



Survey-Iris Recognition Using Machine Learning Technique

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Abstract. In this digital era, Iris identification and detection are most useful and secure to use in banking, a financial section for security as well as it avoids fraud card detection. Iris recognition system gets images of an eyes by CSI scanner, after this, it traces out and senses the iris in the image which is then meant for the feature extraction, training, and matching. In this project, we will make use of two techniques by Iris image extraction for two separate classification method of the machine learning approach. Before feature extraction Normalization and Segmentation is used for the finding out the correct position of iris region in the particular portion of an eye with accuracy. This paper more focuses on machine learning approach to use supervised learning method.

Keywords: Machine learn · Biometrics · Normalization · Classification · Hamming distance

1 Introduction

The digital authentication technology that analyzes and measures human body characteristics either physiological or behavioral for the authentication and security purpose. When the internet has reached its peak and has formed the base for all modern banking systems and business systems, the accurate authentication for accessing our information in online banking sector will be necessary. There is an need for intelligent technology where can make use of security IPIN, OTP, secure signs/images etc. technologies possibly to use for most security purpose in banking sectors now a days [1, 2].

The new technology and method of machine learning are developed. Like an Artificial Intelligence (AI), Decision tree, Decision networks, Self-organizing networks, SVM and many more techniques are developed. The some image feature that is used in this theory is a human iris [2].

Neural networks process any network through their weight and get a single output which we called as binary classification technique in supervised learning of ML. Such networks of ANN, as well as FNN, are known as decision network through which it gets to the optimal solution or reaches to the specific goal which is the complete solution. The family network is one part of this Neural Network defined as the complexity of NN. Decision function is chosen the appropriate weight for neural networks connection where minimum error calculation is done by taking an optimal weight of

neural network architecture. The process of training and matching via multilayer feed-forward NN, feed-forward back propagation NN [1–4].

2 Literature Survey

The author wrote about a machine learning technique of classification and SVM for iris recognition in the paper of Pattern recognition letter in 2016. In order to reflect the research trend, they choose to list relevant work in chronological order. He also studied on Methods based on Fuzzy neural network where he finds some similarity in NN and FNN to calculate the distance via classification technique [2]. Only the difference is to get more flexibility in handling any cluster shape in Minkow Ski distance calculation through which it provides more recognition rate 98.12%. There are three types of SVM technique that are kernel linear, quadratic and polynomial for Iris image(segmented) recognition. Therefore it gives the best performance with the least square and quadratic kernel method to increase the rate of recognition by 98.50% with zero false Acceptance Rate. So nowadays this SVM in support with different classification techniques under ML for supervised and unsupervised method deal with particular recognition and also with applications of iris and eye detection in banking, finance section for security purpose and even nowadays it makes more usefulness to detect card to avoid fraud detection [2–4]. According to the author reference, conditional false reject probability of iris pattern is 109.6 which is generally one in 4 billion. In a single scan of image can analyze more than 200 variable of the iris image as furrows, corona, rings, freckles, etc. The digital scanner deals with the identification of persons different iris pattern extracted from the image eye. The human eye generally consists of the pupil (the inner darkest part), iris (the complete color part) and the Creamish/white part (sclera). Non-concentric areas of eyes are iris and pupil. The accurate $\pi/2$ area of the internal liner of the iris will not be constant which will be increase or decreases continuously that are depending upon the amount of light incident on the pupil [5, 6].

3 Implementation Concept

It mainly goes through 2 main processes which are registration and authentication. The registration phase goes through 3 basic stages which are image acquisition, normalization, segmentation and feature extraction same for an authentication phase. These phases are described below. The iris recognition system goes (Fig. 1).

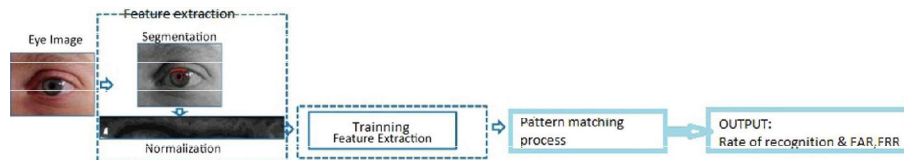


Fig. 1. Implementation workflow

Workflow through the following stages:

- Feature Extraction via 2 stage process
- Training process
- Matching process

3.1 Feature Extraction via 2 Stage Process

The process of image normalization and segmentation process called feature extraction. A clear image normally does not contain much noise that needs to be suppressed. In this stage, the eye image is captured via capture device i.e. CIS 202 3M cogent Iris scanner. Even we can create our own database through this scanner. Completing this step appropriately is of high importance because it goes through the 2 stages of feature extraction using machine learning [5–7].

Machine learning characterizes the main approach of feature extraction via SVM classification. We will do calculation by hamming distance method, it gets an accurate and robust rate of recognition of iris. As SVM hamming distance calculation is second classifier work fails in iris image extraction. So It needs to make use of separate image extraction method for these two classifiers instead of using the same features for both of them because if so it gives low FAR and FRR is not that low. Therefore use SVM on haar wavelet extraction of features method is first and then second feature extraction technique with 1D Gabor wavelets' to get no false.

3.2 Training Process

In this training process, train the capture image using any dataset Like Liam et al. A gaussian dataset which gives 25 to 30 set of five samples per images (150 samples). Here captured images had the number of features gone through 2 stages feature extraction process such that each feature is to train for the process of matching via neural network algorithm like Multi-layer Feedforward NN and Feedforward Back Propagation NN. The process with 2 types of the neural then compared with each other to increase the accuracy of recognition rate by lower down the rejection rate and increase acceptance rate. These two neural networks are Multilayer FNN and Feedforward Back Propagation NN, works with hidden layer had 30 neurons and o/p layer with 10 neurons, weights to be override by backpropagation method [1, 2]. Any distance matrices calculation process to compute the distance between a couple of neurons, this will exploit to upgrade the weight without bias functioning. So the performance of both Multilayered FNN and Feedforward Back Propagation NN will get similar but will be more accurate functioning of Multilayer FNN as compare to Feedforward Back Propagation NN and other Neural Network in time computation. This database of 30 neurons with SVM and Gabor wavelet for extracting iris features which will be deterministic in nature [2]. SVM based architecture gives a very good result of FAR in the closed set and open set situation, wherein open set authorized person use other personal identity and in the closed set, imposter uses authorize person identity. Therefore it will be well protected from attacker like imposters. With a bad rate of FRR, it will increase the rate of recognition and accuracy [12–16].

NN. So for this, we made use of Daugman's iris data set with different signal to noise ratio for given training set [8–11].

3.3 Matching Process

There are 2 types of the neural networks. These two neural networks are Multilayer FNN and Feedback Propogated NN, where one hidden layer having 30 neurons and an o/p layer with 10 neurons, weights to be override by backpropagation method [1, 2]. Any distance matrices calculation process to compute the distance between a couple of neurons, this will exploit to upgrade the weight without bias functioning. So the performance of both Multilayered FNN and Feedback Feedback Propogated NN will get similar but will be more accurate functioning of Multilayer FNN as compare to Feedback Propogated NN and other Neural Network in time computation. This database of 30 neurons with SVM and Gabor wavelet for extracting iris features which will be deterministic in nature [2]. SVM based architecture gives a very good result of FAR in the closed set and open set situation, wherein open set authorized person use other personal identity and in the closed set, imposter uses authorize person identity. Therefore it will be well protected from attacker like imposters. With a poor rate of FRR, it will increase the rate of recognition and accuracy [12–16].

4 Scanner for Iris Details

Hardware as CIS202 iris scanner, Detects 40 iris images by NIST SAP.

The possibility of change in iris of human eye appears only in cases where the area is affected by damage. Other possibility includes change due to medical operations. Iris is considered as security measure in parallel with finger print, only significance of iris is it's human internal organ and has less chance of getting affected throughout the life span of human. Iris itself is unique feature, sensible part of body and appearance is external [1, 2].

CIS 202 Scanner which offers an error-free low-cost solution image catures in within few seconds (Fig. 2).



Fig. 2. Iris scanner CIS 203-3M cogent

This scanner has illumination of infrared, USB powered scanner is mostly applicable to catch high-resolution iris pictures, in addition it removes chance of disturbing detection position and controls the spectral image sensitivity. Light capture at the range at some nano meter range and has rating of IP 54, CIS scanner handy design and more ideal for some application such as registry enrollment, applicants object identification, inmate release management etc. and many more [17].

4.1 About a Scanner

We develop this project or recognition system which is able to identify account customer with unique identification of iris. Using this scanner gets best picture quality of iris during project execution. Because of this scanner, it makes to minimize the normalization error and mean square error in segmentation. This will increase the accuracy ratio of iris system. We can use it insecurity, a sensitive business application where security having very much importance. So we can create our own data set in the form of templates or in any latest type database. This scanner image is supportable under the language of Python and Mat-lab. It uses both images of eyes left as well as right. Refer Fig. 3 shows the eye captured by the scanner.

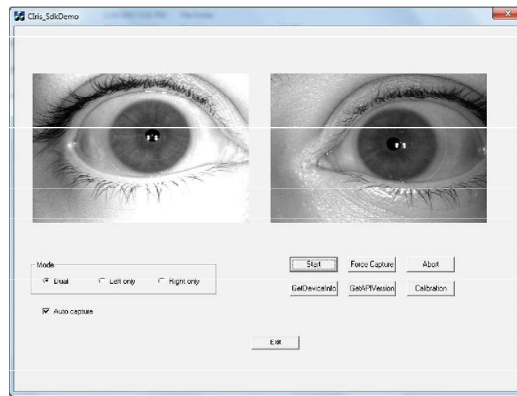


Fig. 3. Image captured by Iris scanner

5 Conclusion

ML technique in this implementation new and is most useful now a day to improve the performance by increasing accuracy in recognition rate and down the robustness characteristic with lower FRR and high false acceptance rate. This is only possible through the machine learning technique two classifier: SVM classifier with hamming distance classifier to calculate the distance between samples (150) with images (30) and One image per 5 samples. In the first stage, SVM classifier will use Haar wavelet feature extraction and at second stage hamming distance classifier will use 1D Gabor wavelets' feature extraction to improve accuracy and non-false acceptance rate.

Machine learning technique with neural network algorithms of Feedforward back propagation network (FBPNN) and Multilayer FNN will also improve the performance of matching training sets. The project is inspired by Machine learning classification with Daugman's algorithm for normalization and segmentation which is the most efficient Iris recognition models that will develop now a day with high performance and maximum rate of recognition.

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