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A Survey on Fusion of Color Images

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***Abstract*— Medical Image fusion has been a quick growing, challenging and fascinating field in real time applications. In the field of image processing an oversized variety of fusion algorithms are developed in last decades. In this paper a trial is formed to review a large variety of methods used for fusion of medical images. This includes PCA, LDA, ICA. This review investigates include all these fusion methods with parameters that challenges in color images like MRI, CT etc.**

***Index Terms*—PCA, LDA, ICA, MRI, CT.**

I. INTRODUCTION

Medical image fusion has been also a popular research topic. Generally medical image fusion mean s the matching and fusion between two or more images of the same lesion area from different medical image equipments and aims to obtain complementary information and increase the amount of information. Medical image fusion techniques is to combine the information of variety of images with computer based image processing method.

II. LITERATURE SURVEY:

Computer tomography and nuclear magnetic resonance imaging MRI are complemantry on reflecting human body information. In order to provide more useful information in clinical diagnosis, we need to fuse the effective information is studied by Joinghua et al. [2010]. Medical Image fusion is used to drive usefull information from multimodal medical image data. The idea is to improves the image content by fusion images like computer tomography and magnetic resonance imaging (MRI images), C. T. Kavita [2010] proposed image fusion based on integer wavelet transform and Neuro-fuzzy. The wavelet coeffiecent are then fused using Neuro-fuzzy algorithms. Srinivasa Rao D. [2012] has proposed comparison between image fusion using fuzzy and neuro fuzzy logic approaches utilized to utilized to fuse images from different sensors in order to enhances visualized.

Zhi-Hua Zhou [2002], said that Lung cancer is one of the most common and deadly diseases in the world. Detection of lung cancer in its early stage is the key of its cure. In general, measures for early stage lung cancer diagnosis mainly includes those utilizing X-ray chest films, CT, MRI, isotope, bronchoscope, etc., among which a very important measure is the so-called pathological diagnosis that analyzes the specimens of needle biopsies obtained from the bodies of the subjects to be diagnosed.

At present, the specimens of needle biopsies are usually analyzed by experienced pathologists. Since senior pathologists are rare, reliable pathological diagnosis is not always available. During the last decades, along with the rapid developments of image processing and pattern recognition techniques, computer-aided lung cancer diagnosis attracts more and more attention.

Chiou et al [1993] designed an artificial neural network based hybrid lung cancer detection system named HLND, which was used to improve the accuracy of diagnosis and the speed of lung cancerous pulmonary radiology.

Mori et al [1996] proposed a procedure to extract bronchus area from 3-D chest X-ray CT images, which was used in a virtualized bronchoscope system. Penedo et al [4] developed a system that employed an artificial neural network to detect suspicious regions in a low-resolution image and employed another artificial neural network to deal with the curvature peaks of the suspicious regions, which was used in the detection of lung nodules found on digitized chest radiographs.

Oshima U, Farihata C [2006] Lung cancers are generally classified into four histopathological subtypes: adenolung cancer (AD), squamous cell lung cancer (SQ), large cell lung cancer (LC), and small cell lung cancer (SC). Molecular biological characterization of these subtypes has been performed mainly using DNA microarrays.

Hayashibe et al [1996] proposed an automatic method based on the subtraction between two serial mass chest radiographs, which was used in the detection of new lung nodules. Kanazawa et al [7] presented a system that extracted and analyzed features of the lung and pulmonary blood vessel regions and then utilized defined rules to perform diagnosis, which was used in the detection of tumor candidates from helical CT images.

Image enhancement techniques can be divided into two broad categories: Spatial domain methods and frequency domain methods. Unfortunately, there is no general theory for determining what “good” image enhancement is when it comes to human perception. If it looks good, it is good! However, when image enhancement techniques are used as pre-processing tools for other image processing techniques, then quantitative measures can determine which techniques are most appropriate. In our image enhancement stage we used three techniques: Gabor filter, auto-enhancement and Fast Fourier transform techniques.

Features related to the local spectrum have been proposed in the literature and used in one way or another for the purpose of texture classification and/or segmentation. In most of these studies the relation to the local spectrum is

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established through features which are obtained by filtering with a set of two-dimensional Gabor filters. Such a filter is linear and local and is characterized by a preferred orientation and a preferred spatial frequency. Roughly speaking, it acts as a local band-pass filter with certain optimal joint localization properties in both the spatial domain and the spatial frequency domain is studied by Gabriel Cristal et al [1994].

Image segmentation is an essential process for most image analysis subsequent tasks. In particular, many of the existing techniques for image description and recognition depend highly on the segmentation results by Rajaei A et al [2011]. We used Thresholding and marker controlled watershed segmentation techniques.

In medical imaging, segmentation is important for feature extraction, image measurements, and image display. In some applications it may be useful to classify image pixels into anatomical regions, such as bones, muscles, and blood vessels, while in others into pathological regions, such as cancer, tissue deformities and multiple sclerosis lesions. The purpose of the segmentation of the lung region in the CT image is to achieve a better orientation in the image. A lot of articles can be found regarding segmentation of the lung region in CT images. Hu et al. [2001] describe a method of global thresholding for that purpose.

Thresholding is one of the most powerful tools for image segmentation. The segmented image obtained from Thresholding has the advantages of smaller storage space, fast processing speed and ease in manipulation, compared with gray level image which usually contains 256 levels. Therefore, thresholding techniques have drawn a lot of attention during the past 20 years.

Naseer Salman [2006] suggested that Marker-driven watershed segmentation extracts seeds indicating the presence of objects or background at specific image locations. The marker locations are then set to be regional minima within the topological surface (typically, the gradient of the original input image), and the watershed algorithm is applied .

Then we started review LDA method for image features extraction: In LDA (Linear Discriminant analysis) Originally developed in 1936 by R.A. Fisher, which is Mathematical analysis based on two classes of data and two independent variables (a, b) that attempts to find a line that best separates the data.

Thus, in discriminant analysis, the dependent variable (Y) is the group and the independent variables (X) are the object features that might describe the group. The dependent variable is always category (nominal scale) variable while the independent variables can be any measurement scale (i.e. nominal, ordinal, interval or ratio).

If we can assume that the groups are linearly separable, we can use linear discriminant model (LDA). Linearly separable suggests that the groups can be separated by a linear combination of features that describe the objects. If only two features, the separators between objects group will become lines. If the features are three, the separator is a plane and the number of features (i.e. independent variables) is more than 3, the separators become a hyper plane. The classification rule is to assign an object to the group with highest conditional probability.

And another method for feature extraction is introduced here PCA which is a useful statistical technique that has found application in fields such as face recognition and image compression, and is a common technique for finding patterns in data of high dimension . PCA is appropriate when you have obtained measures on a number of observed variables and wish to develop a smaller number of artificial variables (called principal components) that will account for most of the variance in the observed variables. Principal components may then be used as predictor or criterion variables in subsequent analyses.

In this project first of all I am going to do the enhancement of the image by using the Gabor filter and that enhanced image is then further goes to the segmentation stage .In this stage iam going to use Marker controlled image segmentation technique for further analysis. After segmentation next stage will be the masking by which we can select the region of interest in the image for detecting the cancer.

III. Conclusion

In this paper, we have addressed the problems needed to overcome for color medical image fusion such as light intensity variable, etc. And we have discussed certain requirements for a reliable and efficient color image fusion system like accuracy, efficiency. We have reviewed different fusion algorithm (PCA, LDA, ICA, ANFIS). Our future works is made a comparison of these algorithms and have discussed the advantages and drawbacks of each of them.

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