

# Review Paper on Image Segmentation

Hardeep Kumar<sup>1</sup>, Supreet Kaur<sup>2</sup>

<sup>1</sup>Research Scholar, <sup>2</sup>Assistant Professor

<sup>12</sup>Department of Computer Engineering, Punjabi University, Patiala, Punjab, India

**Abstract-** Several general-purpose algorithms and techniques have been developed for image segmentation. Since there is no general solution to the image segmentation problem, these techniques often have to be combined with domain knowledge in order to effectively solve an image segmentation problem for a problem domain. This paper presents a comparative study of the basic Block-Based image segmentation techniques.

**Keywords-** segmentation, knowledge base, optimization

## I. INTRODUCTION

Image segmentation is an important part of image analysis, object representation and image processing task. Image segmentation is the first step of image processing. Basically it is process of dividing a digital image into multiple segments. In other words, it is a grouping the pixels that have similar properties and have similar attribute. It improves the information for human interpretation

**Following are the types of the image segmentation**

- **Pixel based segmentation:** This technique is used to segment the image and it is directly applied to an image. It is easy to implement with pre and post processing techniques. It is also called as threshold based segmentation because it works on the basis of threshold mechanism.
- **Edge Based Segmentation:** The edge-based segmentation methods are on the basis of the rapid change of intensity value in a picture just because a single intensity value doesn't provide good information regarding edges. Edge detection techniques locate the edges where either the initial derivative of intensity is greater when compared to a particular threshold or the next derivative has zero crossings.
- **Region Based Segmentation:** This method is opposite to the edge based method it detects the pixel outwards from the middle of the object until it reach the boundaries. This method finds the closed boundaries to the related pixels. The computation is based on similarity. It works best when the region homogeneity standard is quite simple to describe. This technique first removes noise and then detects the edges.

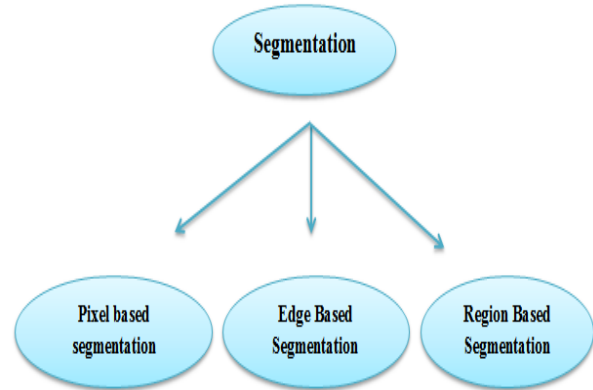


Fig.1: Types of Segmentation

## II. RELATED STUDY ON IMAGE SEGMENTATION

### A. Particle Swarm Optimization Approach

Enhanced artificial bee colony optimization algorithm is introduced which is used for getting the optimal and effective results in image segmentation. In this work local search is combined with the PSO based equation. The local search and global search solution is used for obtaining the best solution and balance the exploration and exploitation [1]. Pham et al worked on the image segmentation of MRI images by using the algorithm PSO and fuzzy entropy clustering. This work is done to solve the problem of sensitivity to the noise and intensity. The objective function used with fuzzy entropy clustering with local spatial information and bias correction. The performance of the proposed system is effective on image with noise and gives effective results [2].

### B. Convolution Neural Network

Duan, Jinming, et al. proposed a deep learning approach called CNN which is used for the segmentation of the MRI image. In this approach CNN is worked with image registration to develop a shape based segmentation tool. Firstly the segmentation task is learning by using the fully convolution network and CMR images are generated by using the long-axis resolution. This approach gives the effective results in image segmentation [3]. Feng, Hsuan-Ming, et al. worked on the radial basis functional neural network to describe the behavior of the image patterns by using the concept of machine learning. The appropriate feature of the of the image pattern is matched by using image data extraction

learning algorithm. The proposed work is generated by the support of image self-extraction feature machine to develop the image descriptors. The performance evaluation of the proposed approach is done on the basis of PSNR index of the reconstructed image [4]. Badrinarayanan, et al. 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 signet is very effective as compared to the existing tasks [6].

### C. Flower Pollination Algorithm

Xue, Jingjing, et al. 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 [7].

### D. Histogram Algorithm

Despanday et al. 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 [8].

### E. Genetic Algorithm

Singh, et al proposed the image segmentation process for diseases detection in the leaf. This approach is beneficial for the farmers to detect the diseases by image automatically. This approach reduces the work load and also the time consumption in monitoring the crops in the fields. In this work image segmentation is used for detection and classification of diseases. These processes are completed by using the genetic algorithm [9].

### F Fuzzy Logic Approach

Yin et al. introduced the fuzzy entropy maximization approach for unsupervised image segmentation. The proposed approach is used automatically segment the color image and gray scale image. Bi-level segmentation is formed by using the graph cut method and fuzzy entropy. Multi-level segmentation approach is performing on the selected region for producing the hierarchy of segments. The proposed

method is efficient for segmentation and it is easy to implement [10]

Author's Name	Technology Used	Year
<ul style="list-style-type: none"> <li>• Gao, Yang, et al.</li> <li>• Pham, et al</li> </ul>	Particle Swarm Optimization	2018
<ul style="list-style-type: none"> <li>• Duan, Jinming, et al.</li> <li>• Feng, Hsuan-Ming, et al.</li> <li>• Chen, Junying, et al.</li> <li>• Badrinarayanan, et al.</li> </ul>	Convolution Neural Network	2018
<ul style="list-style-type: none"> <li>• Xue, Jingjing, et al.</li> </ul>	Flower Pollination Algorithm	2017
<ul style="list-style-type: none"> <li>• Despanday et al.</li> </ul>	Histogram Algorithm	2017
<ul style="list-style-type: none"> <li>• Singh, et al</li> </ul>	Genetic Algorithm	2017
<ul style="list-style-type: none"> <li>• Yin et al.</li> </ul>	Fuzzy Logic Approach	2017

## III. CONCLUSION

In image analysis, segmentation is the partitioning of a digital image into multiple regions (sets of pixels), according to some homogeneity criterion. The problem of segmentation is a well-studied one in literature and there are a wide variety of approaches that are used. Different approaches are suited to different types of images and the quality of output of a particular algorithm is difficult to measure quantitatively due to the fact that there may be much "correct" segmentation for a single image. Here, a graph theoretic framework is considered by modeling image segmentation as a graph partitioning and optimization problem using the normalized cut criterion.

## IV. REFERENCES

- [1]. Gao, Yang, et al. "An enhanced artificial bee colony optimizer and its application to multi-level threshold image segmentation." *Journal of Central South University* 25.1 (2018): 107-120.
- [2]. Pham, Thuy Xuan, Patrick Siarry, and Hamouche Oulhadj. "Integrating fuzzy entropy clustering with an improved PSO for MRI brain image segmentation." *Applied Soft Computing* 65 (2018): 230-242.
- [3]. Duan, Jinming, et al. "Introducing Anatomical Knowledge to A Deep Learning Approach for Segmentation of Cardiac Magnetic Resonance Images." (2018).

- [4]. Feng, Hsuan-Ming, et al. "Evolutional RBFNs image model describing-based segmentation system designs." *Neurocomputing* 272 (2018): 374-385.
- [5]. Chen, Junying, et al. "A study of image segmentation algorithms combined with different image preprocessing methods for thyroid ultrasound images." *Imaging Systems and Techniques (IST), 2017 IEEE International Conference on*. IEEE, 2017.
- [6]. Badrinarayanan, Vijay, Alex Kendall, and Roberto Cipolla. "Segnet: A deep convolutional encoder-decoder architecture for image segmentation." *IEEE transactions on pattern analysis and machine intelligence* 39.12 (2017): 2481-2495.
- [7]. Xue, Jingjing, et al. "Multi-threshold Image Segmentation Method Based on Flower Pollination Algorithm." *International Conference on Bio-Inspired Computing: Theories and Applications*. Springer, Singapore, 2017.
- [8]. Deshpande, Abhinav V., and M. Monica Subashini. "An investigative approach towards various image segmentation algorithms used for traffic sign recognition." *Image Information Processing (ICIIP), 2017 Fourth International Conference on*. IEEE, 2017.
- [9]. Singh, Vijai, and A. K. Misra. "Detection of plant leaf diseases using image segmentation and soft computing techniques." *Information Processing in Agriculture* 4.1 (2017): 41-49.
- [10]. Yin, Shibai, Yiming Qian, and Minglun Gong. "Unsupervised hierarchical image segmentation through fuzzy entropy maximization." *Pattern Recognition* 68 (2017): 245-259.