DETECTION OF DIABETIC RETINOPATHY

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INTRODUCTION:

MATLAB (matrix laboratory is a multi-paradigm environment and fourth-generation programming language. Diabetes, often referred by doctors as diabetes mellitus, describes a group of metabolic diseases in which the person has high blood glucose (blood sugar), either because insulin production is inadequate, or because the body's cells do not respond properly to insulin, or both. Patients with high blood sugar will typically experience polyuria (frequent urination), they will become increasingly thirsty (polydipsia) and hungry (polyphagia). A person with diabetes has a condition in which the quantity of glucose in the blood is too elevated (hyperglycemia). This is because the body does not produce enough insulin, produces no insulin, or has cells that do not respond properly to the insulin the pancreas produces. Research says that at least 90% of this disease can be cured with proper treatment and monitoring the eyes. Diabetic Retinopathy is of two types:

1. Non-Proliferative Diabetic retinopathy(NPDR)
2. Proliferative Diabetic Retinopathy(PDR)

Current examination methods involve ophthalmoscope photography and fluorescein angiography. These methods are manual, expensive and require trained ophthalmologist. It is important to have an automatic detection method for diabetic retinopathy in an early stage. The proposed system thus mainly focuses on non proliferative diabetic retinopathy. The objective of this project is to implement an automated detection of diabetic retinopathy (DR) using SVM classifier. By using SVM classifier the accuracy level increases due to the features used for extraction and classification. This will help in reducing the time through automatic results generation and as the accuracy level increases it will help the ophthalmologist in analyzing the retina that is affected due to diabetic retinopathy.

OBJECTIVE:

The objective of this project is to implement an automated detection of diabetic retinopathy (DR) using digital fundus images. By using MATLAB to extract and detect the features such as blood vessels, microneurysms, exudates and textures which will determine two general classifications: normal or abnormal (DR) eye. An early detection of diabetic retinopathy enables medication or laser therapy to be performed to prevent or delay visual loss.
METHODOLOGY:

The study begins by pre-processing eye fundus images, getting rid of the optic disc from the fundus of the eye and then separating the vascular tissue of the damaged area of the retina. Damaged areas of the retina consist of dark and bright lesions. Mathematical morphology methods are used to detect the presence of dark lesion. To detect the presence of bright lesion a combination of mathematical morphology, Estimated Background, Color analysis, Max-tree and attribute filters are used by utilizing a branch filtering approach. Fundus image segmentation results are extracted and classified using Support Vector Machine (SVM) based on microneurysm and exudates features. Eye fundus images are classified into, Mild Non-Proliferative Diabetic Retinopathy, Moderate Non-Proliferative Diabetic Retinopathy and Severe Non-Proliferative Diabetic Retinopathy.

CONCLUSION:

Microneurysm segmentation automatically done by using mathematical morphology is quite effective to obtain its value. Exudates segmentation results are automatically performed by using maxtree and attribute filtering to reduce noise and obtain exudates candidates. The method improved previous researcher’s methods. Feature extraction using exudates feature values, microneurysm, entropy green channel, green channel homogeneity, the statistical value of saturation images (mean, standard deviation, kurtosis, skewness) can be used a reference for classification.

Performance of Support Vector Machine was in excellent category with a sensitivity value of 96.9%, Specificity 100%, positive predictive value 100%, negative predictive value (NPV) The development of image processing methods to a mature level where the results can be transferred from the research laboratories to practice requires the following: accepted and applied protocols for evaluating the methods, protocols that are similar to the strict regulations in the medical treatment, and medicine research.

FUTURE WORK:

We proposed the first step for a standardized evaluation of methods for detecting findings of diabetic retinopathy. It is a difficult database, but it corresponds to the situation in practice: the images are uncalibrated, expert evaluation is free form and the displays used to
view the images are uncalibrated. In the future, however, we will continue to develop the database and evaluation methodology. The following development steps will be taken:

1. The fundus camera and optics are calibrated due to deficiencies of imaging (as the results, optical distortions are known and photometric information is the same between images). Calibration level 1 achieved.
2. A predefined set of directives for different kinds of findings is provided to the experts. The directives prevent the free form description, and thus, allow control over subjective interpretations.
3. Findings are classified based on the confidence level (high, medium, low) given by the expert. All findings are independently verified by several experts.
4. The effect of display calibration for the experts will be evaluated.
5. Sensitivity and specificity measures will be improved (sensitivity/specificity function).
6. Location of normal findings will be added to the data and a protocol for evaluating also their localization accuracy.