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CNN Based Retinal Micro Aneurysm Detection with Multi-Sieving Deep Learning using Thermal Images

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Abstract - *Diabetic retinopathy (DR) is an eye abnormality caused by long term diabetes and it is the most common cause of blindness before the age of 50. Microaneurysms (MAs), resulting from leakage from retinal blood vessels, are early indicators of DR, yielding a large body of diagnostic work focused on automatic detection of MA. However, automated detection of MAs is difficult because the small size of MA lesions and low contrast between the lesion and its retinal background, the large variations in color, brightness and contrast of fundus images, and the high prevalence of false positives in regions with similar intensity values such as blood vessels, noises and non-homogenous background. Diabetes is a common chronic disease that may lead to several complications. Diabetic retinopathy (DR), is one of the most serious of these complications, and also most common cause of vision loss among diabetic patients. Automatic Detection of diabetic retinopathy at early stage from the large scale retinal images help the ophthalmologist to treat the affected patient and avoid vision loss. The current research work recommends on detecting and extracting the features of the affected retinal images.*

Key Words: Diabetic Retinopathy, Deep Learning, Infrared Thermography, Micro Aneurysm, CNN.

1. INTRODUCTION

Diabetic retinopathy (DR), also known as diabetic eye disease, is when damage occurs to the retina due to diabetes. It can eventually lead to blindness. The various signs and markers of diabetic retinopathy include microaneurysms, leaking blood vessels, retinal swellings, growth of abnormal new blood vessels and damaged nerve issues.

Diabetes is a chronic disease which triggers the damage of retina. Retinal blood vessels entering the retina from the optic disc are damaged which result in loss of sight. Initial stage shows no change in vision, but with time and lack of diabetes control may lead to total loss of vision. In this fast paced life diabetes is estimated to rise from 415 million in 2015 to 642 million in 2040. Diabetic retinopathy causes loss of sight in 1.8 million from 37 million people. Leakage of blood vessels lead to loss of vision.

This paper aims at proposing a diabetic retinopathy diagnosis model that automatically learns features which are pivotal in diagnosing the stage of the disease without explicit or manual feature extraction. This is an effective way of detection but requires the service of experienced clinicians for analysis of the photographs manually, which is time-consuming. Rural areas, where the rate of diabetes is usually high, lack the expertise of well-trained clinicians and sophisticated equipment that are necessary for detection of DR. Better infrastructure with automated detection techniques are now required to tackle the growing number of individuals with diabetes. An early detection can help to avert or decrease the spread of DR which otherwise might cause blindness. The proposed project detects type of DR based on CNN classification. The algorithm detects groups of damaged pixels in the macula region and evaluates the total damaged area in the macula from the colour retinal images.

A microaneurysm is a tiny aneurysm, or swelling, in the side of a blood vessel. In people with diabetes, microaneurysms are sometimes found in the retina of the eye. These miniature aneurysms can rupture and leak blood. Their importance lies in the fact that they are the first clinical sign of diabetic retinopathy disease, so that the recognition can be treated as the prevention not leading to the next severe stage and avoiding vision loss. An automatic detection framework is developed in this work, the framework involves preprocessing techniques, feature extraction and classification of the data. Performance measures such as accuracy, precision, recall are analysed. Classifier methods are used so that they provide predictability of the diabetic retinopathy disease. The experiments show that this framework can detect DR efficiently, and can help doctors diagnose the color fundus images for screening.

2. PROPOSED SYSTEM

The proposed framework uses administered AI procedures to order the warm pictures of an eye into "Typical" or "Diabetic Retinopathy". The shading transformation model is essential to separate the necessary highlights.

In this work, two change, for example, RGB to Gray and RGB to HSI are done and RGB, Gray and HSI shading model are utilized as an info pictures for highlight extraction module. Highlight Extraction is the most significant advance in the examination of pictures. It is a procedure of get-together recognizable data from the picture itself from an article or gathering of items. Finally step use CNN model and recognize diabetic retinopathy.

2.1 System Architecture

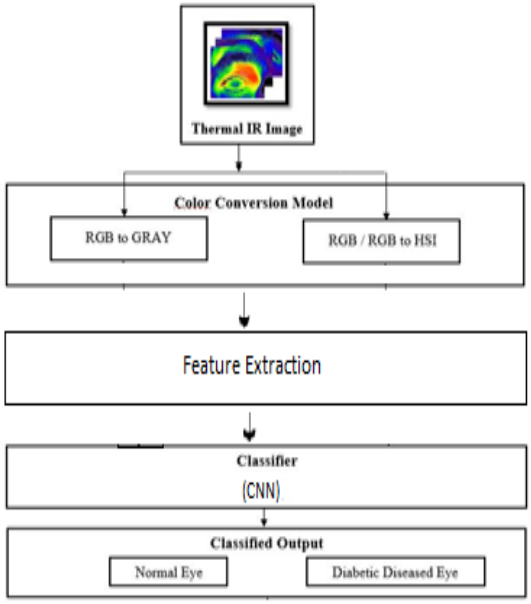

Fig-1: System Architecture

In AI, Convolutional Neural Networks (CNN or ConvNet) are unpredictable feed forward neural systems. CNNs are utilized for picture arrangement and acknowledgment in light of its high exactness. It was proposed by PC researcher Yann LeCun in the late 90s, when he was roused from the human visual impression of perceiving things. The CNN pursues a various leveled model which takes a shot at structure a system, similar to a pipe, lastly gives out a completely associated layer where every one of the neurons are associated with one another and the yield is handled. Images captured by the thermal camera. Image with a high level contrast so it gets more details. Thermal camera shows the object in temperature difference. The color conversion model is very important to extract the required features.

3. RESULT

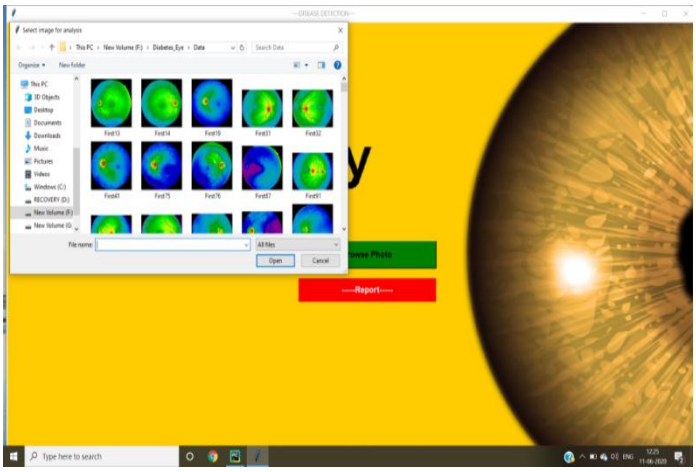

Fig-2: Selection of Image from Database

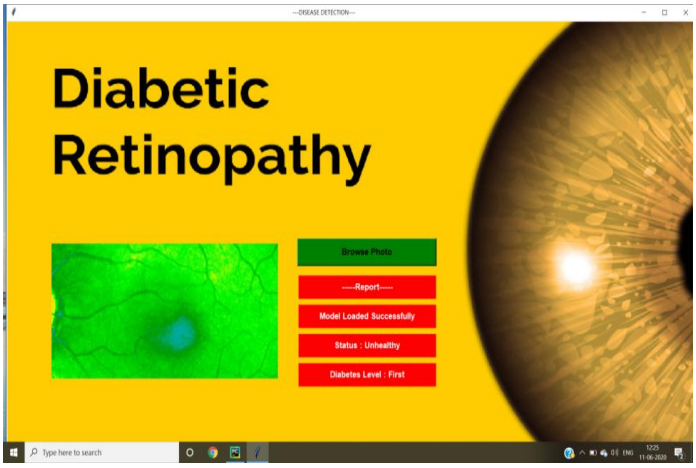

Fig-3: Detection of First Stage Disease

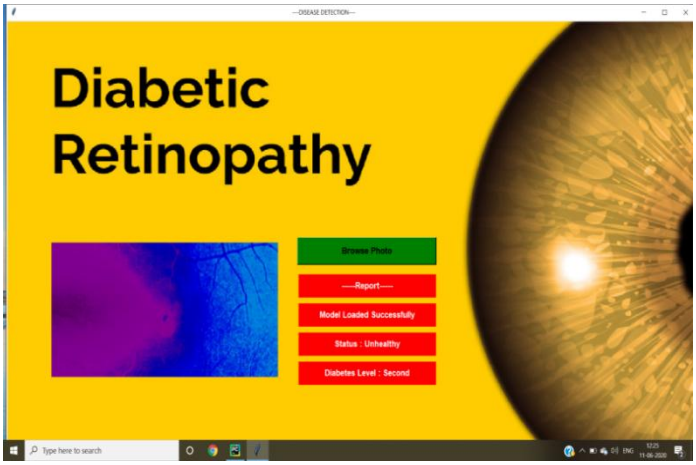

Fig-4: Detection of Second Stage Disease

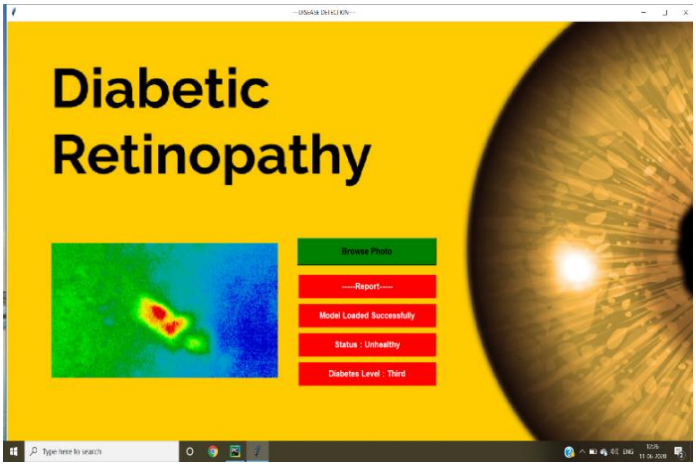

Fig-5: Detection of Third Stage Disease

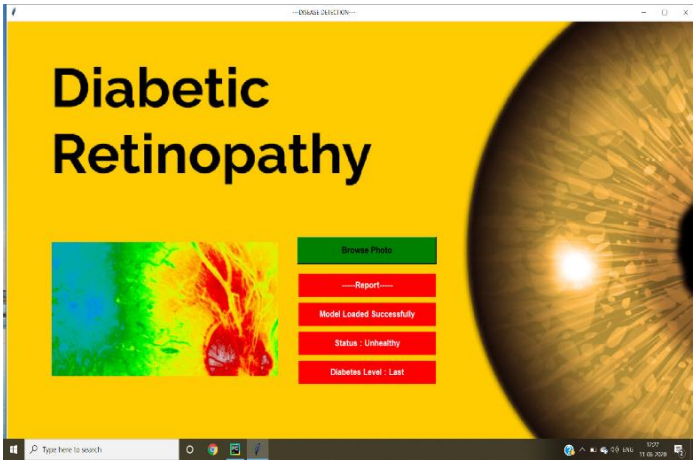

Fig-6: Detection of Last Stage Disease

4. CONCLUSION

This paper presents the design, architecture and implementation of convolutional neural networks (CNN) for automatic detection and classification of diabetic retinopathy from Thermal images.

REFERENCES

[1] Ling Dai,Ruogu fang,Huating Li,Xuthong Hou,Bin Sheng,Qiang Wu,Weiping Jia,"Clinical Report Guided Retinal Microaneurysm Detection with Multi-Sieving Deep Learning".2017 IEEE.

[2] Arun Govindaiah,Md.Akter Hussain, Roland Theodore Smith and Alauddin Bhuiyan," Deep Convolutional Neural Network Based Screening And Assessment Of Age-Related Macular Degeneration From Fundus Images".2018 IEEE.

[3] Isabel N. Figueiredoa, Susana Mouraa,J´ulio S. Nevesa, Lu´ıs Pintoa, Sunil Kumarb, Carlos M.Oliveirac, Jo˜ ao D. Ramosc "Automated retina identification based on multiscale elastic registration", Computers in Biology and Medicine 00 (2016) 19.

[4] N. Selvarasu, Alamelu Nachiappanand N. M. Nandhitha. , "Euclidean Distance Based Color Image Segmentation of Abnormality Detection from Pseudo Color Thermograph", International Journal of Computer Theory and Engineering, Vol. 2, No.4, pp. 514 – 516, August 2010.

[5] Padmapriya Nammalwar, Venkateswaran Narasimhan, Toshita Kannan and Sindhu Madhuri Morapakala, "Noninvasive Glaucoma Screening Using Ocular Thermal Image Classification", CIT. Journal of Computing and Information Technology, Vol.25, No.3, pp. 227–236, September 2017.

[6] HarshvardhanG, Venkateswaran N and Padmapriya N, "Assessment of Glaucoma with Ocular Thermal Images using GLCM Techniques and Logistic Regression classifier", IEEE WiSPNET 2016 conference, pp.15341537, June 2006.

[7] U. RajendraAcharya, Jen Hong Tan, Vidya S, Sharon Yeo, Cheahoon Too, Wei Jie Eugene Lim, Kuang Chua Chua, Louis Tong, "Diagnosis of response and non-response to Dry Eye treatment using infrared thermography images", Elsevier, Infrared Physics & technology, Vol. 67, pp. 497503, September 2014.