IMAGE SEGMENTATION ENHANCEMENTS & OPTIMIZATIONS: A STOCHASTIC APPROACH*

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ABSTRACT

This project proposes a novel technique for image segmentation providing customized parameters. Predefined customized parameters makes the technique usable for supervised segmentation, but the results of unsupervised segmentation can be used as an input to the method to get combined results. Image segmentation is very important in visual detection and visual recognition such as facial recognition, object detection, etc. It is quite adaptive to all the supervised segmentation techniques, and also flexible to the unsupervised techniques. Major features of the technique includes easy customization, neutrality towards nature of the segmentation technique, open-source nature, and uniformity of segmentation procedure. The core idea of technique lies in random probabilistic distribution (stochastic model), in which we created 2 matrices of size 8 x 8; one for highly bright image and one for a highly dim image. Matrices were constructed on the basis of random nature of image and we can also use other matrices also (customization). Those initial matrices were then weighted to an score of 10 and -10 (Plus for brightness and Minus for dim image) for effective manipulation and operations. The smallest image that can be processed using this technique is 8 x 8, in that case only one iteration is necessary to calculate the resulting segmented matrix.

If the size of image is greater than 8 x 8, matrices act as filters and calculate filtered value for each row-column element for the image. Since there are two matrices, we calculate 2 filtered results and then average out them for best results of highly bright image and highly dim image. We've tested some images with supervised techniques such as thresholding technique as well as some of unsupervised techniques such as otsu, li, local, etc. We've also demonstrated the technique on some advanced techniques such as snake based contours and Felzenszwalb; and that gives excellent results from a human perspective. We've also implemented this technique for a clustering technique – linear iterative clustering that also give very promising results.

1 INTRODUCTION

2 PRELIMINARIES

3 RELATED WORK

Image segmentation is one of the most explored field in the subject of computer vision and digital image processing. Many techniques have been discovered for segmentation which are widely used in inter-domain applications. Each of them have their own pros and cons.

Some segmentation techniques survey and comparisons are presented in [24] and [62]. The idea of a hidden Markov model in Image segmentation is inspired from [2]. The randomization concept was first given by [41]. Some techniques such as linear iterative method is given in [3]. Contour based segmentation is popularized by [31], [32]. Solving the problem of segmentation using genetic algorithms was first studied by [59]. An automata based approach was used in [65].