IRIS LIVENESS DETECTION USING CONVOLUTIONAL NEURAL NETWORK

SANA MATTEKHANE, SANAPARVEEN SHAIKH, SHRAVANI THORAT.
Department of Electronics and Telecommunication Engineering, Modern Education Society's College of Engineering, Pune, Maharashtra, India.
(PROF.S.N.DHARWADKAR Professor in Department of Electronics and Telecommunication Engineering,Modern Education Society's College of Engineering,Pune)

Received: February 06, 2019 Accepted: March 28, 2019

ABSTRACT: *The objective of this paper is to propose algorithm for iris Liveness detection based on convolution neural network (VGG 16). We have developed our own dataset by calculating feature vector along 40 images including fake and real images. It measures the pattern and different features within the colored concentrating circle of the subject's eye. CNN automatically calculate feature vector without extra preprocessing operation. It takes input from real and fake iris and comparison is done by calculating relative distance between two images.*

Key Words: *Biometrics, Iris Liveness detection, CNN, Feature Extraction.*

1 .INTRODUCTION

Iris is one of the most popular biometric traits. It has been widely used in many applications such as national ID card, banking, social benefit, border control, mobile payment, etc. Now a days attacking iris system with fake iris system pattern has become the largest security risk of iris recognization system. The risk of security attacks to iris recognition systems increases hence it is necessary to develop self protection algorithms to identify all possible attacks to iris recognization system. This all type authentication attacks can be prevented by liveness detection techniques. In this paper we focus on Iris Biometrics Detection by using CNN in which input from real or fake iris patches are given to CNN and comparison is done. At the end we get whether the patch is from real or fake person.

CNN is a class of deep neural network. It is widely used in image classification. It have multilayer and require minimal preprocessing. It is artificial neural network based on their shared weights architecture. It consists input output and multiple hidden layers. It is a cross co-relation rather than a convolution. VGG16 is one of the types of CNN. This is freely available over internet. It has 16 layers which perform different tasks. It is pre trained network in mat lab that performs very well in Image Net. It automatically extract biometrics feature. It's a simple logistic method. It is more efficient and result show highest efficiency. We use IIT Delhi iris data base [2] having 320 by 240 resolutions, all images are captured by CMOS Digital Camera.

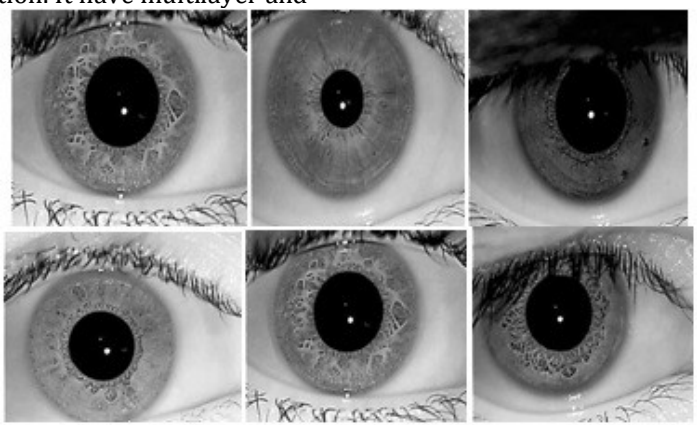

Figure 1.samples from the iris IIT Delhi dataset [2]

2. RELATED WORK AND CONTRIBUTIONS

Hardware and software system have its own advantages and disadvantages. Hardware system required some additional sensor in case of software there is no need.

2.3. Contributions of this Paper

Iris liveness detection that overcomes many of the problems in authentication system. In generic image classification there is the scarcity of data. We use a smaller architecture which based on the liveness of single patches rather than the whole image. We introduced some of the changes in deep metric learning and reduced the computational complexity. Second our approach is extracted features matched using a simple Euclidean distance.

3 BLOCK DIAGRAM

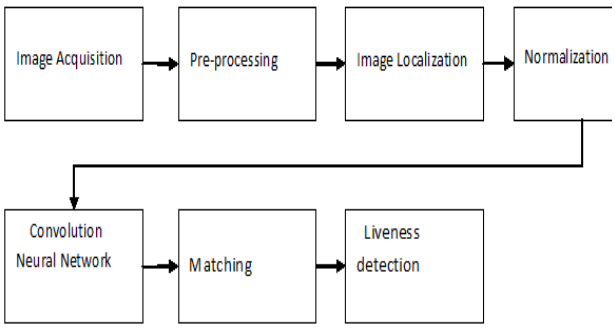

Figure 2.Iris recognition

Iris recognition divided into four main block:

1. Image Acquisition: We take image directly from database, the image is already acquired there is no need of acquisition.
2. Preprocessing: The acquired image contain some unnecessary parts e.g. eyelid, pupil. so its necessary to separate this information from iris.

   Preprocessing divided into two parts

   a) Iris localization

   In which iris is separated from the pupil, first the inner and outer boundary of iris is detected and it separated from pupil also eyelid is separated from iris.

   b) Iris Normalization

   Circular iris is converted into rectangular form, then Rectangular patch converted into constant Rectangular patch in this step.
3. Image Analysis in which we find the features of set of images .CNN is used to extract biometric feature. it extract feature without extra filter.
4. CNN - convolution neural network it is mainly used for analysis of image. CNNs have multiple layer each layer is connected with each other like neuron. Output of one layer is given as input to next layer so it is called as feed forwarding network it required less preprocessing. It has shared-weights architecture weight is divided among different layer. Its structure is similar to that the connectivity pattern between neurons. CNN not required any extra filter it have inbuilt filter. It is used in image and video and image classification. A CNN have an input, output layer and multiple hidden layers (convolution layers, pooling layers, fully connected layers and normalization layers) It is a cross-correlation convolution. Different layers learn different features, feed forwarding network used for image classification.
5. Image Recognition: Iris patch feature is stored in the database for future comparison. During recognition input iris patch is compared to the every file in database. Support vector machine: Also called as support vector network that analyze data used for classification. Mainly used for classification, regression and other so many applications. It is classification algorithm which gives good results within limited data.

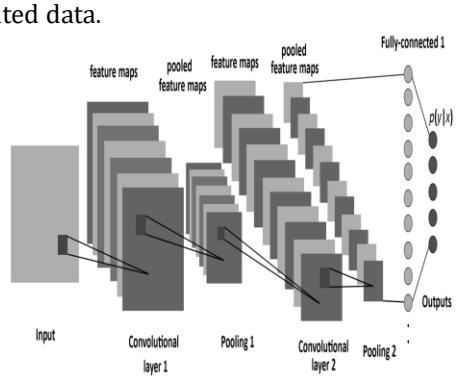

Figure 3.CNN Architecture[4]

6. PROPOSED ALGORITHM

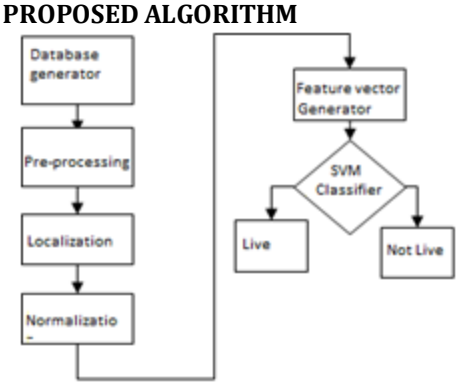

Figure 4.Algorithm

1. Read the input image from IIT Delhi database so there
   Is no need of image acquisition
2. Draw Histogram of input Image.
3. Detecting first peak in the histogram.
4. Conversion of gray image to binary for pupil detection.
5. Centre of mass procedure for centre of the pupil.
6. Co-ordinate of centre of the pupil.
7. Calculation of radius of pupil.
8. Elimination of pupil from the image.
9. Polar to rectangular conversion.
10. Formation of strip.
11. Making constant strip.
12. CNN extract biometrics feature
13. Find the feature vector.
14. matching is performed.
15. .Result is obtained.

7. EXPRIMENTAL SETUP AND RESULT

Mat lab 2018 deep toolbox is used for it. We work on fake and real iris patch, aura algorithm is photo based.

Proposed algorithm is worked on 25 live iris images and 15 non live iris images and we get result whether the iris from live person or not. Accuracy is found to be 90.02%.

RESULTS

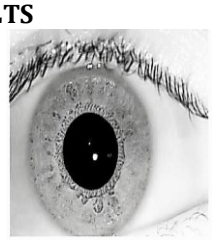

Figure 5. Input image

Figure 6. Localization

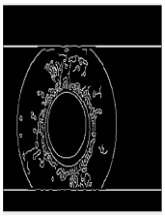

Figure 7. Normalization

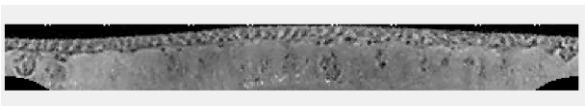

Figure 8. Constant strip

8. Conclusion

We conclude that software based livenss detection system not required any extra sensor and should never give a false result. so such system should be continuously updated and monitored. Experiment will perform on large dataset. The software and hardware based iris detection have its own advantage and disadvantage if in future we combine both it will give better result.

References

1. Federico pala, Birr Bhanu Center for Research in Intelligent systems University of California CA Riverside , 92521,USA.IEEE 2007
2. Ajay Kumar and Arum Passim, "Comparison and combination of iris matchers for reliable personal authentication," Pattern Recognition, vol. 43, no. 3, pp. 1016-1026, Mar. 2010.
3. [PR2007] J. Fierrez, J. Ortega-Garcia, D. Torre-Toledano and J. Gonzalez-Rodriguez, "BioSec baseline corpus: A multimodal biometric database", Pattern Recognition, Vol. 40, n. 4, pp. 1389-1392, April 2007.
4. https://goo.gl/images/XL52sU