Novel approach of Fruit images segmentation by grey wolf optimization

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Abstract-proposed work based on the disease detection of fruit by using the concept of image processing. The segmentation process divides the image into small parts according to the similarity of features. The concept of local Segmentation used for the disease detection. Local segmentation is a process which is used for the processing of current pixel by making the reference to the values of its neighboring pixels.work is done on recognition accuracy and computation complexity in design of recognition approach. This approach uses the images from the image database and then preprocesses them for applying histogram algorithm to extract the HOG features and GWO from the image. The recognition results by this process are effective and efficient.

Keywords-*segmentation,GWO,features.*

I. INTRODUCTION

Now the days the demand of agriculture industry is growing with a high rate so that it is important to full fill the demand by effective farming. The effective production of fruit and vegetable is necessary to full fill the demand. Fruits are the rich sources of vitamins and proteins which are required for human body. Fruits give effective nutrition when they are fresh and disease free.

Disease in fruits is very common problem and it is detected by the farmer's manually till its harvest period. In manual monitoring it is not possible to detect the disease at the proper time and the farmers always need advice from experts. This problem is solved by using the automatic detection methods for the external fruit diseases. The common diseases in fruits are given below.

A. Fungal Disease
B. Bacterial Disease
C. Canker Disease

In this paper, image segmentation method of image processing is used to detect the disease from the fruit. The segmentation is the main part of image processing. Image processing has been proved to be effective tool for analysis in various fields and applications. Different types of image processing approaches and methods are used to enhance the quality of the image and getting useful information from them.

The rest of consist of related study, methodology and algorithm used in this work. The paper also consists of flow chart of work and performance analysis on the basis of different parameters.

II. RELATED STUDY

This section of the paper presents the related study to the topic in which different methods of the segmentation and algorithms are discussed by different researchers and used to enhance the knowledge related to segmentation.

Sharif, Muhammad, et al. (2018) proposed the feature selection approach for the citrus fruit disease detection and classification. This work is based on the contrast stretching mechanism which is applied on the infected region for contrast enhancement. The work is based on two phases in which first is related to the lesion spot detection from the fruit and leaves and second phase related to the classification of infected and not infected disease. The lesion spot in the first phase was detected by using weighted segmentation approach. The classification is done by using the multi-class SVM. The outcomes of the proposed work provide better accuracy on two different datasets. Ma, Juncheng, et al. (2018) proposed the deep convolution neural network to detect the disease in the cucumber. The work detects the four disease of the cucumber by using the leaves. The problem of over fitting is reduced by enhance the dataset of the segmented images of the leaves. The proposed deep neural network enhances the accuracy of the disease recognition. The classification of the disease is done by using support vector machine and random forest.

Chen, Junying, et al. (2017) presented the image segmentation algorithm for thyroid ultra sound images. The preprocessing of images is also done by performing the edge detection, and segmentation. This work includes the different filters that are Butterworth filter, Improved Butterworth Filter and median filtering. This work combines the segmentation and preprocessing of images for getting better results in thyroid images. Badrinarayanan, et al. (2017) proposed the deep convolution neural network for semantic pixel-wise segmentation called signet. The signet consists of encoder, decoder and a pixel wise classification layer. The encoder and decoder s used to map the features for pixel wise

classification. The features are un-sampled by the decoder from the low resolution input feature map. The performance of the segnet is very effective as compared to the existing tasks.

Xue, Jingjing, et al. (2017) introduced the flower pollination algorithm for multi threshold image segmentation for pattern recognition. The existing methods that are used for searching the threshold are computationally very expensive. The maximum entropy method is used for design the fitness function and FPA is used for parallel optimization. The proposed algorithm performed well in image segmentation process then the genetic algorithm and frog leaping algorithm.

Despanday et al. (2017) worked on the traffic sign recognition process by using the image segmentation approach. The work is done on recognition accuracy and computation complexity in design of recognition approach. This approach uses the images from the image database and then preprocesses them for applying histogram algorithm to extract the HOG features from the image. The recognition results by this process are effective and efficient.

Zhang, Kaihua, et al. (2016) introduced a level set method for image segmentation in the presence of intensity homogeneity. The object with different mean and variance is used to map the original image into another domain by using the Gaussian distribution. The transformed domain is estimated by multiplying the bias field with original signal within the window. The region of whole image is defined by using the maximum likelihood energy function. The effectiveness of the proposed method is represented by the comparative results of the approaches.

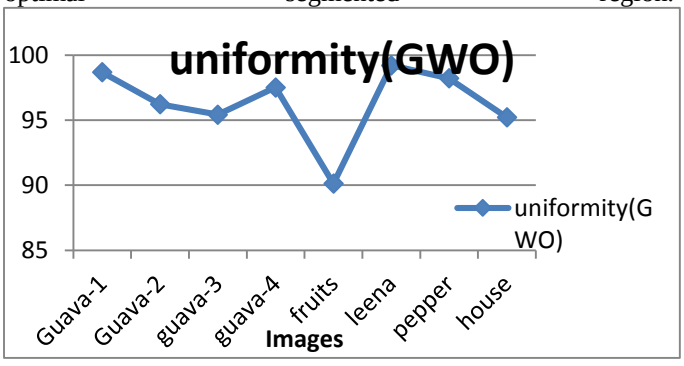
Milletari et al. (2016) proposed convolution neural network for the segmentation of medical images and solved the problem related to MRI and CT-scans. This image segmentation is based on the 3-D images in which CNN is trained on these images. This model learns to predict segmentation for whole images at once. The Dice Coefficient function is used to optimize the training and it does not need to reweight the foreground and background pixels. The results of the proposed approach show its effectiveness on different parameters. Bora et al. (2016) proposed watershed algorithm for color image segmentation which is based on the combination of histogram equalization. In this work, firstly the image is given as input and then converted into HSV from RGB and extract the V-channel. The hidden edges are enhanced by histogram of the V-channel. Then the preprocessing is done by using the Ostu's method and Sobel filter because they perform better preprocessing. After this segmented imaged is produced by using the watershed algorithm after the filtering process. The performance evaluation is done by using MSE, PSNR, NAE and AMBE parameters and gives effective outcomes.

Badrinarayanan et al. (2015) proposed the architecture for image segmentation which is based on the Deep Convolution encoder decoder. The work is done on the segnet which is a semantic pixel-wise segmentation process. The proposed segmentation engine consists of encoder and decoder network which is followed by classification layer. The encoder network consists of 13 convolution layer in the VGG16 network. The decoder network is used to map the low input features to high resolution input features for pixel-wise classification. The non-linear upsampling is done by max-pooling layer. The proposed approach is compared with FCN approach and the proposed approach gives effective segmentation results in terms of memory and computational time. Ayala et al. (2015) proposed a differential evolution approach for image thresholding segmentation. This algorithm provides the optimal level threshold by using Otsu criterion. The efficiency of the BDE approach is shown by some results when it applied on the two different case studies of image segmentation. The result of the proposed approach BDE is compared with PSO and it performs better. The quality of solution and mean evaluated the test case studies.

Bhandari et al. (2015) proposed an approach based on modified artificial bee colony algorithm for satellite image segmentation. The optimal level threshold is achieved by using different objective functions. In the proposed algorithm improved search equation for better optimal solution and improve the exploitation. The global convergence is improved when initial population is generated by using opposition based learning and chaotic methods are employed. The outcomes of this approach show that it reduces the computational time.

III. PROPOSED WORK

This section describes the proposed work methodology with complete detail. The chapter gives the full detail of algorithm used to optimization and work flowchart of the methodology. In this work Grey Wolf Optimization is used for the optimization of features of the image and it provides the optimal segmented region.



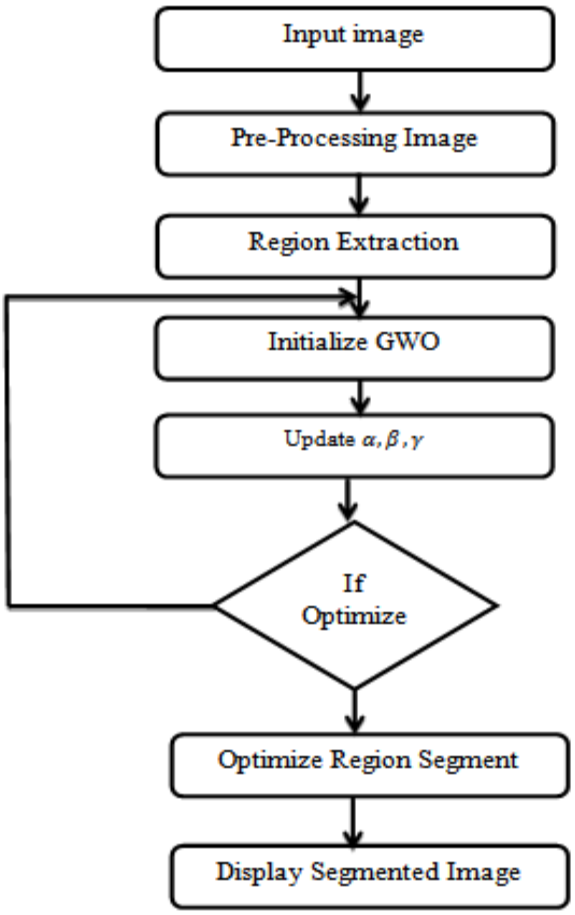


Fig.1.1 Flow chart of proposed methodology

Methodology Steps

1. Input the images.
2. Preprocessing of images to remove the noise.
3. Extract the region from the image.
4. Initialize the Grey Wolf optimization Algorithm for optimized segment.
5. Checks the output of GWO is optimized or not if yes then go to next step otherwise go to step 4 again.
6. Display the segmented image.

IV. RESULTS AND DISCUSSIONS

In this section result of the proposed methods is presented with the help of images and graphs. These results are performed on optimization with GWO and without optimization. The performance evaluation of the work is done by using the results on different iterations on the images.

A. Results of Uniformity GWO and Uniformity without Optimization

Fig. 1.2 Uniformity with Grey Wolf Optimization (GWO) algorithm

The figure 1.2 depicts the uniformity of the different images using Grey Wolf Optimization (GWO) algorithm. The x-axis of the graph represents the images name and y-axis represents the value of the uniformity. The curve on the graph represents the values of uniformity in which it changes according to the image by image.

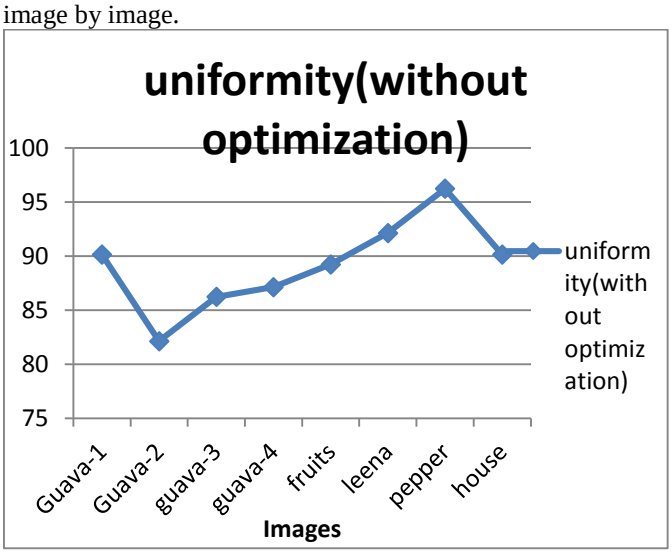


Fig. 1.3 :Uniformity without using Uniformity

The figure 1.3 depicts the uniformity of the different images without using Optimization algorithm. The x-axis of the graph represents the images name and y-axis represents the value of the uniformity. The blue curve on the graph represents the values of uniformity in which it changes according to the image by image

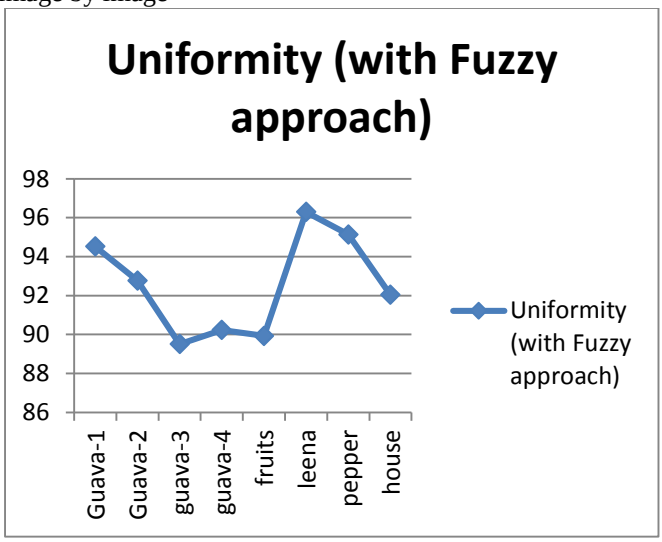


Fig. 1.4: Uniformity with Fuzzy Approach

The figure 1.4 depicts the uniformity of the different images with fuzzy algorithm. The x-axis of the graph represents the images name and y-axis represents the value of the uniformity. The blue curve on the graph represents the values of uniformity in which it changes according to the image by image

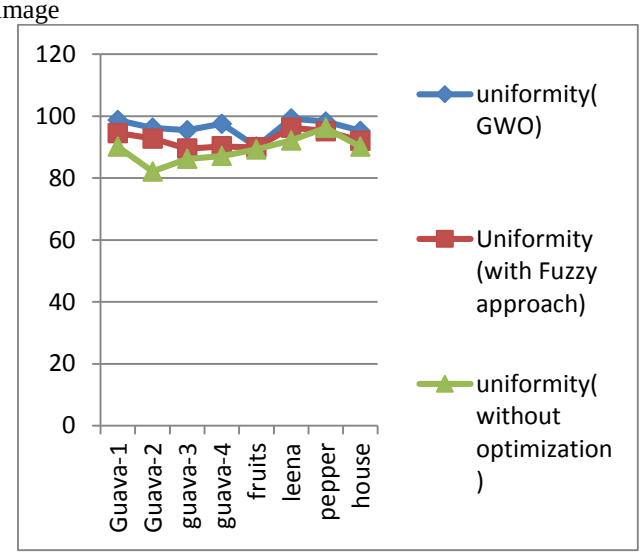


Fig. 5.17:Comparative results with and without Optimization and fuzzy approach.

The figure 5.17 depicts the comparative results of the uniformity with and without optimization and Fuzzy approach. The x-axis of the graph represents the images name and y-axis represents the value of the uniformity. The blue curve on the graph represents the values of uniformity with GWO and red curve graph represents the values of uniformity without optimization. The curve of the graph represents that the uniformity without optimization is less than the uniformity with optimization. This clearly shows that the proposed approach with optimization gives more effective results than the existing approach.

V. CONCLUSION

The proposed work based on the disease detection of fruit by using the concept of image processing. The segmentation process divides the image into small parts according to the similarity of features. The concept of local Segmentation used for the disease detection. Local segmentation is a process which is used for the processing of current pixel by making the reference to the values of its neighboring pixels. The local segmentation approach is applicable to host of image processing tasks besides denoising. This approach makes a connection between low level and high level analysis and there is a common disadvantage that is noise. Noise in the approach makes it weak and preprocessing process is required to reduce the noise from the image. The histogram shape can be modeled as Gaussian function and affected by illumination. In histogram it is not fixed that it has Gaussian function shape and well separated clusters. The other problem is that we don't know which cluster has useful information and which has not. Some cluster can be noise and some contains the useless information.

VI. FUTURE SCOPE

To reduce the noise label region approach is useful but it classifies all the noises to the new region to overcome this issue pixels are compared only when the difference between the pixel values is higher than the threshold value. This algorithm classifies the pixel to a new class and that why it is called modified label region algorithm. The issue in this algorithm is its threshold value is too big, and it is not able to classify pixels having small gray level difference. If threshold value is small it is vulnerable to noise and very difficult to decide the proper threshold value.

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