Distinctive Identification of Glaucoma Disease Using PNN Classifier

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Abstract—Glaucoma is the second leading cause of permanent blindness worldwide. Early detection of glaucoma can limit the disease progression. In this project from the given input image disease is detected by step by step process. To automatically extract a feature, we make use of a canny method which is a filter based method for edge detection method. For the feature extraction method histogram equivalization methods are evaluated. Further to obtain the particular region, binary classification is applied to the obtained image. Then it is tested for a pattern matching. Thus, the method may provide a reliable solution in detection of glaucoma. In future, identification of glaucoma is done by different method and also aimed to increase the efficiency of the process.

Index Terms—Glaucoma, Canny method, Histogram Equivalization.

I. INTRODUCTION

Medical imaging is an emerging technology for clinical analysis and medical intervention and also it is an art of creating visual segmentation of the interior of the body. It will find the internal structures hidden by the skins and bones and also to diagnose and treat diseases. It establishes a database for identifying the abnormalities. Medical imaging is a part of biological imaging and also incorporates radiology which uses the medical technologies. Invisible light medical imaging is generally equated to clinical imaging and the medical practitioner responsible for acquiring the images is a radiologist. Visible light medical imaging consists of digital video that can be seen without special equipment. Two modalities that use visible light imagery are dermatology and wound care. Diagnostic radiography particularly designates the acquisition of medical image. The radiologic technologist is usually responsible for acquiring the diagnostic quality of medical images. In radiology nuclear medicine provides functional assessment.

Medical imaging provides a sub discipline of medical physics, medicine or biomedical engineering depending on the context: in the area of research and development instrumentation, image acquisition, quantization and modeling are usually the preserve of medical physics, computer science and biomedical engineering. Research into the application of medical images is to preserve medical sub-discipline and radiology to medical condition or area of medical sciences under investigation.

Medical imaging also has many applications like scientific and industrial application. It includes set of techniques that produces images of the internal aspect of the body noninvasively. In some cases medical imaging can be seen as the solution of mathematical inverse problems. The noninvasive is a method where no instrument is introduced into a patient’s body which is the case for most imaging techniques used.

Glaucoma is a disease which will affect the major nerve of vision called the optic nerve. the optic nerve receive the nerve impulses from retina and then transmits it to the brain where we recognize those signals as vision. Glaucoma is characterized by progressive damage to the optic nerve that generally begins with a suitable loss of peripheral vision. if it is not treated properly means then it would leads to central vision loss and blindness. Generally glaucoma associated with intraocular pressure in the eye. So, this would leads to the damage of the optic nerve.
Glaucoma may also occur in the presence of normal eye pressure. This type of glaucoma is believed to be caused by poor regulation of blood flow to the optical nerve.

There are two types of glaucoma:
1. open angle glaucoma
2. angle closure glaucoma

A. Symptoms of Glaucoma

This would occur for most people, there are usually some symptoms of glaucoma. The first symptom of glaucoma is often the loss of side vision or loss of peripheral, which can go unnoticed until late in the disease. So that glaucoma is often called the "silent thief". We should have a complete exam with an eye specialist every one to two years so that glaucoma can be detected earlier. Sudden eye pain, headache, blurred vision, or the appearance of halos around light may occur when the intraocular pressure rise to several levels.

B. Diagnosis of Glaucoma

To diagnose glaucoma an eye doctor will test our vision and examine our eyes through dilated pupils. The eye exam focuses on the optic nerve. In fact, photographs of the optic nerve can also be helpful to follow over time as the optic nerve appearance changes with the progression of the disease.

II. LITERATURE SURVEY

In existing identification system, glaucoma is recognized by segmenting the optic cup and optic disc regions. To classify the super pixel as disc or non-disc regions by using optic disc segmentation. For better performance include the feature space information into feature space.

A. Related work

Siamakyousefi Michael h. golbNum[15] has discussed the recognizing glaucomatous defect patterns and they used the visual field data to identify glaucomatous defect patterns and to detect the glaucomatous progression. The analysis pipeline included three stages namely glaucoma boundary limit detection, clustering and glaucoma progression detection testing. Cross functional visual field tests were clustered using a mixture of Gaussians and model parameters and they were estimated using expectation maximization. The defect patterns were identified by decomposing each clusters and also the defect patterns along with each patterns were identified. To derive a definition of progression abnormal cluster axes were projected and the was approximated using linear regression to determine the confidence limit of each axis. The longitudinal visual fields of each eye on the abnormal cluster axes were projected and slope was approximated by linear regression. Progression was assigned or the stability was assumed.

Hafsahahmad[12] has presented the detection of glaucoma using fundus images. In this glaucoma is categorized by using retinal fundus images by extracting the features. It includes CDR (cup to disc ratio) which is used for diagnosis of glaucoma and considered as one of the primary physiological parameter. And the ISNT quadrants used for verification of ISNT rule. An accuracy of 97.5% is achieved by implementing on 80 retinal images by taking an average computational time of 0.8141 seconds. This technique includes preprocessing, morphological opening, minima imposition, extended maxima operator, and watershed transformation. In the proposed system extraction of optic disc automatically through region of interest and component analysis method for cup detection is discussed and morphological techniques have been used.

Siamakyousefi, mickealh. golbaum[16] has discussed the glaucoma progression detection using structural retinal fiber layer measurements and functional visual field points. In that they have used machine learning classifiers to detect glaucomatous progression using the structured data extracted from retinal nerve fiber layer and functional data recorded from standard automated perimetry tests. The longitudinal feature vector was created for each patient using the collected data by computing the norm 1 difference vector of the data. These features were then fed to the machine learning classifier to classify each eye as stable or progressed over time. This method is performed using several machine learning classifiers, the relative effectiveness of each feature is ranked by the combinations of structural and functional features. Finally the outcomes of the classifier were assessed by performance metrics and effectiveness of these features were analysed.

Behdaddashtbozorg[11] has tested an automatic graph based approach for artery/vein classification in retinal images. In this A/V classification based on the analysis of a graph extracted from vasculature. The proposed method classifies the entire vascular tree on the graph nodes and assigning one of two labels to graph links. Final classification is performed by the combination of graph based labeling with the set of intensity features. The result of this proposed method is compared with three public databases having accuracy values of 87.4%, 88.3%, 89.8%. These results show us that this method outperforms recent approaches for A/V classification.
K. Muthusamy [13] has discussed the gradient-based glaucoma detection by segmenting optic disc and cup. In this, they used an classification of optical disc based on superpixel and optic cup using an gradient method for glaucoma identification is proposed. In optic disc segmentation histogram is used and then they are applied to R, B, G, H and S disc. To evaluate the quality of the automated optic disc segmentation a self-assessment reliability test is performed. In optic cup to fine tune the optic cup boundary vessel bends tracking is also included. CDR is commonly used and it is well accepted and it is one of the glaucoma factors. A larger value of CDR indicates a higher risk of glaucoma so that this method can be used for glaucoma screening and automatic segmentation.

Gennady Andrienko [14] has discussed an visual analytics methodology for eye movements studies. In this, they performed an extensive empirical evaluation of a broad range of visual analytics methods which is used in analysis of geographic movement data. The methods have been tested for applicability to eye tracking data. This allows us to select the suitable methods and analysis tasks that can support. The paper describes how the methods work in eye tracking data and also provides guidelines for method selection depending on analysis tasks.

Jeffrey Chun-HuiLin [17] has tested a parylene based intraocular pressure sensor and it is an convenient biomarker of glaucoma. To determine the presence of the disease, clinics will generally measure an individual IOP. Applanation tonometers are of two types and both are non-implantable. A physical contact approach to touch the cornea, and the area of the flattened portion is the first type of applanation tonometers and it is determined by an ophthalmologist. By the given applanation force and flattened area the IOP can be calculated. Pneumotonometer which is another type of applanation tonometry obtains IOP by puffing an air jet onto the eye and measuring the flattened portion of the cornea optically. By using an LC-tank resonant circuit, this work presents our effort to develop a telemetric implantable IOP sensor. IOP sensor can allow continuous and wireless IOP monitoring.

III. PROBLEM STATEMENT

Due to segmentation process of optic cup and optic disc region needs more algorithms for better performance. The segmented optic cup and optic disc is then used to compute the cup to disc ratio for glaucoma screening. So it reduces the storage cost and efficiency.

IV. PROPOSED SYSTEM

In proposed system, classification method is used instead of segmentation method. In this edge detection method uses an advanced algorithm of canny method which would find out the optic nerve and eye ball shape which is considered as an disc. And in feature extraction we are using an histogram enhancement method which would be used for increasing the accuracy compared to an earlier method. And finally classified image is given for an pattern matching which is used to identify whether an given image is glaucomatous or not.

V. CONCLUSION AND FUTURE WORK

The paper describes the identification of glaucoma by using different algorithms. A super pixel classification based methods is used. It has been demonstrated that canny method is beneficial for edge detection method. Instead of segmentation process classification method is used. Also histogram equivalence used for feature extraction screening is presented.

In future, Identification of glaucoma is done by different method and also aimed to increase the efficiency of the process.

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