Fuzzy-Decision-based Segmentation Approach for Detecting Region of Interest

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ABSTRACT
Many clustering strategies have been used, such as the hard clustering scheme and the fuzzy clustering scheme, each of which has its own special characteristics. The conventional hard clustering method restricts each point of the data set to exclusively just one cluster. As a consequence, with this approach the segmentation results are often very crisp, i.e., each pixel of the image belongs to exactly just one class. In this paper we have considered the fuzzy decision based clustering approach for finding the objects of interest. The methodology is basically the parameter based clustering where the regions are divided based on the parameter value which develops the regions of interest. The proposed methodology is test on the benchmark datasets and evaluated with different measures for performance analysis.

Keywords
Fuzzy clustering, segmentation, decision set.

1. INTRODUCTION
There are some applications of image processing like face detection, agriculture applications, medical imaging, microscope image processing, remote sensing, whether forecasting, atmospheric study and astronomy applications[1]. Objection detection, object recognition and image segmentation are the research areas of image processing. Object detection is a part of image processing. Object detection is a challenging problem in vision based computer applications[2]. It used to identifying that whether an object is in scene or not. Occlusion for object detection is a serious problem. The similarity measure computes the average distance of the image edges. The disadvantage of this similarity measure is that it is not robust to occlusions because the distance to the nearest edge increases significantly if some of the edges of the model are missing.

In this paper we have proposed a fuzzy-decision based approach for detecting region of interest. In this approach we are using segmentation for detection. The fuzzy-decision based approach is being used the shadow c-mean concept with RGB channel segmentation. Proposed Methodology is a clustering approach which has been proposed for the detection of the region of interest in this work. It generates the decision set which is used to detect and locate the region of interest.

2. REVIEWED PAPERS

Table 1: Summary of Reviewed paper

Techniques	Conclusion
Multi-Component object detection pipeline[3]	The algorithm achieves good imperceptibility and robustness for object detection.
Multi-class Hough Transform approach[4]	This algorithm improves the classification accuracy for detecting multi-class object.
Boosted Haar cascade[5]	It can detect the object efficiently while preserving the information.
Latent Hough Transform (LHT)[6]	The approach can improve the imperceptibility and robustness very well.
Spectral clustering techniques[7]	This procedure obtains better imperceptibility for detecting the object class.
Double object occlusion pattern detection[8]	Reoccurring occlusion patterns can be automatically mined and reliably detected.
Shadowed C-mean approach[9]	The algorithm is robust in the presence of outliers.

3. PROBLEM DEFINITION
The similarity measure computes the average distance of the image edges. The disadvantage of this similarity measure is that it is not robust to occlusions because the distance to the nearest edge increases significantly if some of the edges of the model are missing.

The problem of object detection becomes a vital point as detailed below:

- The objects under different scene conditions will have change in appearance and hence the performance of different feature detectors will be significantly change.
- The noise is not removed in this clustering approach but the noise is clustered assigning some membership values.
- Partial occlusions in object detection done from different angle treats the causes of occlusions as first priority in the detection problem.

4. PROPOSED METHODOLOGY

4.1 Methodology
The clustering is based on the concept of fuzzy decision sets that is described as follows:

- Decision sets are information granules induced by fuzzy sets so that they capture the essence of fuzzy sets at the same time reducing the numeric burden because of their limited three-valued characteristics of resulting sets.

- Instead of generating a binary allocation of patterns to a group, which could be quite restrictive in many cases, the notion partial membership helps to quantify the aspect of belongings in a far greater detail.
- The lower the membership degree, the less likely the pattern could be treated as belonging to a group.
- The central idea of a decision set is that it can easily assign membership values closer to 0 or 1 but have significant difficulties in assigning uncertain membership grades around the value 0.5.
- The concept of proposed methodology is to improve the observability and interpretability of fuzzy sets by identifying the areas of vagueness.

4.2 Steps of Proposed Method:

The proposed method is divided into three steps:

Step 1: Pre-processing Phase
The input image is preprocessed for the noise removal

Step 2: Detection Phase

- The number of clusters is initialized.
- The value of the membership for each point is calculated.
- The threshold value α is computed from the fuzzy set.
- The centroid value of each cluster is computed
- Membership value of each data point is again updated
- The objective function is computed.
- The steps repeated until the algorithm terminates.

Step 3: Evaluation Phase

The clusters are obtained showing the region of interest. The results are compared and validated on different measure like PSNR and MSE.

5. IMPLEMENTATION METHODOLOGY

- **Tools**
  MATLAB 13 instances as desktop computers with 2.0 GHz Intel(R) Core(TM) 2 Duo processor and 2 GB RAM having Windows 7 (64 bit) Operating system.

- **Dataset Description**
  The dataset is to recognize objects from a number of visual object classes in realistic scenes. It is a supervised learning process in the training set of labeled images. Some of the different classes in the datasets are mentioned below:

  - Person
  - vehicle

6. EXPERIMENTAL RESULTS

6.1 Implementation of Pre-processing Phase

In pre-processing phase, It takes the input image and using the median filter filtering is done and gives the filtered image which has resulted in removed noise and resized image.

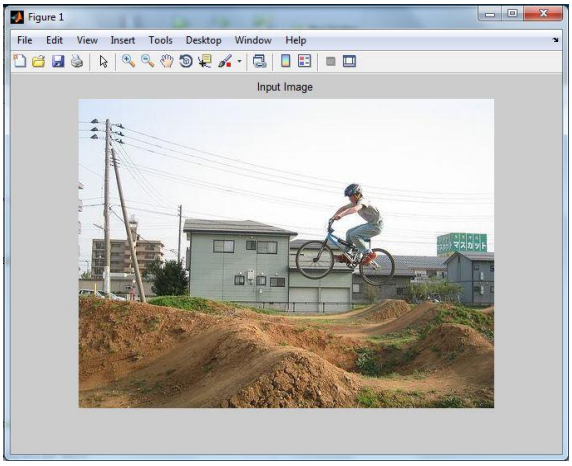

Figure 6.1: Input image for filtering

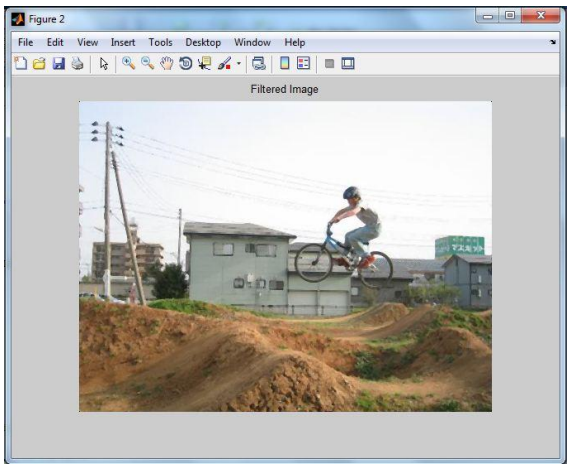

Figure 6.2: Filtered image

6.2 Implementation of Detection Phase:

The occluded color images are taken as input in the pre-processing stage. The pre-processed images are segmented with the proposed methodology into different RGB channel and finally into a segmented image. The final image is the object that is recognized after the occlusion gets removed when the segmentation of the object is done. Here, we have considered three different images having occlusion with a wooden box, a man , a man with the objects such as car, a man and a car. All the images are segmented with proposed method where the object of interest gets as output.

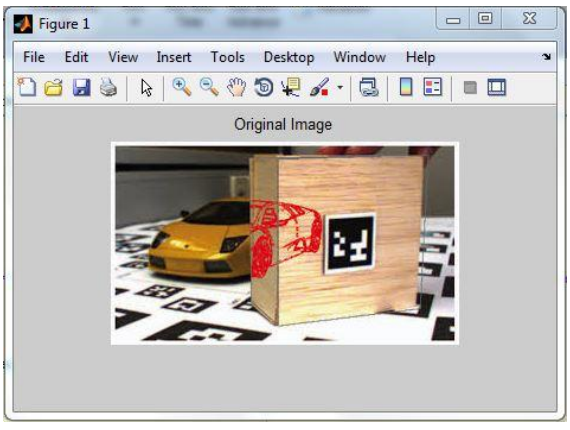

Figure 6.3: Original Image

Input is taken as image in pre-processing phase from which region of interest is going to be located and detected.

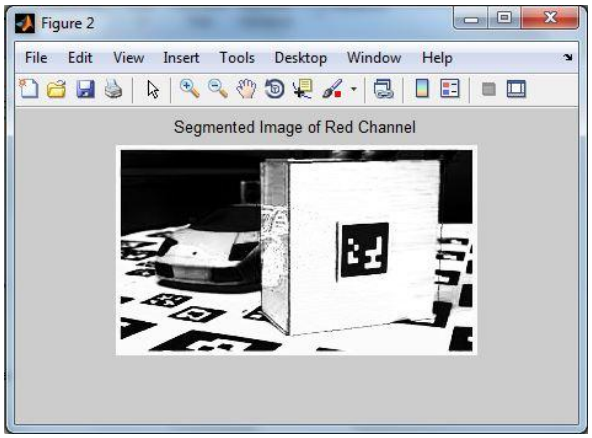

Figure 6.4: Segmented image of Red Channel

The pre-processed images is segmented with the proposed methodology into segmented image of Red channel.

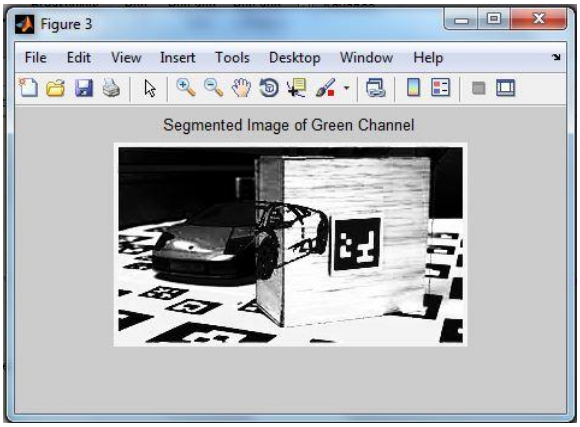

Figure 6.5: Segmented image of Green Channel

After image segmented into red channel, it is segmented into Green channel.

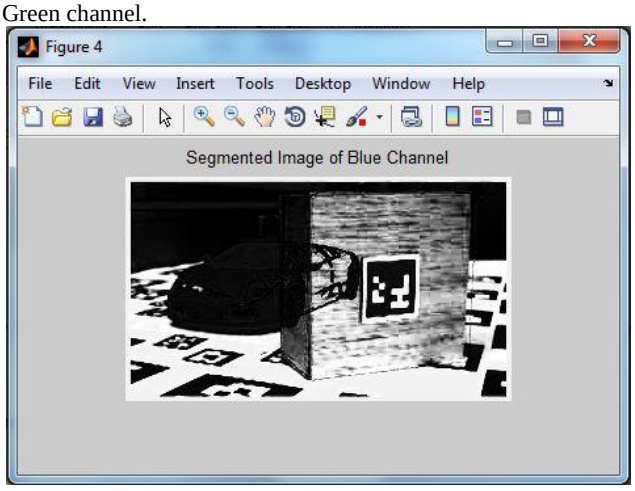

Figure 6.6: Segmented image of Blue Channel

After image is segmented into Green channel, it is segmented into Blue channel.

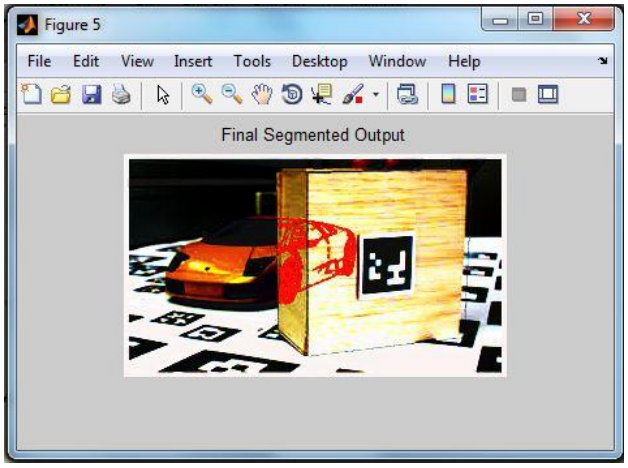

Figure 6.7: Final Segmented Image

After segmented into blue channel, Image is finalize in segmented image.

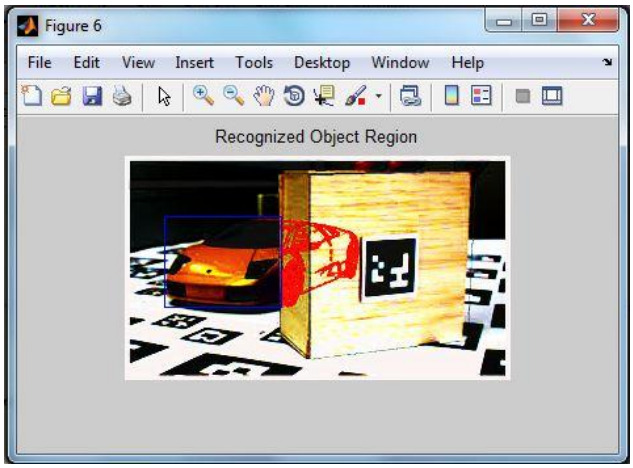

Figure 6.8: Recognized Object Region

After segmented image, the object or region is recognized and located by bounding box.

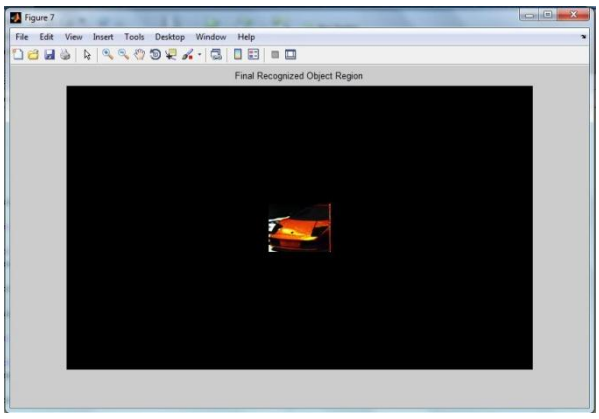

Figure 6.9: Final Recognized Object Region

The final image is the object that is recognized after the occlusion gets removed when the segmentation of the object is done.

6.3 Results Analysis

6.3.1. Graphical Representation using PSNR:

The performance of the proposed method shows a higher PSNR value with 25 error rate as compared to the existing method where the rate is minimum as compared to the proposed method. The result for different set of images is plotted over which shows the proposed method has better error rate and results in better recognition of the object from the set of occluded images.

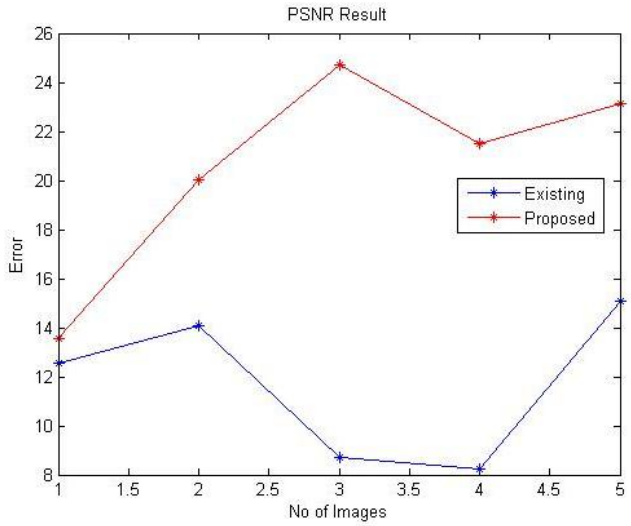

Figure 6.10: PSNR Results

6.3.2. Graphical Representation using RMSE:

Another measure done for the analyzing the performance of the algorithm is the RMSE. In this measure the proposed method has very less amount of error as compared to the existing ones. The error rate is negligible in proposed method whereas the existing method has an error rate of 12, 30, 46, 15 for different of images. The presence of occlusion in the images detoriate the performance of the existing system. However, the proposed method final optimum values form the thresholding and hence results in better output.

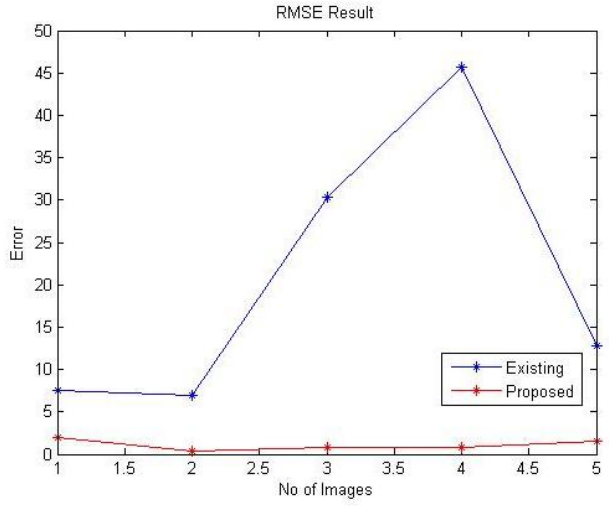

Figure 6.11: RMSE Results

7. CONCLUSION

An object recognition system finds objects in the real world from an image. 'Fuzzy-Decision-based Segmentation Approach for Detecting Region of Interest', this approach will be useful for finding region of interest and make the better performance of detection. This approach is deal with the occlusion problem and it will remove the unnecessary part from the result and gives the accurate result. Occlusion problem can be removed. In this work I have considered the fuzzy decision based clustering approach for finding the objects of interest. This approach high-lights the region of interest.

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