Chapter 5
Analogizing the Thinning Algorithm and Elicitation of Vascular Landmark in Retinal Images

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ABSTRACT

The retinal tissue is composed of network of blood vessels forming a unique biometric pattern. Feature extraction in retinal blood vessel is becoming an emerging trend in the field of personal identification. Because of its unique identity and less vulnerability to noise and distortion it has become one of the most secured biometric identities. The paper highlights the segmentation of blood vessel and the extraction of feature points such as termination and bifurcation points using Zhang Suen's thinning algorithm in retinal images. A comparison has been made and results are analyzed and tabulated between Zhang Suen and Morphological thinning. The count has been taken for both termination and bifurcation markings as spurious and non- spurious minutiae. The spurious minutiae are removed by using the crossing number method. The results clearly depict that the Zhang Suen's thinning algorithm gives better result when compared to morphological thinning.

1. INTRODUCTION

Retinal pattern is a unique biometric identification which forms the inner layer of the eye where even identical twins do not share the same pattern. The pattern remains unchanged from birth to death. The retinal blood vessel pattern plays a vital role as a secured personal identification mark. The fundus image obtained from the retina scanners can be accessed only from living human beings because the retina decays soon after the death. So it is mainly used in military bases and governments where very high

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secured identifications are required. In the article by Kataryzna and Adam (2004) the authors say that the retinal blood vessels are the land mark of fundus images. A typical fundus image and the important parts of retina are shown in Figure 1.

The retina is found in the posterior region of an eye which forms a tissue like substance mainly composed of Optic nerve, blood vessels and Macula. In the article by Fabiola and Edgardo (2009) the authors says that the blood vessel pattern forms a unique structure for each individual and are analyzed which results in tiny characteristics points.

2. EXISTING WORK

Stapor and Switonski (2004) presented Segmentation using Mathematical morphology such as top hat transform in retinal images. Villalobos-Castaldi and Felipe-Riveron (2009) presented segmentation steps and minutiae retrieval in retina. Fraz, Remagnino and Hoppe (2012) presented the segmentation methodologies on retinal images. Divya and Shantala (2013) presented the blood vessel extraction using optic disc in retina. Ahmad and Butt (2013) presented segmentation using thresholding and filtering techniques in retina. Sivakumar and Chitra (2014) presented the improvised line detection and entropy thresholding in retinal images. Akhavan and Faez (2014) presented the centre line detection and segmentation using morphological operations and combined the two results to obtain the segmented image in retian. Monisha and Seldevchristopher (2015) presented segmentation in retina and also feature extraction along with matching.

3. PROPOSED METHODOLOGY

This paper focuses on the thinning methods for the retinal image. The retinal characteristics are obtained and compared by applying Zhang suen and morphological thinning algorithm. The different stages used in Retinal minutiae extraction are shown in Figure 2

Figure 1. Sample retinal image