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A REVIEW ON 3D RECONSTRUCTION OF RETINAL IMAGES USING FUNDUS IMAGE FOR INCREASED ANATOMIC VIEW.

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Abstract: For diagnosing eye diseases the structure analysis of structure Optic Nerve Head (ONH) and registration of retinal images are very important. So this paper proposed the 3D construction and registration of retinal images. The previous reconstruction method states disparity map estimation as a depth cue to remove uncertainty of the relative positions and then by using guided filter final depth map can be obtained. The red cyan anaglyph can be computed by using this depth map and 3D structure of ONH can be constructed

Index Terms - **3D reconstruction, Optic-nerve head (ONH), Disparity map, image registration**

I. INTRODUCTION

There are two important steps for retinal image pairs : 3D reconstruction and registration of image, which gives us the improved accuracy for diagnosis of eye diseases. For example, Glaucoma is a disease in which intraocular pressure causes the optic disc to cupped which causes the may be permanent impairment of vision. To avoid such kind of disease patient should take the clinical routine which includes examination of Optic Nerve Head(ONH).The Optical Coherence Tomography(OCT)is used to quantify the topography of ONH by using scanner laser[2,3] but it lacks lot of data and is not available in every clinic. So, it is very important to reconstruct the 3D structure of ONH by using a pair of retinal images.

On the other hand Image registration process contains the geometric transformation that is pixel to pixel correspondence between two images of the same eye in terms of time, sources and viewpoints. For diagnosing or monitoring the retinal abnormalities or diseases the registration algorithm for retinal images is needed. There are some important factors which cause the difference between retinal images are[4]: (1) Eye positions including movements of X,Y and Z-axis; (2) Change in camera parameters such as focal length and resolution etc.; (3) Change in image modality; (4) Change in retinal tissue in the progression of diseases. All these factors are very important for image registration. Due to the limitation of image capturing angle ,the image regions are obtained each time always relatively smaller as compared to the whole fundus image. So it is important to mosaic the retinal image pairs together.

Compared to other anatomic structures (e.g., the brain, heart, or lungs), the retina has a relatively small number of key anatomic structures (landmarks) visible using fundus camera imaging. Additionally, the expected shape, size, and color variations across a population is expected to be high. The literature for the analysis of retinal images mainly deals with the issue of 2-D registration to align a sequence of images to a reference frame in order to facilitate the detection of lesions by ophthalmologists. Accurate diagnosis often requires a 3-D image of retina. In particular, the analysis of the 3-D shape of retinal fundus is essential for identifying lesions and estimating the extent of the lesion, and measuring eye pressure on the optic disc. To obtain the 3D shape of retina, practitioners generally use the specialized devices such as the scanning laser ophthalmoscope (SLO) and the optical coherence tomography (OCT) system [16]. OCT provides a cross-sectional image of retinal fundus with less than 10μm resolution. In any case, the utilization of OCT isn't across the board because of the necessary expensive hardware. An elective comprises of deriving the 3-D state of the retina utilizing fluoresce in pictures of the retina, as these pictures are routinely procured by professionals. Robot-helped eye medical procedure is the focal subject of the EC subsidized task EurEyeCase. Significant targets of the task contain the improvement of systems to perform two surgeries that can't be effectively done by a sole human specialist, specifically retinal vein cannulation and retinal film stripping. In the proposed assistive framework, the outside of the retina is demonstrated before the activity utilizing picture information from the accessible stereo magnifying lens. Pre-employable 3D remaking expects to furnish the specialist with a nitty gritty 3D work model of the outside of the retina to encourage his/her pre-usable arranging. To be specific, the representation of the recognized vessel structure or potentially the optic circle in 3D gives the specialist a one of a kind chance to analyze the structure of the eye from novel perspectives and to design the way of the instrument with a higher certainty. The specialists can picture a part or territory suspected to be contaminated by the infection in 3D view to inspect the spread of the ailment. Exact conclusion regularly requires a 3D picture of retina. The investigation of the 3D state of retinal fundus is required for recognizing injuries and assessing the power of injury. The created 3D model of the eye can be utilized for examining the life systems of the eye finding of retinal malady, treatment arranging and for instructive reason.

Many important eye diseases as well as systemic diseases manifest themselves in the retina. While a number of other anatomical structures contribute to the process of vision, this review focuses on retinal imaging and image analysis. Following a

brief overview of the most prevalent causes of blindness in the industrialized world that includes age-related macular degeneration, diabetic retinopathy, and glaucoma, the review is devoted to retinal imaging and image analysis methods and their clinical implications. Many important diseases manifest themselves in the retina and originate either in the eye, the brain, or the cardiovascular system. A brief overview of the most prevalent diseases that can be studied via eye imaging and image analysis follows :

A) Diabetic Retinopathy—Diabetic retinopathy (DR) is a complication of diabetes mellitus and the second most common cause of blindness and visual loss in the U.S., and the most important cause in the working age population. The number of patients with diabetes in the U.S. is increasing rapidly and in 2007 reached 23.5 million [5]. There is abundant evidence that blindness and visual loss in these patients can be prevented through annual screening and early diagnosis [8]. In the eye, hyperglycemia damages the retinal vessel walls.

B) Glaucoma—Glaucoma is the third leading cause of blindness in the U.S., characterized by gradual damage to the optic nerve and resultant visual field loss [22]. Early diagnosis and optimal treatment have been shown to minimize the risk of visual loss due to glaucoma. Glaucoma is primarily a neuropathy, not a retinopathy, and acts on the retina by damaging ganglion cells and their axons. The hallmark of glaucoma is cupping of the optic disc, which is the visible manifestation of the optic nerve head (ONH) 3-D structure. The optic disc can be imaged twodimensionally either through indirect stereo biomicroscopy or with stereo color fundus photography. The ratio of the optic disc cup and neuroretinal rim surface areas in these images, called cup-to-disc ratio, is an important structural indicator for assessing the presence and progression of glaucoma. Glaucoma is typically treated with ocular pressure lowering drops, and in refractory cases through surgery.

C) Cardiovascular Disease—Cardiovascular disease manifests itself in the retina in a number of ways. Hypertension and atherosclerosis cause changes in the ratio between the diameter of retinal arteries and veins, known as the A/V ratio. A decrease in the A/V ratio, i.e., thinning of the arteries and widening of the veins, is associated with an increased risk of stroke and myocardial infarction [22]. Hypertension can also invoke direct retinal ischemia, which causes retinal infarcts visible as cotton wool spots and choroidal infarcts visible as deep retinal white spots. In addition, systemic vascular disease can cause arterial and venous occlusions, known as central and branch arterial occlusions (CRAO, BRAO) and central and branch venous occlusions (CRVA, BRVO)

D) Age-Related Macular Degeneration—Age-related macular degeneration (AMD) is the most common cause of visual loss in the U.S. and is a growing public health problem. Currently, almost 7.3 million Americans (6.12% of Americans aged 40 years and older) have some form of AMD, and AMD is the cause of blindness for 54% of all legally blind Americans [17]. Severe AMD reduces the likelihood of employment by 61% and salary by 39%, while mild AMD reduces these by 44% and 32%, respectively. The estimated annual cost burden from AMD in the U.S. has been estimated as $30 billion [18]. The prevalence of AMD is expected to double over the next 25 years [5]. The two major forms are dry and wet AMD, of which dry AMD typically leads to gradual loss of visual acuity. Wet AMD, also called choroidal neovascularization (CNV), is the most visually threatening form, characterized by ingrowth of a choroidal vascular structure into the macula accompanied by increased vascular permeability.

For this study secondary data has been collected. From the website of KSE the monthly stock prices for the sample firms are obtained from Jan 2010 to Dec 2014. And from the website of SBP the data for the macroeconomic variables are collected for the period of five years. The time series monthly data is collected on stock prices for sample firmsand relative macroeconomic variables for the period of 5 years. The data collection period is ranging from January 2010 to Dec 2014. Monthly prices of KSE -100 Index is taken from yahoo finance.

II. CONCLUSION

It was studied that different types of technologies are being used to reconstruct 3D form of retinal images using fundus images.. By using these techniques they are enabled to construct 3D form of retinal image To diagnose eye dieses easily there is need to have a 3D view of the human eye, as 2D representation has certain disadvantages in terms of lacking in giving different views of the object, information loss due to unavailability of depth information of the object, not providing much information about the structure of the object, and lack of giving realistic effect.

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