|| Volume 5 || Issue 12 || April 2021 || ISSN (Online) 2456-0774
INTERNATIONAL JOURNAL OF ADVANCE SCIENTIFIC RESEARCH & ENGINEERING TRENDS
Multidisciplinary Journal
Double-Blind Peer Reviewed Refereed Open Access International Journal

SVM BASED METHOD FOR DIABETIC EYE DISEASE DETECTION

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Abstract: One of the large concerns worldwide is a diabetic disease. This can cause the severe decline of the eyes, including permanent vision loss. Early detection of eye disorders, by effective treatment, improves the danger of survival. The proposed approach is to explore the technique of machine learning to detect diabetic patients using thermographic images of an eye fixed and to include the effect of thermal variation of abnormality within the eye structure as a diagnostic imaging tool that's helpful for clinical diagnosis by ophthalmologists. Thermal images are pre-processed then texture characteristics supported by the grey Level Cooccurrence Matrix (GLCM) from gray images are extracted and categorized employing a classifier with a spread of features. The gray-level co-occurrence matrix (GLCM), also referred to as the gray-level spatial dependency matrix, maybe a statistical procedure for analyzing texture that considers the spatial relationship of pixels. RGB is that the most ordinarily used color space and that we have already addressed it in past tutorials. RGB stands for red, blue, and green. What the RGB model states is that three distinct images actually structure each color image. Blue image, red image, black image. Only one matrix can characterize a traditional grayscale image, but a color image is really made from three. The HSI color model factors each color among three components: hue (H), saturation (S), intensity (I). Various matrices.

Keywords: *Machine learning, CNN, image processing, Feature extraction*

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I INTRODUCTION

Accurate diagnosis has attained in the procedure by identifying the symptoms using emerging imaging modalities. There are various diagnostic modalities including fluorescein angiography and visual consistency tomography. Fundus Photography is usually used for the evaluation of diabetic patient eye diseases. The present modalities of medical imaging are invasive and painful for patients also. Infrared thermography is an emerging nonionizing technique that is a noninvasive method and is successfully accepted for diagnosis. Thermal imaging modality recently utilized in carcinoma detection, diabetic foot, and various eye diseases like dry eye, glaucoma, Meibomian gland dysfunction, and thyroid eye diseases. The diabetic disease may be a chronic disease that affects various organs of the physical body including attention. One of the large concerns global is a diabetic eye disease. This can produce a severe degeneration of the eyes, including permanent vision loss. Early detection of eye disorders, by effective treatment, improves the danger of survival. The proposed approach is to explore the technique of machine learning to detect diabetic patients using thermographic images of an eye fixed and to include the effect of thermal variation of abnormality within the eye structure as a diagnostic imaging tool that's helpful for clinical diagnosis by ophthalmologists. Thermal images are pre-processed then texture characteristics supported by the grey Level Cooccurrence Matrix (GLCM) from gray images are Extracted and categorized employing a classifier with a spread of features.

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A non-invasive infrared warm image method was proposed by Tai Yuan Su et al. [6] to live the spatial and temporal variation within the eye surface temperature. Ankush A Kawali analyzed eye thermal imaging using a diagnostic tool that distinguishes inflammatory eye conditions from non-inflammatory conditions [7]. Thermography images not only suitable for the eye but also used carcinoma detection for early diagnosis.

Handcrafted features are employed by a Neural Network classifier so as to classify the breast as normal or suspected cancer. Thermo grams supported color analysis completed for abnormality detection using K-Means Clustering. Priya Hankare et al. proposed an approach using the K-means clustering technique for segmenting hot regions using three clusters denote is in a position to accurately segment the recent regions within the image. In order to get the specified region of interest (ROI), the breast infrared thermography images are segmented by gradient operator and canny operator.

Extraction of features is shown on the segmented images of the breast. Multilayer neural perceptron network based on the supervised technique of machine learning is used to classify breast thermograms as normal, benign, and malignant [10]. The thermography has been based on higher metabolic activity and blood flow in the cancerous tissue region rather than the normal tissue region. Infrared thermography does a bright and happening technology for breast cancer discovery.

II PROBLEM DEFINATION

Diabetic retinopathy causes blindness. Diabetic retinopathy is one of the attention diseases which are caused thanks to retinal vessel extraction. Diabetic retinopathy affects blood vessels within the light-sensitive tissue called the retina that lines the rear of the attention. It is the foremost common explanation for vision loss among people with diabetes and therefore the leading explanation for vision impairment and blindness among working-age adults. Here we introduced a system wherever we extract retinal line vessels for catching eye diseases. Manually extracting the retinal blood vessels may be a long task there are many automated methods are available which make work easier. The user will input retina images into the system. The system will apply filtering techniques. Image preprocessing steps are applied to get accurate results. The system command eliminates all undesired things from an image. The system will use the algorithm to obtain retinal line ships. Finally, the system will detect diabetic retinopathy.

III LITERATURE SURVEY

1) Paper Name : Blood Vessels Extraction from Retinal Images Using Combined 2D Gabor Wavelet Transform with Local Entropy Thresholding and Alternative Sequential Filter.

Authors :Abdullah Biran, Pooya Sobhe Bidari,

Description: The descent of retinal blood capillaries is a first step in identifying eye disorders that cause blindness, including diabetic retinopathy. It further explains other techniques for image processing, such as grouping. Since manual extraction is a long task and training is necessary, several automated techniques have been proposed. An algorithm to extract blood veins from fundus images has been introduced in this article. The algorithm is based on the Gabor two-dimensional filter, the threshold for local entropy, and the alternative sequential filter. The approach proposed has been tested using MATLAB codes on fundus images from the Standardized Study of Retina and Digital Retinal Images for Vessel Extraction (DRIVE) databases. The findings indicate that this mechanism is completely capable of removing blood vessels.

2) Paper Name : A Deep Learning Method for Microaneurysm Detection in Fundus Images.

Authors: Juan Shan

Description : The main explanation for blindness within the working-age population is diabetic retinopathy. Microaneurysms are the first signs of DR due to leakage from retina blood veins. However, due to the little size of MA wounds and the artificial distinction between the tumor and its retinal account, automatic detection of MA is difficult. For automatic characteristic descent and coordination problems, especially for image analysis, deep learning strategies have been used recently. To MA exposure in Fundus images, a Stacked Sparse Autoencoder, an instance of a DL approach, is exhibited in this paper. Of the initial Fundus images, humble image pieces are created. In series to list defining characteristics of MA, the SSAE learns high-level features from pixel intensities alone. To describe each image piece as MA or non-MA, the high-level characteristics learned from SSAE are fed into a classifier. To include the training/testing data and ground facts, the general public benchmark DIARETDB is employed. With the 89 images, a result of 2182 image applications with MA wounds serve as real data, and a random sliding window operation produces another 6230 image patches without MA lesions to serve as negative data. SSAE learned directly from the raw image patches with no vessel removal or complex preprocessing operations and automatically extracted the distinguishing features to spot the patches using the Softmax Classifier. Using 10-fold cross-validation, an improved F-measure 91.3 and a mean area under the ROC curve (AFC) 96.2 were achieved by using the fine-tuning operation.

3)Paper Name :A Brief Review of the Detection of Diabetic Retinopathy in Human Eyes Using Pre-Processing Segmentation Techniques

Authors: Yogesh Kumaran, Chandrashekar M. Patil

Description : A brief insight into the identification of DR in human eyes using different sorts of segmentation techniques for preprocessing is provided during this research article. Once the retinal tissue tissues remain segmented, there are a class of methods of segmenting the blood vessels found in the retina that can detect whether or not the eyes are affected by diabetic retinopathy. This detection all depends on the region of the network of the RNFL. If the entire area of the nerve fiber is smaller if the world of the nerve network is bigger, it's suffering from diabetic retinopathy (DR), therefore the eyes are not affected by diabetic retinopathy and hence it is usual. It is a well-known incontrovertible fact that diabetics have an important role in influencing each and every organ within the health of the citizenry. In the human eye, one such organ. This DR will result in a lack of sight in the human eye as the optic nerve is related to the brain. In disease-altered images, retinal fundus images are popularly used for the identification of disease diagnosis. New photos of the retinal fundus are hard to interpret by machine education algae.

4)Paper Name :Microaneurysm Detection Using Principal Component Analysis and Machine Learning Methods

Authors : Wen Cao*, Juan Shan

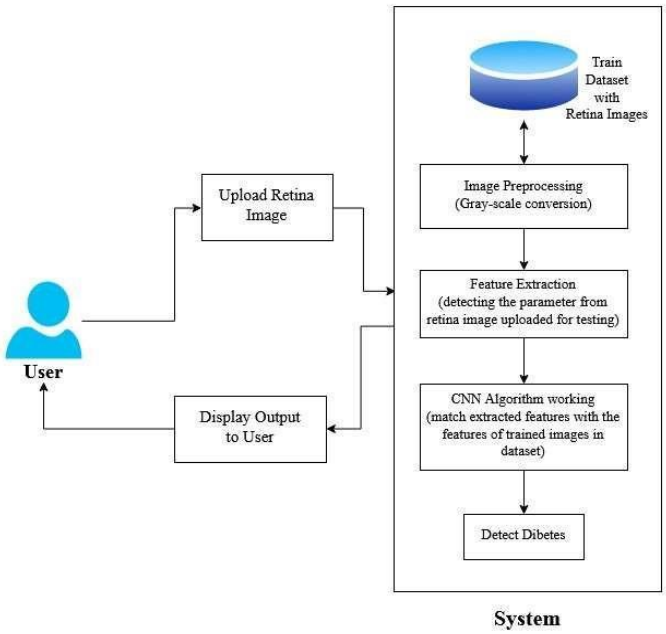
Description : A brief insight into the identification of DR in human eyes using different forms of segmentation techniques for pre-processing is provided in this research article. Once the retinal nerve fibers are segmented, there is a spread of methods of segmenting the blood vessels found within the retina which will detect whether or not the tastes are affected by diabetic

retinopathy. This detection all depends on the region of the network of the RNFL. If the entire area of the nerve fiber is smaller if the world of the nerve network is bigger, it's suffering from diabetic retinopathy (DR), therefore the eyes are not influenced by diabetic retinopathy and hence it is common. It is a well-known incontrovertible fact that diabetics have an important role in influencing each and every organ within the health of the citizenry. In the human eye, one such organ. This DR will end in a loss of vision within the human eye because the nervus opticus is connected to the brain. For the description of disease analysis in disease-affected images, retinal fundus images are widely used. New photos of the retinal fundus are hard to interpret by motor training algae.

IV PROPOSED SYSTEM

The advanced system uses supervised machine learning methods to analyze the thermal images of an eye into “Normal” or “Diabetic Diseased Eye”. The color change model is very necessary to extract the required features. In this work, two conversions such as RGB to Gray and RGB to HSI are done and RGB, Gray, and HSI color models are used as input images for the feature extraction module. Feature Extraction is the various important step in the investigation of images. It is a method of gathering distinct information from the image itself from an object or collection of objects. The system focuses on a tool that can be used in the localized language to overcome this limitation, to support local patients in their native language. The native language provided would be English, Hindi, and Marathi. The system is split into four modules Delegation of Profile, Base Input, Symptom analyzer, and Recommendation algorithm. The recommendation algorithm is used for consultancy on healthcare issues. Machine learning algorithms are applied to train the system for analyzing the disease on basis of marks.

4a. System architecture



System

4b. Explanation of system architecture

First of all, we do image preprocessing in system architecture, we remove blurred and unwanted information from the given image in this process. We're doing feature extraction after that. We can define the diabetic eye or normal eye on the basis of its structure and characteristics in feature extraction. In the next step, with the help of the CNN Algorithm, we classify that image. And we can finally detect that the eye image given is or is not diabetic. The proposed method uses supervised machine learning systems to classify the thermal images of an eye into “Normal” or “Diabetic Diseased Eye”. The color change model is very necessary to extract the required features. In this work, two conversions such as RGB to Gray and RGB to HSI are done and RGB, Gray, and HSI color models are used as an input image for the feature extraction module. Feature Extraction is the most crucial step in the study of images. It is a method of gathering distinct information from the image itself of an object or group of objects.

WORKING – This model is categorized into three main parts:

Pre-processing ;-

Pre-processing is a common name for operations with images at the lowest level of abstraction -- both input and output are intensity images. The aim of pre-processing is an improvement of the image data that suppresses unwanted distortions or enhances some image features important for further processing

Feature Extraction :-

Feature extraction is a part of the dimensionality reduction process, in which, an initial set of the raw data is divided and reduced to more manageable groups. So when you want to process it will be easier.

Classification :-

Classification is a supervised machine learning approach, in which the algorithm learns from the data input provided to it and then uses this learning to classify new observations.The CNN algorithm is simple algorithm to implement and usually represent method

ALGORITHM OF PROPOSED SYSTEM

•Convolutional Neural Network(CNN)

The CNN gives a state-of-the-art system for image credit. This is a multilayer neural network, whose neurons like small patches of the former layer as input. It is robust against small shifts and rotations. A CNN system includes a convolution story and a pooling (or subsampling) layer. In the convolution layer, unlike for general fully connected neural networks, weights can be considered as n × n (n ¡ input size) filters. Each input convolves these filters. Every layer should many filters that produce different outputs. For the image memory task, the different features are extracted by those filters. The filters are often called (convolution) kernels. The pooling panel produces the outputs by activation over rectangular regions. There are different activation techniques, such as maximum activation

and average activation. This does CNN's products more invariant with regard to position.

A typical CNN comprises multiple convolutions and pooling layers, with a fully connected layer to produce the final result of the task. In image analysis, each unit of the final layer shows the class probability. A CNN has hyperparameters that include the number of middle layers, the size of the convolution, and the active functions. In this project, we compare the optimization of some of these parameters. In our project, we practice Python(ML) which is a CPU implementation of a CNN Python, for the CNN library.

CNN's are regularized versions of multilayer perceptrons. Multilayer perceptrons usually mean fully connected networks, that is, each neuron in one layer is connected to all or any neurons within the next layer. The "full connectivity" of those networks makes them susceptible to overfitting data. Typical ways of regularization, or preventing overfitting, include: penalizing parameters during training (such as weight decay) or trimming connectivity (skipped connections, dropout, etc.) CNN's take a special approach towards regularization: they cash in on the hierarchical pattern in data and assemble patterns of accelerating complexity using smaller and simpler patterns embossed in their filters. Hence, on a range of connectivity and complexity, CNNs are on the more moderate extremity.

APPPLICATION –

•Eye clinic

•Hospital

UML DIAGRAM

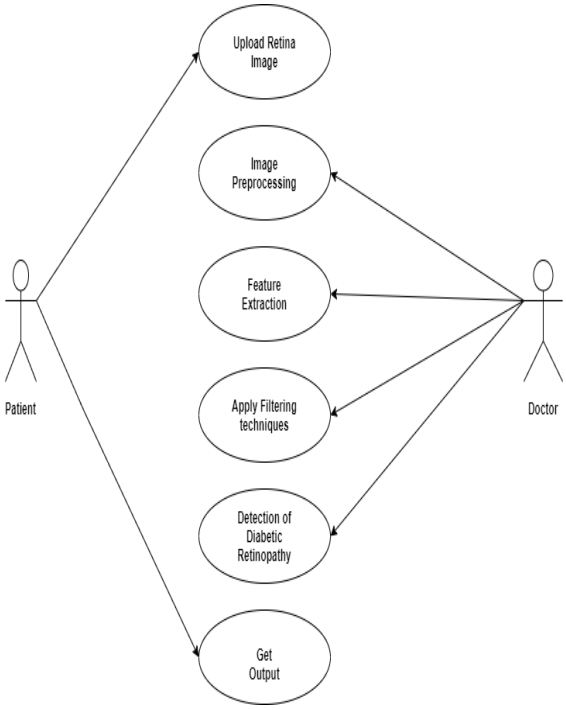
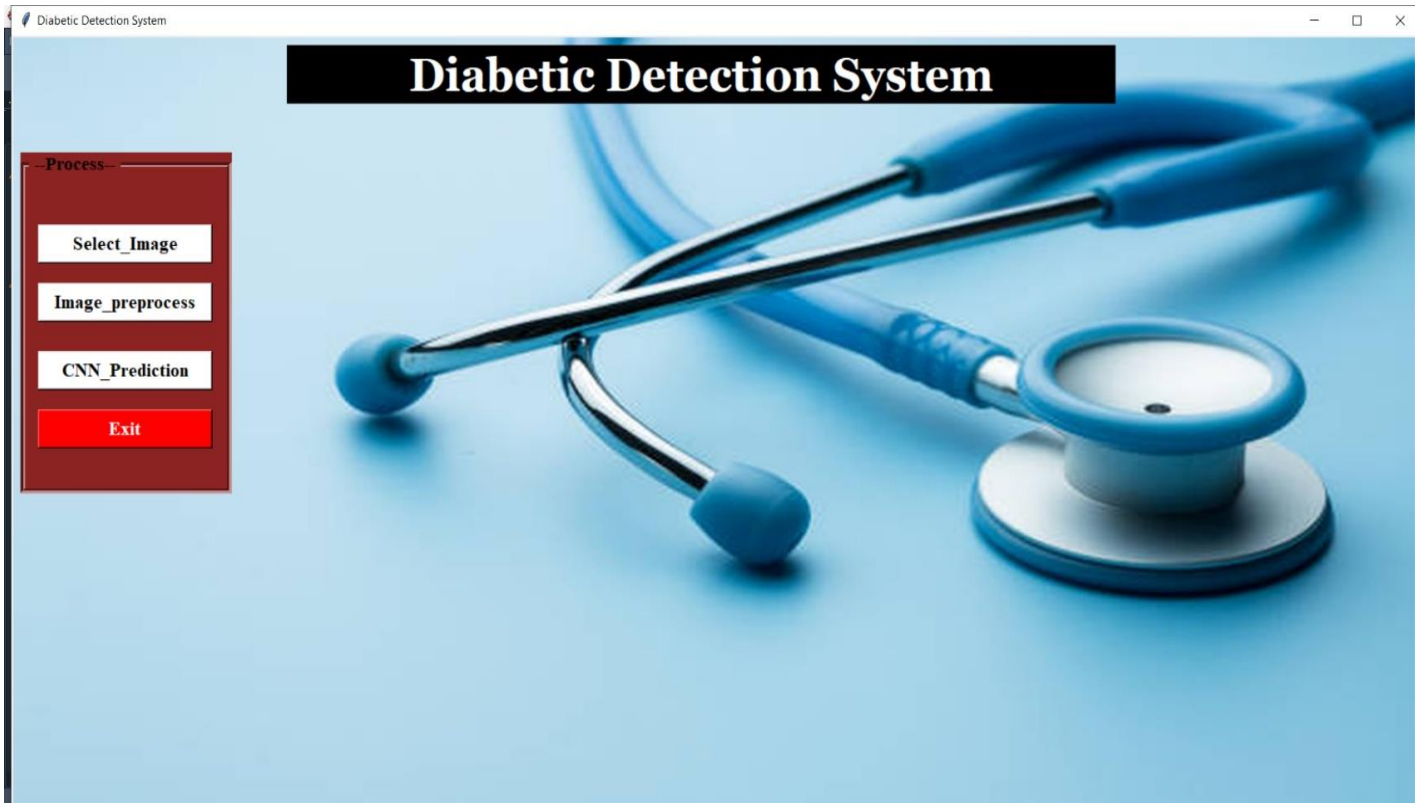
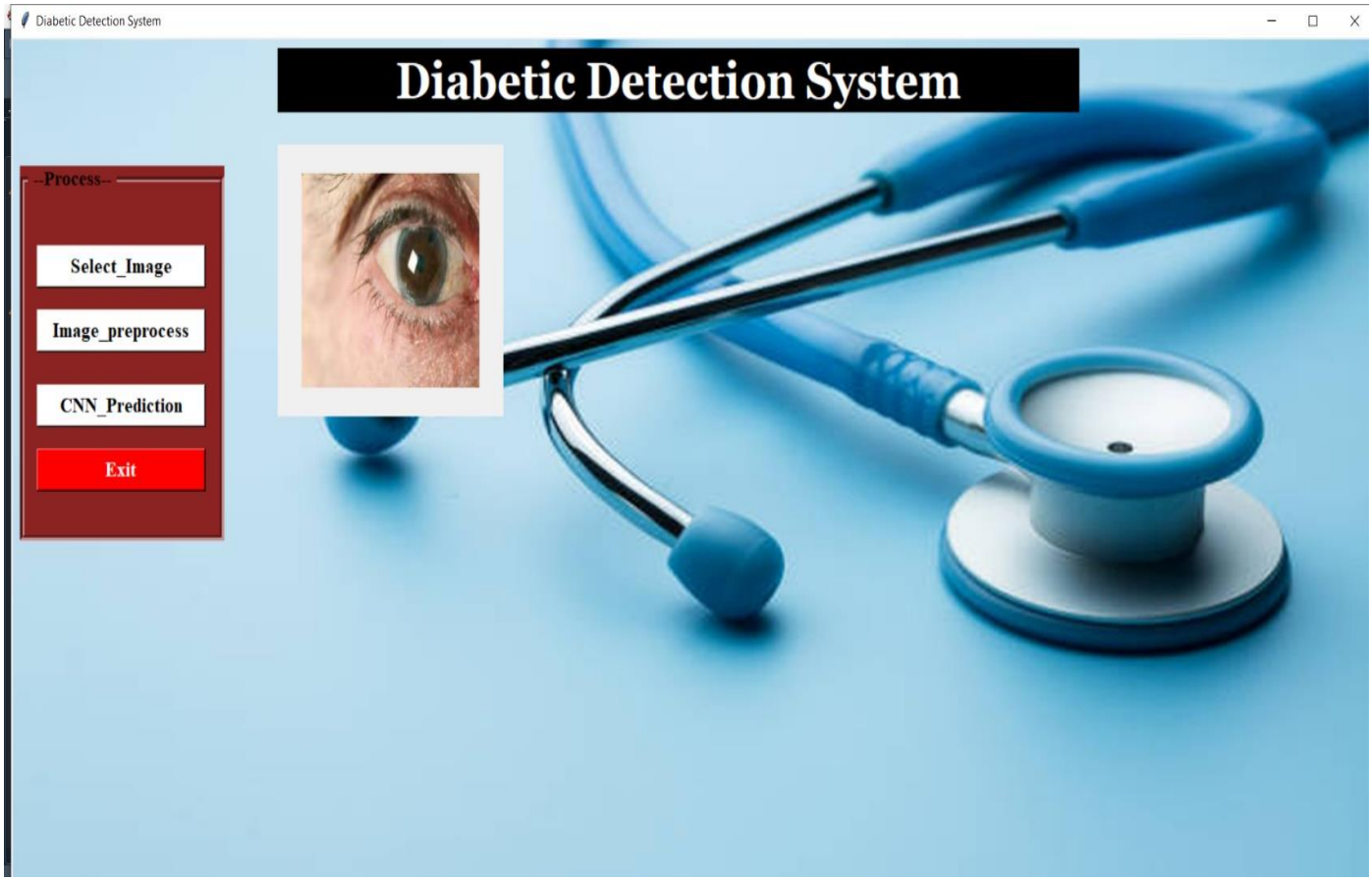
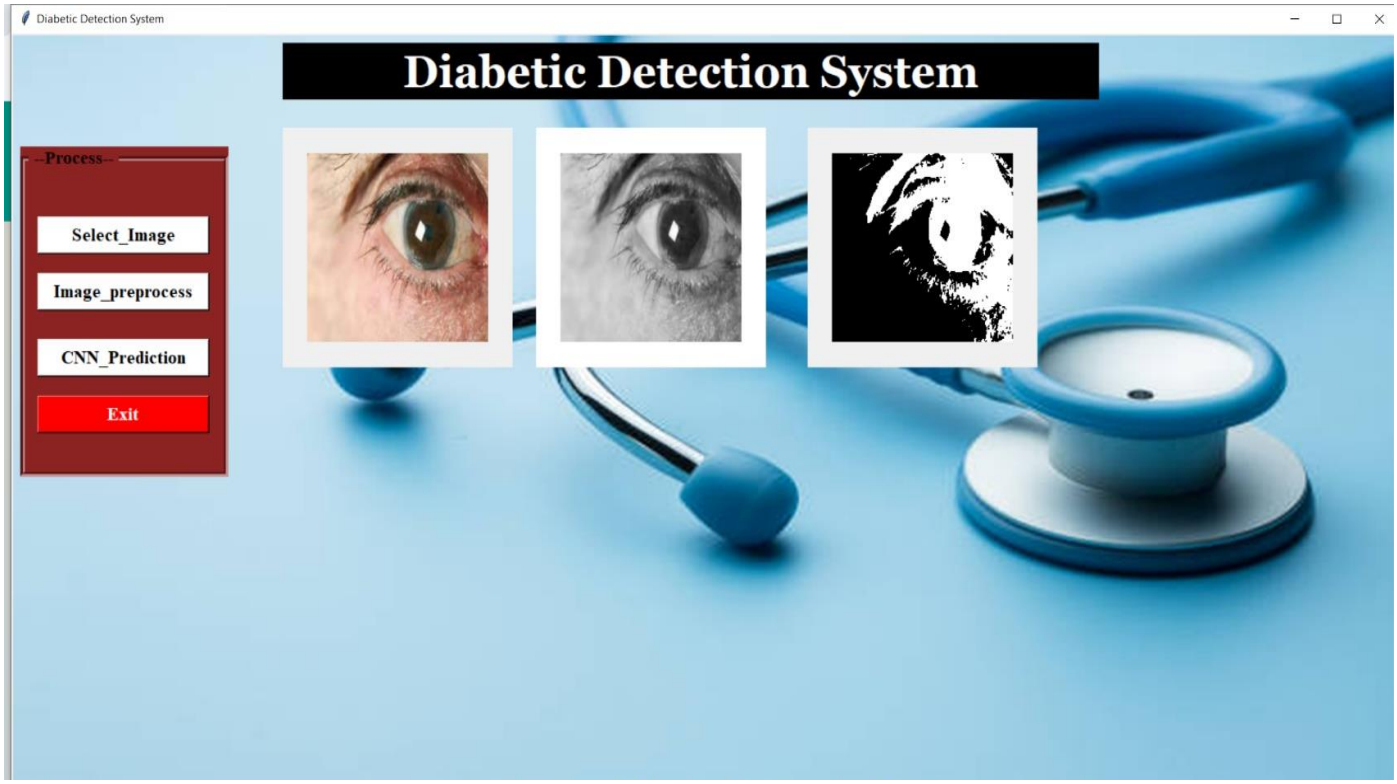


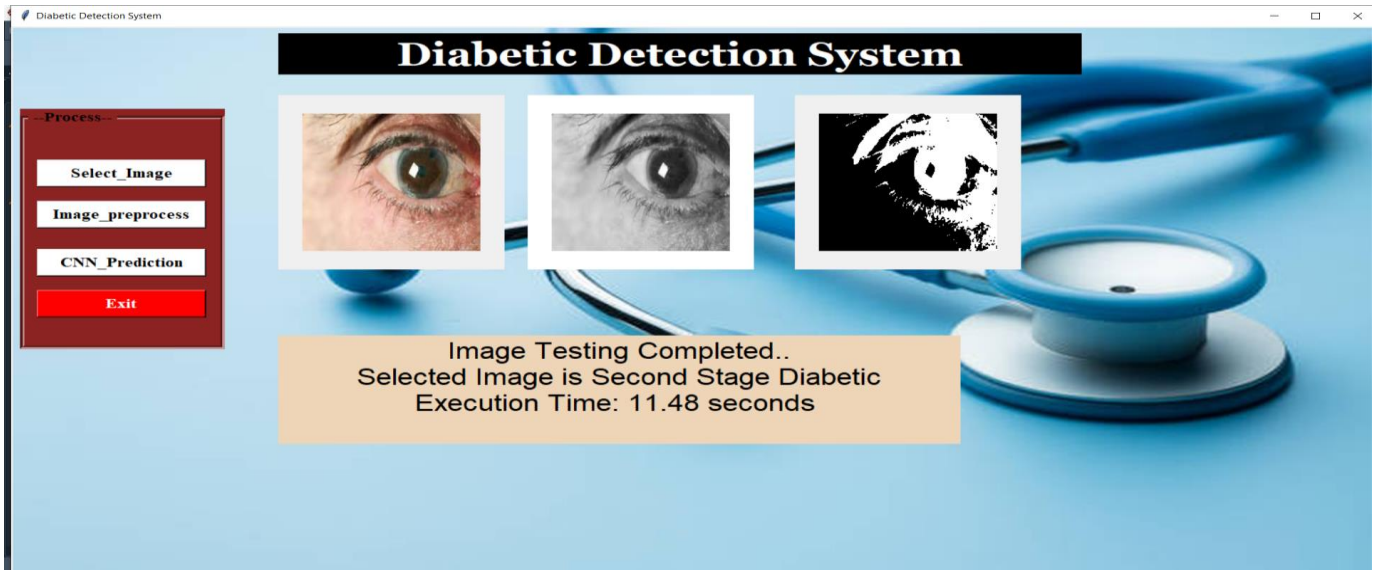
Fig. Use case Diagram

V RESULT:-




Diabetic Detection System
Diabetic Detection System
--Process--
Select_Image
Image_preprocess
CNN_Prediction
Exit


Diabetic Detection System
Diabetic Detection System
--Process--
Select_Image
Image_preprocess
CNN_Prediction
Exit



V CONCLUSION

In the proposed work, a non-invasive procedure has been presented to guage the presence of diabetic diseases within the eye. The classification of diabetic diseased and normal eye IR images is completed through Support Vector Machine classifier using various combination of texture and statistical features The simulation results indicate that the classifier in the detection of diabetic diseased eye performed in the accepted level and provide accuracy, sensitivity,specificity classifier.

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