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Segmenting Internal Part of Retinal Layers from Optical Coherence Tomography Images

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Abstract: Optical coherence tomography (OCT) is one of the methods to scan the retinal images. OCT employments retro-reflected light whichdelivers micron-resolution, cross-sectional filters from biological tissues. It will be generally utilized in light of the clinically calculable features similar to non-invasive, non-contact, no radiation and painless scan.From this OCT image features like structural information of retina, blood flow level and versatile parameters atomic content for intra-retinal layer can be identified.In this paper we are using OCT images to segment the layer in the retinal imaging by implementing the method of diffusion mapping after that individual retinal layer can be determined with its features.OCT segmentation will be tedious,time-consuming and experiences inter-variability.

Keywords: *Optical coherencetomography (OCT), diffusion mapping, retinal layer.*

1. INTRODUCTION

Optical coherence tomography (OCT) images are the major analytical imaging tool for diagnosing retinal diseases. It is an imaging technique which can be used to focus the intra-retinal boundaries.[1] OCT is a powerful tool for ophthalmic imaging and can be used to view the retinal cell layers to notice and display a variety of retinal diseases and also macular edema, macular holes, degeneration (thinning) of retinal nerve cells due to glaucoma, and detachments of the neuro-sensory retina and pigment epithelium can find [2]. OCT images are often noisy and low contrast level, several previous studies focus on contrast improvement in OCT images. Segmentation of the retinal layer performed by using the diffusion mapping method. Generally OCT image are generally noisy so it starts with basic pre-processing step that reduce the noise by using filters.

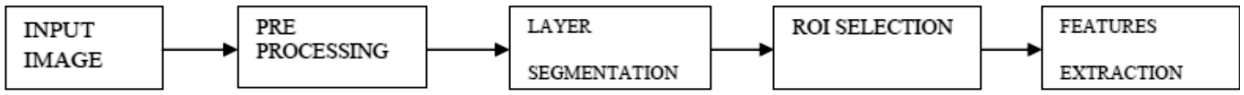

Figure 1

The proposed technique includes steps are listed below :

1. First it converts the RGB OCT image into gray image
2. Apply median filter to OCT image that removes the noise.
3. Segment the retinal layer by using the diffusion method.
4. Select and Highlight the individual layer.
5. Extract the features of the image.

2. PROPOSED METHOD

2.1. Image Preprocessing

Gray level conversion and filtering are the basic step followed in the phase 1. Filtering is most fundamental operation of image processing and computer vision. After the filtering,the noise present in the image will reduce. Gaussian filtering is the most common filtering method in image processing. But it mostly fails in OCT images so median filtering is implemented in the OCT images [3] Median Filtering keeps the quality of OCT image and it prevents the boundaries. [6]

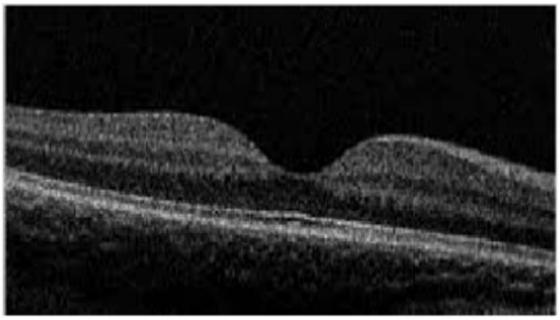

Figure 2: (*a*) OCT image

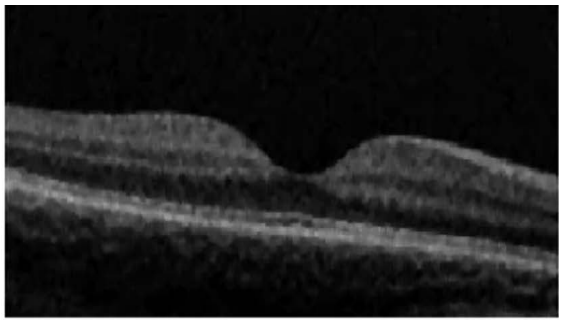

Figure 2: (*b*) OCT image after filtering

For the OCT image in Fig (B) shows the image smoothed by median filter in that the boundaries are blurred.

2.2. Layer segmentation from OCT image

Layer Segmentation are performed in this phase : In order to perform a diffusion map, first select the boundaries like *x, y* then the second step to identifies the inner layers. Diffusion map was applied on 3D OCT datasets and for each dataset; the procedure was composed of two steps of applying diffusion maps (one for partitioning the sections, and another one for localization of internal layers). There is no connections and could not be merged to form a good diffusion map algorithm.One may consider the kernel as an affinity between nodes which results in a graph (an edge between x and y carries the weight $k(x, y)$)

$$(x) = \Sigma y\,(x, y)$$

This new kernel is not symmetric, but it satisfies the requirements of being the probability of the transition from node x to node y in one time step

$$p(x, y) = k(x, y)/s(x)$$

The first diffusion map clustered the data into three parts, second of which is the area of interest and the two other sections were eliminated from the next calculations. In the second step, the remaining area went through another diffusion map algorithm and the internal layers were localized based on their similarity of texture.Each 3D OCT image will segment into localize seven layers

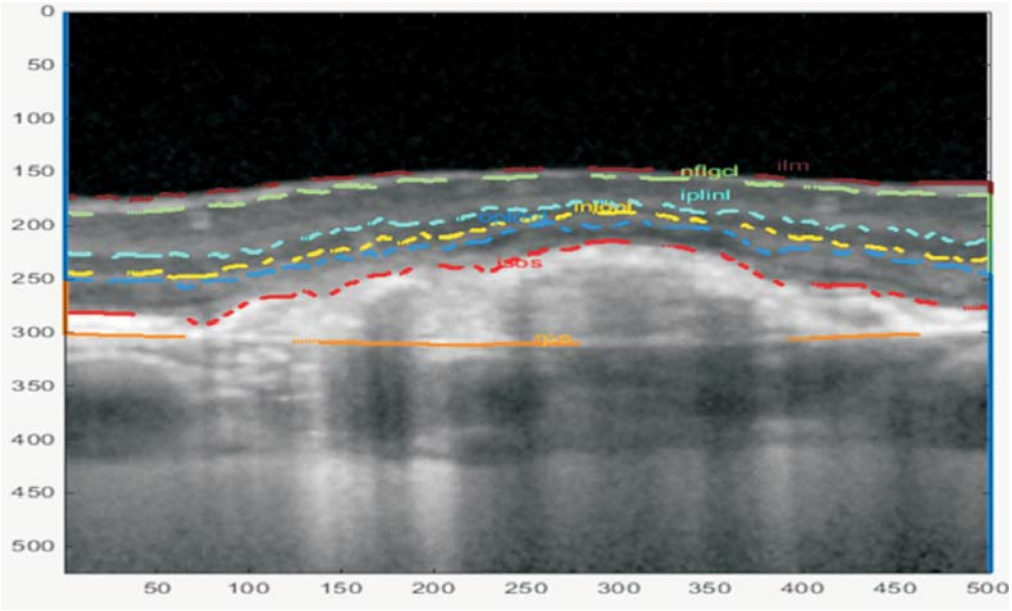

Figure 4: Segmented image

2.3. Identifying individual layer

In this phase individual layers can be selected and highlighted for better understanding about the retinal layer. ROI (region of interest) is used to select the particular region in the image.[9]

With the help of ROI particular area can be selected in the OCT image. More than one region can be selected in the image. It is useful to identify the defected parts in the image.

2.4. Feature Extraction

In this features of the image extracted like energy, correlation, contrast, homogeneity.

3. CONCLUSION

In this method segmentation of retinal image is proposed in the paper. The technique first smooths the image using a median filter. Then, it detects the individual layer with its features. In this method the quality of the image will be maintained throughout the process. Segmenting the layer is more important for clinical diagnosis and investigation. This is highly encouraging for both reducing the time and manpower required to segment images.

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