Methodology for Detecting Diabetic Presence from Iris Image Analysis

Prof. S. K. Bhatia[1], Priyanka Atole[2], Sarika Kamble[3], Pooja Telang[4]

***Abstract*— For clinical diagnosis, Iris image analysis is one of the most efficient non-invasive diagnosis method which helps to determine the health status of organs. Though correct and timely diagnosis is critical, it is very essential requirement of medical science. From the literature survey that we have done, is observed that lot of modern technologies also fails in diagnose disease correctly. From different perspectives this attempt explore the area of diagnosis. Iridodiagnosis is the branch of medical science, with the help of which different diseases can be detected. Initially the images of eye are captured, database is created with their clinical history, features are found out and finally the classification is done whether the diabetic is present or not. Several classification methods can be used for training and classification purpose. Support vector machine will be useful in the diagnosis field which is faster and user friendly.**

***Keywords*— Iridodiagnosis, iris, diabetic, SVM classification, feature extraction.**

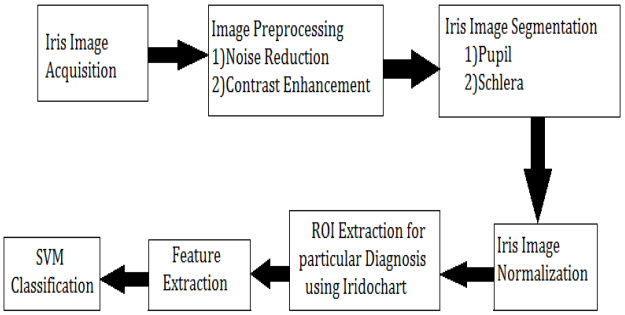
I. INTRODUCTION

Basically, iridolgy is the branch of science that deals with the study of iris i.e. colored part of the eye. The Iris is the greenish-yellow area surrounding the transparent pupil (showing as black). The white outer area is the sclera, the central transparent part is the cornea. The main intention of irido diagnosis is to collect some information about underlying disease. As technology have developed, there are various methods present for the diagnosis which are highly reliable and accurate. Basically, irido-diagnosis is consists on empirical science, to look into the particular area of eye for systemic health condition of the specific organ of the body[1].

Iridology is the diagnosis of medical conditions and "pre-disease states" through abnormalities of pigmentation in the iris. The location of abnormalities on the iris is associated with the location of the medical condition in the body. The iris of the eye is divided into 60 sectors, each sector is corresponding to an inner organ. The iris is associated via multiple nerve connections to the organs. Depending on the features of the iris classification is done and diabetic is detected. Iridodiagnosis can also be used to detect Gall Bladder Disease in the patient's iris [4].

1. METHODS AND PROCEDURES

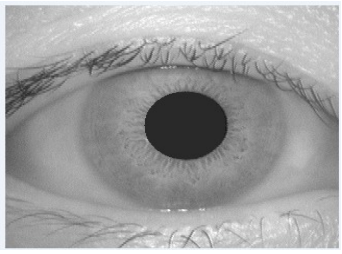
The framework followed in this paper is illustrated in the fig(1).



Fig(1). Block diagram of proposed approach

a. Eye Image Acquisition

Initially the eye image is captured with the help of certain cameras, and stored in the database which contains normal as well as abnormal results of iris. Captured eye image looks as shown in fig(2).



Fig(2) captured eye image

b. Image preprocessing

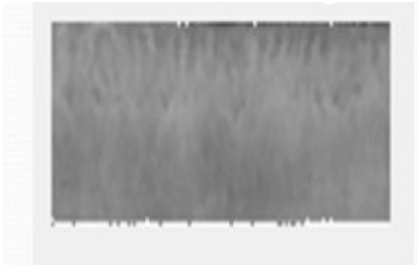
The preprocessing is done in order to reduce the presence of noise in the iris image and enhancement is done in order to manipulate an image so that the result is more suitable than the original. It makes the hidden features of an image more available for us. Enhancement is done for improving the details of an image.

c. Segmentation

Segmentation is done in order to find inner and outer boundries of the iris. By subtracting pupil from sclera, we will get the iris part of an eye[5]. Once the iris region is segmented from an eye, the next step is to transform the iris region into fixed dimentions. After subtraction, we will get the iris pattern into circular shape.

d. Normalization

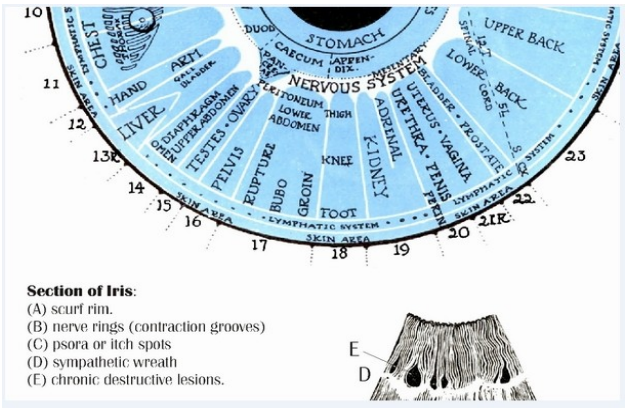
Normalization is done to convert circular iris pattern into rectangular shape as shown in fig(3).



Fig(3). Normalized iris

a. ROI extraction

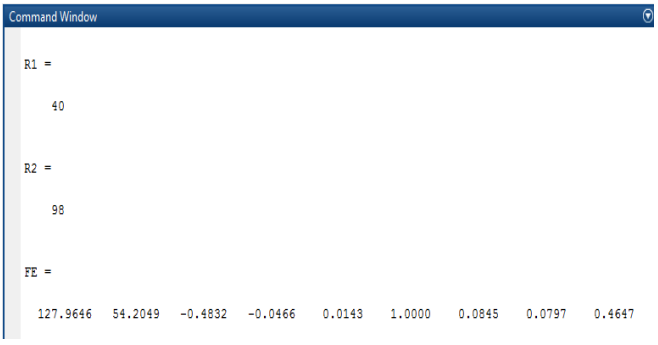
After normalization, the next step which comes into picture is ROI extraction. ROI extraction is nothing but cropping particular portion of normalized iris image according to "irido-chart" as shown in fig(4).



Fig(4) Irido-chart

b. Feature extraction

Feature extraction includes the features of the extracted region such as mean, variance, standard deviation etc[6]. it will show all these features into the command window as shown in following fig(5).



Fig(5) Features of iris

According to the irido-chart, the region of interest can be identified. Principal Component Analysis (PCA) is used for extracting the features of region of interest[3]. To apply the PCA on this ROI, matrix manipulation is necessary. Basically PCA assigns the specific weightage to the particular feature.

c. SVM classification

SVM classification is the important part of the approach because the overall process depends upon the classification done through this algorithm[7].

1. ALGORITHM

The algorithm used here for classification purpose is support vector machine (SVM) [2],[8]. SVM has successful applications in many complex, real-world problems such as text and image classification, hand-writing recognition etc. SVM classification is of two types: linearly separable and non-linearly separable. The approach used here is non-linearly separable.

Linearly separable:

We are given a set of n points:

$x1, x2, \ldots\ldots, xn$ such that xn is a vector of length m, and each belong to one of two classes we label them by "+1" and "-1".

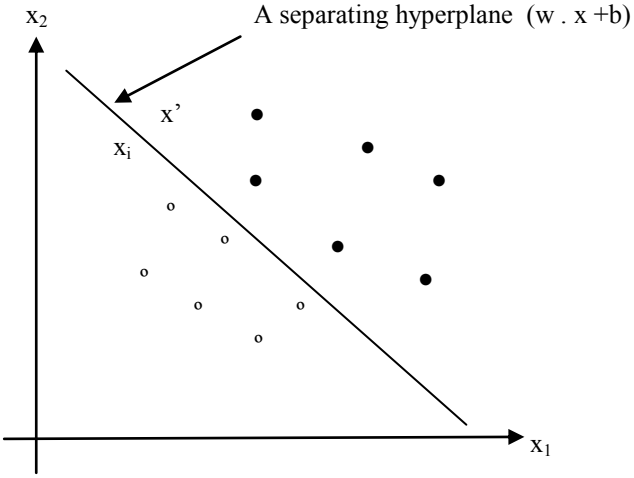
So our training set is:

$$(x1, y1), (x2, y2), \ldots\ldots, (xn, yn)$$

$$\forall i, xi \in R \wedge m, yi \in \{+1, -1\}$$

We want to find a separating hyperplane $w \cdot x + b = 0$ that separates these points into the two classes "the positives (class +1)" and "the negatives (class -1)".

Assuming that they are linearly separable.



- $yi = +1$
- $yi = -1$

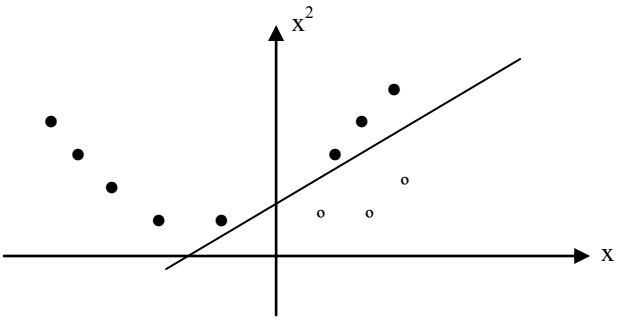
$$f(x) = sign(w \cdot x + b)$$

But there are many possibilities for the separating hyperplane. Suppose we choose the hyperplane that is close to some sample xi. Now suppose we have a new point x' that should be in class "-1" and is close to xi. Using our classification function $f(x)$ this point is misclassified. Hyperplane should be as far as possible from any sample point . in this way a new data that is close to the old samples will be classified correctly. The SVM idea is to maximize the distance between the hyperplane and the closest sample point. Support vectors are the points closest to the separating hyperplane. Separating

hyperplane equation is:
$w\hat{}t \cdot x + b = o$ where $w \in R\hat{}m, x \in R\hat{}m, b \in R$ w € R^m , x € R^m, b € R

Non-linearly separable:
This approach is used for mapping the data to higher dimention. Map the points with a mapping function $\phi(x)$ to a space of sufficiently high dimention so that they will be linearly separable by a hyperplane.
Mapping data to two-dimentional space with

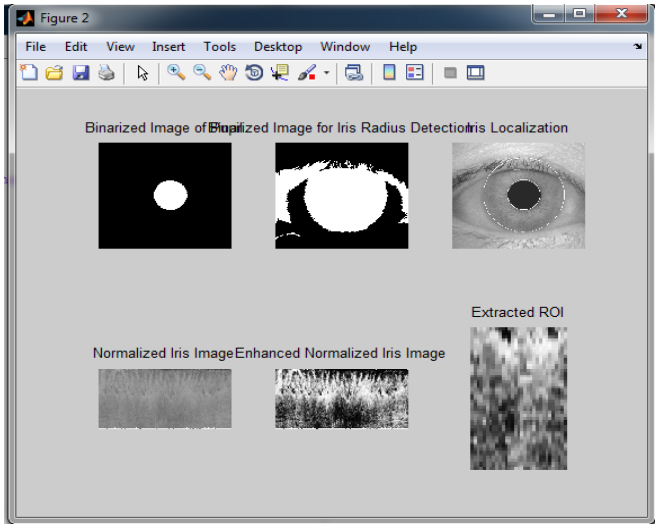
$$\phi(x) = (x, x^2)$$



The decision function will be
$g(x) = f(\phi(x)) = sign(w^t \cdot \phi(x) + b)$
The purpose of using SVM approach here is for the classification purpose, to maximize the margin and also it proved itself to have better performance on test data in both practice and in theory.

a. RESULT

The result window in matlab will contain all the results such as binarization of pupil, binarization of iris radius, iris localization, normalization of iris image, enhanced normalized iris image, extracted ROI.



CONCLUSION

We are proposing a new framework for Detection of Diabetic from Iris image. For clinical feature analysis, enhancement is essential for extraction of deep layer features. In this project we acquired one eye image, stored into database, filtered that image of eye by using median filter, found iris pattern from eye image, normalized and enhanced that iris pattern and extracted some features like mean, variance, standard deviation etc. We are studying the easiest method for diabetic recognition.

ACKNOWLEDGMENT

It is a great pleasure for us to present a project **"Methodology for Detecting Diabetic presence from Iris Image Analysis"** where guidance plays an invaluable key and provides concrete platform for completion of the project.

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Prof. S. K. Bhatia, B. Tech., M. Tech., Pursuing Ph.D, She is an Assistant Professor at JSPM's ICOER.

Priyanka M. Atole, Student of BE ECE at JSPM's ICOER, Pune.

Sarika L. Kamble, Student of BE ECE at JSPM's ICOER, Pune.

Pooja B. Telang, Student of BE ECE at JSPM's ICOER, Pune.

