approach, implemented feature extraction based method using PAD method. It extracts the features using key-points and saved in arch based key-points.

In proposed method implemented method using SIFT algorithm to extract the features in the form of key-points. BFOA algorithm to select the features using three phases: - (i) Elimination (ii) Dispersal and (iii) Reproduction.

After that selection process using MLNN to classify and detect the shape-based object. Performance analysis based on metrics (i) MSE (ii) FAR (iii) FRR (iv) Accuracy Rate and (v) Success Rate and Comparative analysis with various methods.

Sections are described as follows-Section 1 described an overview of object detection. Section II explained about literature survey III section Research methodology is a flow chart and detailed description. IV section Result analysis elaborated the performance metrics, mathematically equation and comparative analysis with proposed and existing methods. V section described that the conclusion and future scope in Shape based object detection.

II. LITERATURE SURVEY

Kamate, S and Yilmazer, N et al., (2015 [16]) proposed a research on the detection and tracing of the moving objects in shape model through unmanned aerial vehicle to increase the safety in united states border. The intruding in the borders by migrants is difficulty raised in the safety by the security service. The main goal of the research was the assistance of the operational users through implementation of the investigation services. In this research, they implemented various techniques for the detection and tracking of the objects from unnamed aerial vehicles. The detection was done utilizing background subtraction method and optical flow tracing technique. Experimental analysis was done on the basis of the recognition and tracing of the objects in videos using unnamed aerial vehicles. **Li C., Zhang, Y and Qu, Y et al., 2018[17]** presented a research on the object recognition that depends on the deep learning of sections. First, approach training approach based on solving issues of the automation process through object regions in various scene images. The gradient at different scales can be recognized using deep learning method to enhance the accuracy rate of complex structured objects. Experimental analysis was done on the basis of the proposed approach with state of art method where the precision value was calculated. **Elhariri, E., El-Bendary, N., Hassanien, A. E and Snasel, V. 2015 [18]** proposed a research on the on internal object detection scheme on basis of the histogram of oriented gradient(HOG), machine learning algorithm, linear differentiated algorithm. Proposed research on the categorized types segmenting, extraction of features, classifier. Experimental analysis based 347 pictures along various internal classes utilized for train and test dataset. Train dataset can be categorized on the basis of the objects. Performance metrics on the basis of the classifier approach acquired 80%, support vector machine 78%. **Hamida, A. B., Koubaa, M., Amar, C. B. and Nicolas, H et al., 2014[19]** studied the representation on the moment object in parallel shape of the shape movable object. The maintenance of the tracking of the moving objects need characteristics at similar time period. Performance analysis describe about the road traffic arrangement. Experimental analysis on organization of object can be described about the parametric metrics. **Eun, H., Kim, J and Kim, C et al., 2015 [20]** presented a research new noticeable object recognition approach that presents the consistent salient object recognition. Firstly, internal picture is managed through high division measurements on the basis of the features related to borders and decreased texture analysis. They applied the picture segmentation process through the clear picture for production of the maximum output where amount of the segmented area is decreased. In addition, proposed approach on the shape-aware area linking with area scale measurement. In final approach, salient features by two approaches. Experimental analysis was done by comparing the state of art characteristics.

III. RESEARCH METHODOLOGY

In image processing the first phase is to acquire the image. To collect the dataset in different-different category like (Camel, Bone, Bat, Apple and heart) from the UCI machine learning repository Site.

Next step, it is required to enhance the acquired image, component extraction. Sometimes the acquired image can contain noise and illumination. Feature extraction works with fixed size images. So to remove the unwanted portion is also a work of image pre-processing. Apply edge detection based on a canny algorithm to detect the edges based on multiple values or properties.

Feature extraction is a process of generating the attributes of the image. It implements the SIFT approach to extract the features based on key point which is a unique property of the original image.

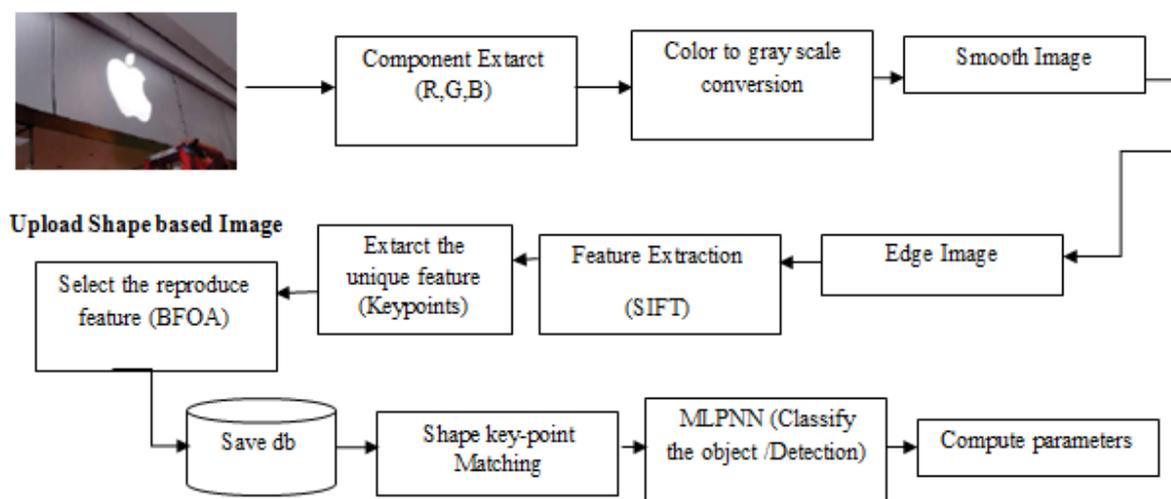


Fig 1. Research Flow Chart

Feature Selection is a process to find the reproduce features and relevant features. It implements the BFOA optimization algorithm to select the features using these steps:-

- (i) Population Size
- (ii) Rotation (Swim and Tumble)
- (iii) Spreading
- (iv) Elimination and Dispersal
- (v) Reproduction using cost function (0,1).

A MLPNN classification algorithm is used to classify and detect the shape base object images. In this the performance of the proposed technique is evaluated on the basis of comparison with state of the art technique/ parameters.

In this propose work; implement a robust approach to detect the shape based object in cluttered image or digital images. Proposed algorithm works with layers and Samples:-

Layers:-

- (i) Input Layer
- (ii) Hidden Layer
- (iii) Activation (Boostup)
- (iv) Output Layer.

Samples:-

- (i) Training Sample
- (ii) Testing Sample

The design process is defined below:-

1. Search Database (Online Dataset Used)
2. Image Acquisition
3. Image preprocessing
4. Feature Extraction
5. Feature Selection
6. Detect and Classify the Shape base object.
7. Compute Parameters.
8. Comparison.

IV. RESULT AND ANALYSIS

In this section, dataset for test object shape class detection methods. It contains 255 test images and test features 4 different shape depend categories such as apple logos, mugs, giraffe, bottles and swans.



Fig 2. Shape Dataset

In this section, described that proposed work using SIFT and Multi-layer perceptron Neuron Network.



Fig 3. (i) upload test image (ii) gray scale image (iii) Distorted Image (iv) Smooth Image and (v) Edge Image

Fig 3 (i) upload the test image from the test dataset. (ii) convert the color image to gray scale image. It reduces the dimensionality of the image. (iii) To find the interference in the uploaded image. (iv) remove the distortion in the given images it produces the smooth image and (v) edge detection using region detection using edge points and save in matrix format.

Extraction of the features from some characteristics is present that helps to relate various scene pictures. The characteristics are different to picture scale and rotate, and partly unchangeable to brilliance and three dimensional camera observation. After that feature extraction implemented a BFOA method to find the valuable features in the uploading dataset image. In this process,

implemented a rotation phase means extracted feature rotate in two forms i.e tumble and swin. Dispersal the extracted feature in case valuable feature eliminate in the extracted features then reproduction the features and saved in dbs.

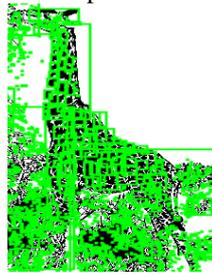


Fig 4 Detected Image

Fig 4 shows that the object detection based on shape or category using classification. In classification process, works with Input Layer, Output Layer and Hidden Layer.

Input layer process the selected features and pass the features in hidden layer means multiple middle layers and scan the features and check the information is true then output generated.

After that classification process using simulation methods to find the similar features in training and testing phase and analyses the output based on features. In this phase find the shape based detection and performance metrics analysis.

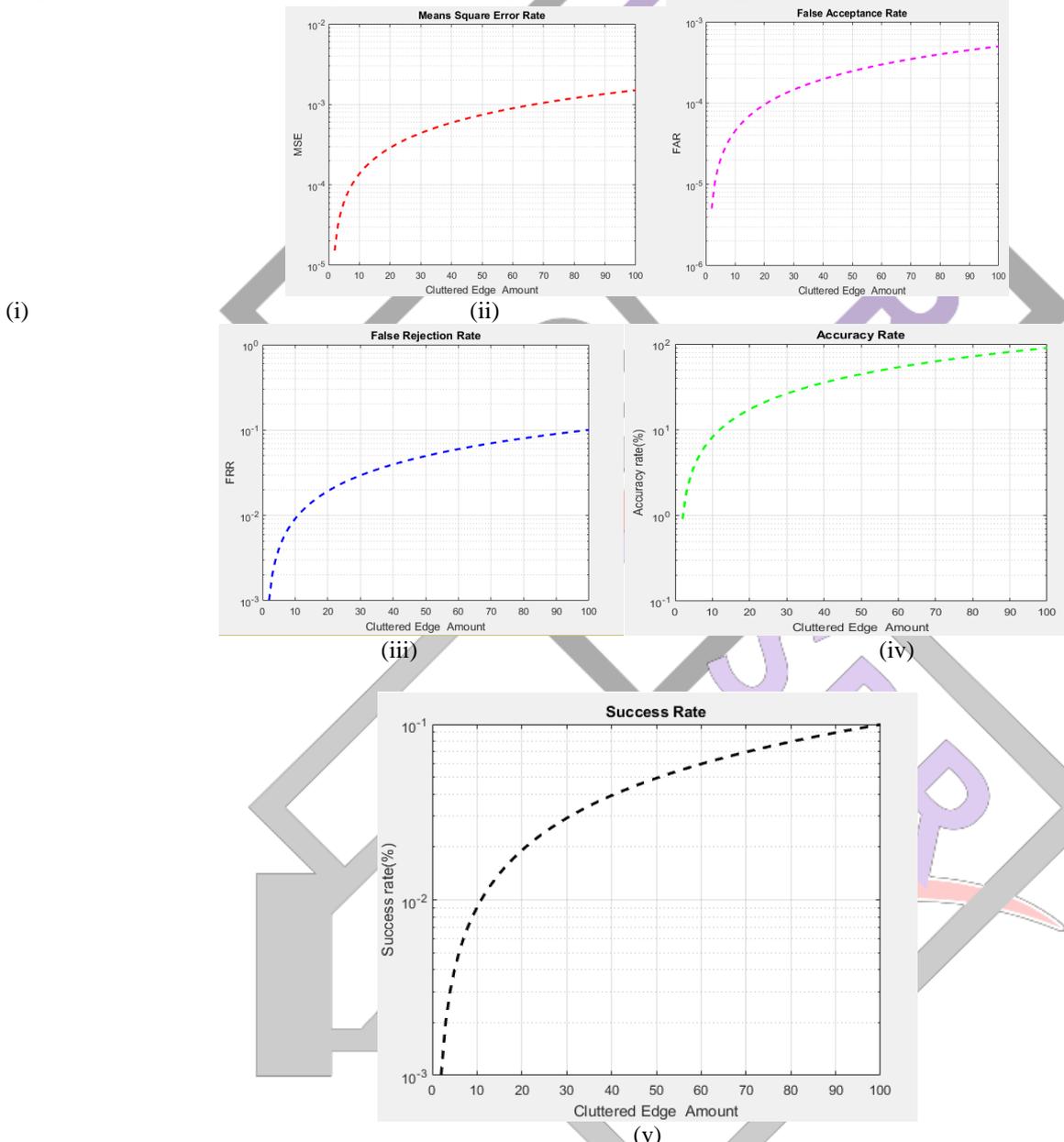


Fig 5 Performance Metrics (i) MSE (ii) FAR (iii) FRR (iv) Accuracy Rate and (v) Success Rate

The above figure 5(i) Shows that the total sum of errors is called as MSE. 5(ii) shows about the wrong data acceptable is called FAR. 5(iii) defines that the wrong information or feature rejectable is known as FRR. 5(iv and v) defined that the Accuracy rate and success rate true positive rate as well as detected feature in accurate manner.

4.2 Mathematical Equations

4.2.1 Accuracy: Accuracy is the value of the proportionality of exact classified value , which are, sum of true positive and true negative to sum of true positive, true negative, false positive and false negative.

Mathematically, this can be stated as:

$$\text{Accuracy} = \frac{TP+TN}{TP+TN+FP+FN} \dots\dots\dots (i)$$

Where TP is True Positive, TN is True Negative; FP is False Positive and FN Is false negative

4.2.2 Mean Square Error: Mean Square error is the estimation of measurement of the mean of the squared errors or the difference among estimation value and estimated value.

4.2.3 False Acceptance Rate (FRR): This method is used for measurement of the acceptance rate. False Acceptance Rate is the proportionality of number of false approval to amount of identified attempts.

$$\text{FAR} = \frac{\text{number of false approvals}}{\text{amount of identified attempts}} \dots\dots\dots (ii)$$

4.2.4 False Rejection Rate (FRR): It is the measurement of inaccurate rejection through approved users. False Rejection Rate is proportionality of false rejections to number of identified attempts.

$$\text{FRR} = \frac{\text{number of false Rejections}}{\text{amount of identified attempts}} \dots\dots\dots (iii)$$

4.2.5 Success Rate :- Success Rate is proportionality of accuracy to initialisation.

$$\text{Success Rate} = \frac{\text{accuracy}}{\text{initialisation}} \dots\dots\dots (iv)$$

4.3 Comparative Analysis

In this section comparative analysis with various methods used in object detection based on categories.

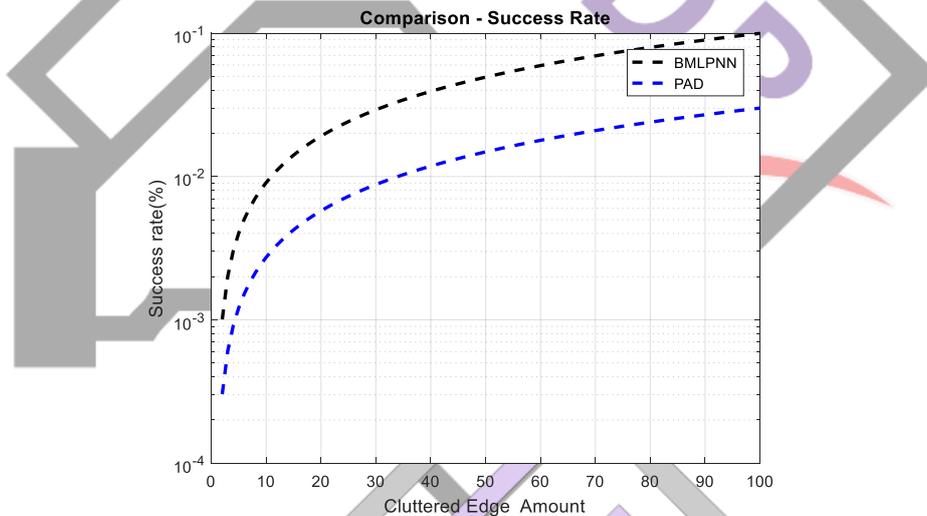


Fig 7 Comparison – Success Rate (%)

Above figure 7 shows that the success rate comparison between proposed work with existing work. In existing methods using PAD method is minimum accuracy rate and BMLPNN method improved the accuracy rate.

Table 1. Performance Metrics

Parameters	Values
MSE	0.0015
FAR	0.0049
FRR	0.1002
Accuracy Rate	89.9331
Success Rate	0.0997

Table 2. Comparative Analysis

Parameters	BMLNN	PAD
Success rate	0.0997	0.0302

Table 1 described that the performance metrics with MSE, FAR, FRR, Accuracy rate and Success rate. Table 2 described the comparison between proposed and existing work with Success Rate parameter.

V. CONCLUSION AND FUTURE SCOPE

In conclusion, Object detection and tracking scheme in pictures are web based applications that generally targets to recognize multiple objects through different kinds of pictures. It has been examined that there has been huge development in object detection in computer vision. In this research, proposed a novel approach using Scale Invariant Feature Transformation (SIFT) algorithm for extraction of features of shape based object image. The methods take place in three stages which are (i) Elimination (ii) Dispersal and (iii) Reproduction. Initially, feature components of uploaded images are extracted and then gray scale images converted to smooth picture. In next procedure, extracted key pint features using Scale Invariant Feature Transformation (SIFT) algorithm. And the, selection of features of shape based image done through bacterial foraging optimization (BFOA)algorithm. Along with that, matching of key points was done. The selection and classification of features based on shape based object image determined through multi perceptron neural network approach (MPNN). Experimental analysis based on parameters (i) MSE (ii) FAR (iii) FRR (iv) Accuracy Rate and (v) Success Rate and Comparative analysis with various methods. Proposed BMLNN method to achieve the success rate value is 0.099 and base paper accuracy rate value is 0.03.

Future scope, detection and tracking of shaped based object with improved accuracy based on machine learning algorithms. Some new finding approached is required to bed developed based on matching of blocks with accurate results. It has been found that, due to presence fast motion of moving objects there may existence of interference of object. Some novel algorithms need to be developed for extraction of distortion of objects.

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