Improved Color Edge Detection By Fusion

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Abstract- Image Fusion is a process of combining the relevant information from a set of images into a single image, where the resultant fused image will be more informative and complete than any of the input images. Also the choice of a color space is of great importance form any computer vision algorithms (e.g. edge detection and object recognition).This paper presents efficient segmentation, edge detection approach, based on a fusion procedure which aims at combining several segmentation images associated to simpler partition models in order to finally get a more reliable and accurate segmentation. Image fusion techniques can improve the quality and increase the application of these data. The objective of Image fusion is to combine the information of the number of images of the same scene from different sensors or the images with focus on different objects. In this paper an introductory approach to some of the image fusion methods has been taken. End edge detection is one of the most commonly used operations in image analysis. In this paper, we present methods for edge segmentation of natural images; we used several techniques for this category.

Keywords- Berkeley image database , color spaces , fusion of segmentations, image processing, edge detection.

I. INTRODUCTION

The process of partitioning a digital image into multiple regions or sets of pixels is called image segmentation One of the most important applications is edge detection for image segmentation Edge detection is a fundamental tool used in most image processing applications to obtain information from the frames as a precursor step to feature extraction and object segmentation. In this paper, we present methods for edge segmentation of natural images. Sobel operator technique, Prewitt technique, Laplacian technique, Canny technique, Roberts technique and Edge Maximization Technique (EMT) and they are compared with with one another so as to choose the best technique for edge detection.

One of the most important applications is edge detection for image segmentation. The process of partitioning a digital image into multiple regions or sets of pixels is called image This process detects outlines of an object and boundaries between objects and the background in the image. An edge-detection filter can also be used to improve the appearance of blurred image; to this cause more studies take this subject can be give some of these studies briefly: Soft computing techniques have found wide applications. Edge detection refers to the process of identifying and locating sharp discontinuities in an image. In this paper, the main aim is to survey the theory of edge detection for image segmentation using soft computing approach based on the Fuzzy logic, Genetic Algorithm and Neural Network[1].The Canny algorithm uses an optimal\ edge.

Image fusion means the combining of two images into a single image that has the maximum information content without producing details that are non-existent in the given images[2][3]. With rapid advancements in technology, it is now possible to obtain information from multi source images to produce a high quality fused image with spatial and spectral information [3] [4 Image Fusion is a mechanism to improve the quality of information from a set of images. Important applications of the fusion of images include medical imaging, microscopic imaging, remote sensing, computer vision, and robotics .Use of the Simple primitive technique will not recover good fused image in terms of performance parameter like peak signal to noise ratio (PSNR), Normalized correlation (NC), and Men square error (MSE). Recently, Discrete Wavelet Transform (DWT) and Principal Component Analysis(PCA),Morphological processing and Combination of DWT with PCA and Morphological techniques have. been popular fusion of image[4][5][6]. These methods are shown to perform much better than simple averaging, maximum, minimum. Edge detection refers to the process of identifying and locating sharp discontinuities in an image.

II. EDGE DETECTION FOR IMAGE SEGMENTATION

The effectiveness of many image processing and computer vision tasks depends on the perfection of detecting meaningful edges. Edge detection has been a challenging problem in low level image processing. It becomes more challenging when color images are considered because of its multi dimensional nature.Color images provide accurate information about the object which will be very useful for further operations than gray scale images.Due to some unavoidable reasons such as distortion, intensity variation, noise, segmentation errors, overlap (large number of

distracting objects i.e., clutter), and occlusion of objects in digital images, it is usually impossible to extract complete object contours or to segment the whole objects. Due to lack of object edge information the output image is not visually pleasing. A Huge number of methods are available in the literature to segment images .This task is hard and very important, since the output of an image segmentation algorithm can be fed as input to higher- level processing tasks, such as model- based object recognition systems. There are many techniques in the literature used for edge detection some of them are based on error minimization, maximizing an object function, fuzzy logic, wavelet approach, morphology, genetic algorithms, neural network and Bayesian approach.

Color image segmentation techniques can be roughly classified into four types such as histogram based approaches, neighborhood based approaches, clustering based approaches and hybrid based approaches. Histogram thresholding is widely accepted and easily computable technique in which the images are composed of regions with different gray level ranges.

Three most frequently used edge detection methods are used for comparison. These are Roberts Edge Detection, Sobel Edge Detection and Prewitt edge detection[7].

1.   The Roberts Detection:

+1	0
0	-1

0	+1
-1	0

Gx   Gy

2.   The Prewitt Detection

-1	+1	+1
-1	-2	+1
-1	+1	+1

0°

+1	+1	+1
-1	-2	+1
-1	-1	+1

45°

3.   The Sobel Detection:

-1	0	+1
-2	0	+2
-1	0	+1

+1	+2	+3
0	0	0
-1	-2	-3

Gx   *Gy*

Fig (1) Original Image

Fig(2) using Sobel   Fig(3) using Prewitt

Fig (4) using Roberts   Fig (5) Fusion

III. EDGE BASED TECHNIQUES

Segmentation Methods based on Discontinuity find for abrupt changes in the intensity value. These methods are called as Edge or Boundary based methods. Edge detection is the problem of fundamental importance in image analysis. Edge detection techniques are generally used for finding discontinuities in gray level images.

Edge detection is the most common approach for detecting meaningful discontinuities in the gray level. Image segmentation methods for detecting discontinuities are boundary based methods Edge detection can be done using either of the following methods Edges are local changes in the image intensity. Edges typically occur on the boundary between two regions. Important features can be extracted from the edges of an image (e.g., corners, lines, curves).Edge detection is an important feature for image analysis. These features are used by higher-level computer vision algorithms (e.g., recognition). Edge detection is used for object detection which serves various applications like medical image processing, biometrics etc. Edge detection is an active area of research as it facilitates higher level image analysis. There are three different types of discontinuities in the grey level like point, line and edges. Spatial masks can be used to detect all the three types of discontinuities in an image.

IV. INITIAL SEGMENTATIONS TO BE FUSED

The initial segmentation maps which will then be fused together by our fusion framework (see Section III) are simply given, in our application, by a K-means [2] clustering technique, applied on an input image expressed by different color spaces, and using as simple cues (i.e., as input multidimensional feature descriptor) the set of values of the re-quantized color histogram (with equidistant binning) estimated around the pixel to be classified. In our application, this local histogram is equally re-quantized (for each of the three color channels) in a $Nb=5\times5\times5=125$ bins descriptor, computed on an overlapping squared fixed-size $(Nw=7)$ neighborhood centered around the pixel to be classified. This estimation can be quickly computed by using a more coarsely re quantized color space and then computing the bin index that represents each re-quantized color.

Each color space has an interesting property, which can efficiently be taken into account in order to make more reliable the final fusion procedure. For example, RGB is an additive color system based on tri-chromatic theory and nonlinear with visual perception. This space color seems to be the optimal one for tracking applications [8]. The HSV is interesting in order to decouple chromatic information from shading effect [9]. The YIQ color channels have the property to code the luminance and chrominance information which are

useful in compression applications (both digital and analogue). Besides, this system is intended to take advantage of human color characteristics. XYZ has the advantage of being more psycho-visually linear, although they are nonlinear in term of linear component color mixing. The LAB color system approximates human vision, and its component closely matches human perception of lightness [1]. The LUV components provide an Euclidean color space yielding a perceptually uniform spacing of color approximating a Riemannian space [10]. Each of these properties will be efficiently combined by our fusion technique.
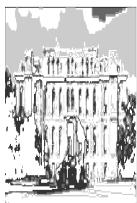

Fig.12. Examples of fusion results input natural image from the Berkeley image database.

V. CONCLUSION

In this paper, we have presented a new segmentation strategy based on a fusion procedure whose goal is to combine

several segmentation maps in order to finally get a more reliable and accurate segmentation result. The initial segmentations to be fused can be the output result of the same initial and simple model used on an input image filtered by a given filter bank, or it can also be provided by different segmentation models or different segmentation results provided by different seeds (or different variation of parameters) of the same stochastic segmentation model. This fusion framework remains simple, fast, easily parallelizable, general enough to be applied to various computer vision applications, and performs competitively among the recently reported state-of-the-art segmentation methods

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