CHAPTER-1

INTRODUCTION

The human eye is a unique region of the human body where the vascular condition can be directly observed. In addition to fovea and optic disc, the blood vessels contributes one of the main features of an retinal fundus image and several of its properties are noticeably affected by worldwide major diseases such as diabetes, hypertension, and arteriosclerosis. Further, certain eye diseases such as choroidal neovascularization and retinal artery occlusion also make changes in the retinal vasculature. As per previous statement, the segmentation of blood vessels in retinal images can be a valuable aid for the detection of diabetic retinopathy and glaucoma diagnosis. An automated segmentation and inspection of retinal blood vessel features such as diameter, color and tortuosity as well as the optic disc morphology allows ophthalmologist and eye care specialists to perform mass vision screening exams for early detection of retinal diseases and treatment evaluation. This could prevent and reduce vision impairments; age related diseases and many cardiovascular diseases as well as reducing the cost of the screening. Over the past few years, several segmentation techniques have been employed for the segmentation of retinal structures such as blood vessels and optic disc and diseases like lesions in fundus retinal images.

However the acquisition of fundus retinal images under different conditions of illumination, resolution and field of view (FOV) and the overlapping tissue in the retina cause a significant degradation to the performance of automated blood vessel and optic disc segmentations.

However, since the vascular network is complex and the number of images is large, the manual segmentation of retinal blood vessels can become a time-consuming process that entails training and skill. An automated segmentation method provides consistency and accuracy, and reduces the time taken by a physician or a skilled technician for hand mapping. Therefore, an automated reliable method for vessel segmentation would provide valuable computer-assisted diagnosis for ophthalmic disorders. Feature characterization and extraction in retinal images is, in general, a complex task. Accurate blood vessel segmentation is a difficult task for several reasons. The challenges include low contrast; the presence of noise influence, mainly due to its complex acquisition; and anatomic variability, depending on the particular patient. The variability of vessel width, brightness, and tree-like shape make the task more difficult. For example, two close

vessels are often considered as one wide vessel. In contrast, a vessel with central light reflex may be misunderstood as two vessels.

Further challenges faced in automated vessel segmentation include the presence of low-contrast small vessels, and the appearance of a variety of structures in the image, including the optic disk, retinal boundary, lesions, and other pathologies. Many methodologies for retinal vessel segmentation have been reported. Reviews and surveys of these methods can be found in. All these approaches for detecting retinal blood vessels can be classified into techniques based on match filtering, morphological processing, vessel tracking, pattern recognition, multiscale analysis, and model-based algorithms. Matched filters for retinal vessel segmentation exploit the piecewise linear approximation, and the Gaussian-like intensity profile of retinal blood vessels. Vessel segments are searched in all possible directions, using a two-dimensional matched filter. Mathematical morphology exploits the fact that the vessels are linear, connected, and their curvature varies smoothly along the crest line to highlight the vessels in the monochromatic retinal image. Vessel tracking methods track the vessels, starting from a set of reliable seed points, using local information of the vessel network.

Keywords—Fundus image, Diabetic Retinopathy, Dilation, Erosion, optic disc,Support vector machine (SVM)