



## *Proceedings*

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# A Comparative Analysis of Entropy Based Segmentation with Otsu Method for Gray and Color Images

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**Abstract:** - Image segmentation quality is usually governed by two main parameters associated with a particular segmentation method: threshold selection and seed-point selection. Various methods such as the histogram method, entropy based method, busyness measure methods, etc. are well known for threshold selection in the image segmentation problems. In this thesis, threshold selection is done on the basis of different entropy measures on both grayscale and color images. Comparative study of the Shannon and non-Shannon entropies (Renyi, Havrda-Charvat, Kapur and Vajda) with Otsu Method is done to obtain image segmentation. We classify these methods according to their evaluation criteria viz. PRI (Probabilistic Rand Index), VOI (Variation of Information) and GCE (Global Consistency Error). These underlying metrics and combination methods help in determining the performance of an evaluation measure. It is observed through the simulation experiments performed on images, that the position of the smallest minima obtained in the entropy versus gray-level plot is different for each entropy measure. For a particular definition of the entropy plots are generated and the threshold values obtained from these plots possess the segmentation results. It is observed that Havrda-Charvat entropy measure is better matched with Otsu Method than other entropy measures.

**Keywords:-** Entropy; Otsu; PRI; VOI; GCE; Threshold;

## I. INTRODUCTION

Image segmentation entails the division or separation of the image into regions of similar attributes and is a vital step in a series of processes aimed towards understanding a given image [1]-[6]. The aim of the division is to make the image more meaningful and to simplify the analysis easier. Typically, Image segmentation helps to properly specify the objects and boundaries (lines, curves, etc.) in an images. More precisely, the process of image segmentation assigns a label to each pixel of an image such that pixels with the same label share certain visual characteristics[7]. The result of image segmentation gives a set of segments also called a set

of contours extracted from the image. In a region, each of the pixels is similar in the sense of intensity, texture. This specialty is different for adjacent areas. Applications of image segmentation include identification of objects, feature extraction etc. [1]-[6]. Segmentation of simple gray-level images also provides useful information about the surfaces in the scene [1].

In this paper, threshold selection is done on the basis of various entropy measures and Otsu Method to enhance the gray and color images. Comparative study of various entropies (Shannon, Kapur, Havrda-Charvat, Renyi and Vajda) and Otsu Method is done to obtain the image segmentation. It is observed through simulation experiments performed on various images, the smallest minima conditions obtained in the entropy versus gray-level plot are different for each entropy measure. For a particular definition of the entropy plots are generated and the threshold values obtained from these plots possess the segmentation results.

Then, all results of Entropies are compared with standard Otsu Method. Quantitative evaluation of the quality of the images is also a significant issue. Different measures have been proposed in the literature for this task.

## II. ENTROPY BASED IMAGE SEGMENTATION

The simplest method of segmentation is Thresholding Method. Thresholding Method gives an optimum threshold value that converts an image into a binary image and this threshold value separates the foreground from background [8].

Threshold selection in image segmentation is not an easy task. It provides important information about image and play important role in segmentation of image. There are various methods to compute threshold value, threshold value can be