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C3 Report

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IRIS RECOGNITION AND SEGMENTATION USING DEEP LEARNING METHODS ON JPEG COMPRESSED IMAGES

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Abstract: - Irises are distinctive among all individuals. Each person has a unique iris shape and there are no two irises that have similar features as well as attributes. In this paper, we presented a new model in iris recognition and discovery which make this procedure of recognition and also detection very easy for anybody to make use of in their daily life for authentication of their tools as well as other security purposes. Our project aim is to use compressed raw images and train a model which when shown an eye image it will be able to recognise and segment iris on that image and also able to give an accurate result.

A CNN model has been presented for segmentation and recognition of the iris image, we have experimented with RGB images and DCT transformed images for our datasets. The experimental

results of our model show accuracy and loss of all 4 types of experiments we performed.The accuracy for RGB and DCT while training is 0.9666 and 0.9967.

Thus, As a result, while experimenting, we get the highest training accuracy while using DCT.

The iris recognition, detection, segmentation and also discovery structure was tried out with a well known informative dataset: IITD Dataset, CASIA.

1. Introduction

In recent years iris recognition, as well as discovery, had a crucial area particularly in the field of biometric pattern recognition. It has a considerable duty in contemporary day-to-day live applications. It aids us to identify every person uniquely since iris verification is one of the safest and secure biometric authentications. Every single person existing on this planet has a distinct iris pattern, there is no chance of 2 various individuals with similar iris features. The iris has arbitrary morphogenesis which makes each person have a unique pattern. Iris recognition has the greatest precision price among other human qualities verification such as fingerprints, handwriting etc. A lot of federal governments and also organizations make use of biometric technology in their safety and security systems as this modern technology has high precision. This paper introduces a new and complete system for Iris acknowledgement which starts with eye detection and after that iris detection and if the image effectively passes these steps it will certainly go through the iris division step as well as the last action is the iris category making use of convolutional neural networks. This paper introduces a new iris division technique to remove attributes from the image.

2. Motivation

Biometric security has been the most significant method of Authentication, one of the best and secure biometric authentication is using iris, iris recognition has been the most popular way of identifying a person, and it's really difficult to bypass iris detector to identify a person, despite that iris detector and recognition systems uses strong infrared highlighters and an HD camera to detect a person. Our project is based on Using JPEG compression techniques we will try to detect iris.

3. Problem statement

A Biometric system is a crucial system utilized for identification where no recognition card or password is called for. Although these systems have been extensively employed in the federal government as well as non-combatant delicate applications with a high degree of protection, they often struggle with a variety of crucial constraints. and also issues that can influence their reliability and performance. This most significant drawback and also problems include (1) noise of chosen characteristic (2) non-universality (3) intra-class variations (4) inter-class similarities (5) vulnerability to spoof strikes. One promising method to resolve these difficulties is to utilize deep understanding. It is a sophisticated subfield of artificial intelligence techniques that depend on finding high-level representations as well as abstractions using a structure made up of numerous nonlinear transformations. This presentation will show the capacity to predict the identity of a private based on his or her iris one-of-a-kind pattern by utilizing deep knowing methods based on the combination of Convolutional Neural Network(CNN) as well as Softmax classifier to essence discriminative attributes of the iris as well as carry out multiclass prediction. This is done based on Python and Keras packages for developing the CNN version. The Iris data source is from IIT Delhi Iris Database (Version1.0) and CASIA.

4. Objectives

The iris recognition and detection model beginnings with a recognition cycle that attempts to observe eyes in the pictures caught by the camera, then, at that point, the subsequent interaction is to perceive the iris at this stage, the pictures of the iris in the eyes are perceived to ensure the eyes have a noticeable iris that could be sectioned in the following not many advances The third cycle is the division of the iris, which is utilized to extricate highlights that will be utilized in the last interaction by the Convolutional Neural Network (CNN) model for preparing and testing Images of Iris.

1. Eye detection

2. Iris Detection

3. Iris Segmentation

4. Iris Classification

5. Literature Survey

We have discovered extra effective techniques to explicitly make use of the spatial partnership among iris masks, internal and also outer iris borders to improve the segmentation performance. In addition, lightweight iris division networks are likewise anticipated to be created for sensible deployment. In addition, the finding out task complexity of CNN designs can be decreased by collaborating with partially unwinded images with a low design accuracy loss. Because of its intro in 1992, JPEG has been one of the most extensively utilized photo compression criteria on the planet, and one of the most widely made use of digital image format, with several billion JPEG pictures generated daily as of 2015.

In The Direction Of Complete and also Accurate Iris Segmentation Using Deep Multi-Task Attention Network for Non-Cooperative Iris Recognition IEEE Transactions on Information Forensics and Security (Volume: 15) [2020]

Purpose :

To attain iris localization without just depending on the iris mask.

To get a basic yet efficient standard version.

Exactly how to make use of several spatial previous restraints to boost the division performance.

Methodology :1: - Pipeline, 2:-multi-tasks Fully Convolutional Network

Dataset:1.CASIA.v4-distance (CASIA) ,2.UBIRIS.v2 (UBIRIS) ,3.MICHE-I (MICHE)

Results:

In this paper, they have proposed a unique multi-task focus network for collectively finding out iris mask, iris outer boundary, as well as pupil mask. Further, parameterized inner and also outer iris boundaries are achieved based on the found out pupil mask as well as iris outer boundary. This way, two significant tasks of a full iris division, i.e., segmentation of iris mask and localization of parameterized inner and also outer iris boundaries, are collectively finished.

End-to-end Off-angle Iris Recognition Using CNN Based Iris Segmentation 2020 International Conference of the Biometrics Special Interest Group (BIOSIG) [2020]

Purpose

A dedicated CNN with uniform iris pictures of each distinctive gaze-angle, and afterwards perform segmentation in iris pictures with specific gaze-angles. The division outcomes thana is the class improved tasks, and both the division and also recognition performance are examined later on. In the second method, it is signified as "improved-heterogeneous".

Methodology

1. FCN
2. Recognition Pipeline
3. Segmentation Evaluation and Measures

Dataset

Images at 0 ° gaze-angle were recorded by a frontal fixed electronic camera, as well as off-angle pictures were caught by a frontal moving electronic camera revolving horizontally from -50 °(N50) to +50 ° (P50) in angle with a 10 ° step-size. Each video camera captured 10 iris pictures per quit, offering 10 frontal as well as 100 off-angle iris photos caught from each topic, to comprise 400 images per angle.

Results

The morphological renovation technique confirmed to make up for some off-angle associated segmentation destructions, improving the division and the recognition results beyond those gotten in, in similar arrangements.

Specular Reflection Removal Using Morphological Filtering for Accurate Iris Recognition

2019 International Conference on Smart Structures and Systems (ICSSS)

Purpose

The proposed morphological dilation and region filling based specular reflection removal method for VW iris images

Methodology

1. Iris Image,2.Binary images creation,3.Morphological dilation. ,4.BW boundaries detection 5. ROI fill 6. Reflection removed images

Dataset

Dataset in UBIRIS.v1 database.

Results

In this paper, specular reflection noise removal in VW iris images has been carried out using morphological dilation and region filling techniques based on the proposed method.

Contrasting the Legendre Wavelet filter and also the Gabor Wavelet filter For Feature Extraction based on Iris Recognition System 2020 IEEE 6th International Conference on Optimization and also Applications (ICOA).

Purpose

The purpose of this research was to examine The Legendre Wavelet filter was compared to the Gabor Wavelet filter

Methodology :1.segmentation ,2.Normalization,3.Feature Extraction,4.Matching

Dataset: CASIA, UBIRIS and MMU databases.

Results

The Legendre Wavelet filter was compared to the Gabor Wavelet filter based on the effectiveness and also the precision of their operations, as well as a considerable increase, was achieved.

Iris Recognition Using Local as well as Global Iris Image Moment Features 2019 Innovations in Power as well as Advanced Computing Technologies (i-PACT).

Purpose

In this paper, we recommend a crossbreed approach for iris acknowledgement using Zernike minute, Maitra's minute.

Methodology: 1. Iris segmentation, 2. Iris Normalization,3.Feature Extraction,4.Classification

Dataset

CASIA.v4.interval, PolyU, and IITD iris database

Results

In this paper, a hybrid approach to represent iris structure making use of Zernike moment, Maitra's minute is presented. These minutes are stable to rotation, scale, translation as well as contrast modifications.

Iris Location and Recognition by Deep-Learning Networks Based Design for Biometric Authorization 2021 IEEE 3rd Global Conference on Life Sciences and also Technologies (LifeTech).

Purpose

In this work, the efficient deep-learning network-based style is studied for iris biometric verification. Firstly, the system locates as well as finds the position of the iris by the YOLO based deep-learning detector, and after that, it strengthens the iris features by pie chart equalization. To start with, the system situates as well as detects the setting of the iris by the deep-learning-based detector, and then it strengthens the attributes of the iris photo by pie chart equalization. Finally, the proposed system identifies the iris photo by the deep-learning-based convolutional neural network (CNN).

Dataset

Data sets of eye images are collected from the members of their laboratory, and the image size used for inputs is 640x480 pixels. After the iris region is located, the region of interest (ROI) of the iris can be extracted.

Results

For iris biometric authentication, a reliable deep-learning network-based layout is established in this paper. First of all, the YOLOv4-tiny based deep-learning model has obtained the discovery of the iris ROI, and then the iris functions are boosted by histogram equalization.

Style and Analysis of Deep-Learning Based Iris Recognition Technologies by Combination of U-Net and EfficientNet 2021 9th International Conference on Information and Education Technology (ICIET).

Purpose:

In this paper, a reliable deep-learning-based technique is established for iris biometric authentication.

Methodology

Extracts and segments the area of interest of the iris by the deep-learning based U-Net detector. Segmented iris area, the iris centre is approximated for the optional normalization process. Pie chart equalization, the comparison minimal flexible histogram equalization. Lastly, the suggested system classifies.

Dataset

CASIA -V1

Results

In this paper, by the mix of U-Net and also EfficientNet, the reliable deep-learning based system is researched for iris biometric authentication.

Two Steps Iris Recognition with SIFT Descriptors as well as Texture Features 2020 International Conference on e-Health as well as Bioengineering (EHB).

Purpose

In this paper, we provide an approach for iris recognition that draws out bottom lines from an iris picture at two different stages combined with texture feature computations making use of Dual-Tree Complex Wavelet Transform (DTCWT).

Methodology:1. Texture features,2. SIFT features, 3. AOT recognition method.

Dataset: UBIRIS, UPOL

Results

The iris acknowledgement was executed with a leave-one-out technique. In all our experiments we have used different TC worths to produce SIFT descriptors.

Making Use Of Discrete Wavelet Transform and also Discrete Cosine Transform for Iris Acknowledgment demand projecting: methods, applications, as well as study possibilities 2020 20th International Conference on Sciences as well as Techniques of Automatic Control and Computer Engineering (STA).

Purpose

The proposed technique is applied to the CASIA interval-v4 image database. For the classification task, the extracted features are fed into the multiclass SVM.

Methodology

Iris image database, segmentation of the region of interest, extraction of the desired features, utilizing the multiclass SVM, and calculation of the rates of the classification.

Dataset: CASIA,

Results The results are higher than analyzing every feature set individually. As shown in Table 1 the best accuracy rate is 100% yielded from the analysis of dataset distribution of 600 as training and 100 as testing sets.

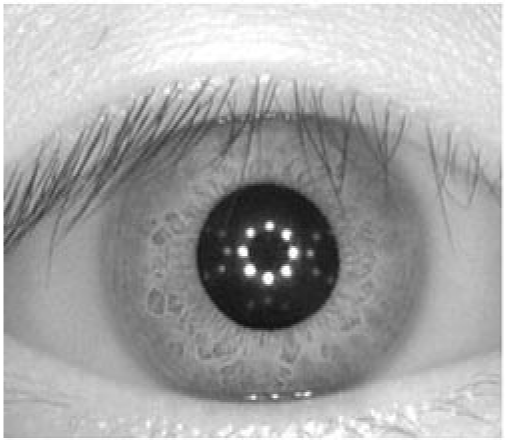
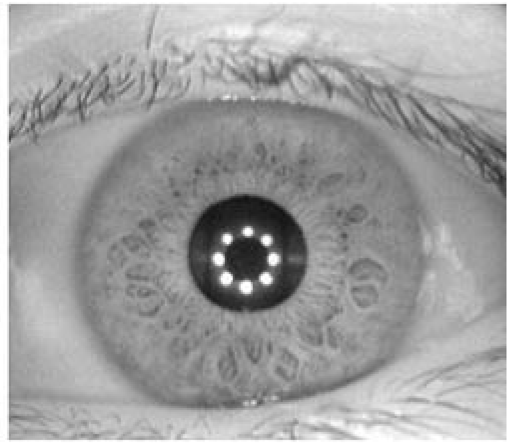
6. Dataset description

LINK: CASIA-Interval Dataset

CASIA Iris dataset is among one of the most commonly used datasets for Iris discovery and recognition. It contains an aggregate of 54,607 iris images from greater than 1,800 certified topics as well as 1,000 digital subjects. All iris images are 8 cycle dim degree JPEG records, gathered under near to infrared light or blended. The six informative indexes were gathered or mixed at numerous celebrations and CASIA-Iris-Interval, CASIA-Iris-Lamp, CASIA-Iris-Distance, CASIA-Iris-Thousand could have a little in between subset cross-over in subjects.

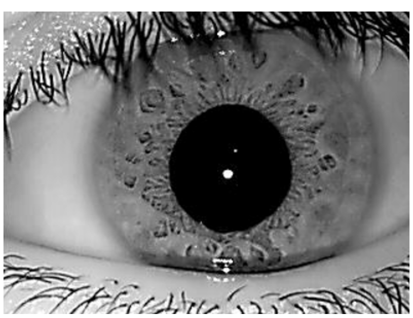
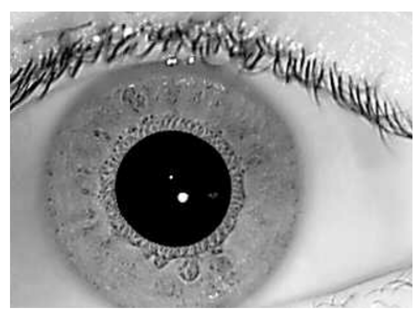
LINK: IIT Delhi Iris Database (Version1.0)

Dataset	Number Of Class	Number of Samples	image size before the training process In Pixel	output size from the Dense-Net Network	Test Image Per Class
Casia Iris Interval	42	1344	200×200	2×2×1664	3 to 4
Casia V4 Iris-Thousand	1000	40000	70×70	6×6×1664	2
Ubiris V1	241	2428	200×200	6×6×1664	1 to 2
Ubiris V2	241	2428	200×200	6×6×1664	1 to 2

IIT D Dataset:

The IIT Delhi Iris Database mostly consists of the iris pictures gathered from the students and also personnel at IIT Delhi, New Delhi, India. This database has been acquired in Biometrics Research Laboratory throughout Jan - July 2007 electronic CMOS cam. NumPycascade,,rmat: BMP images 432 X 48.

7. Language and tools

We will be majorly using Python 3 as the project programming language.
Tools :

- Pandas → A software library used for data manipulation and analysis.
- Scikit-learn →A Machine learning library for python.

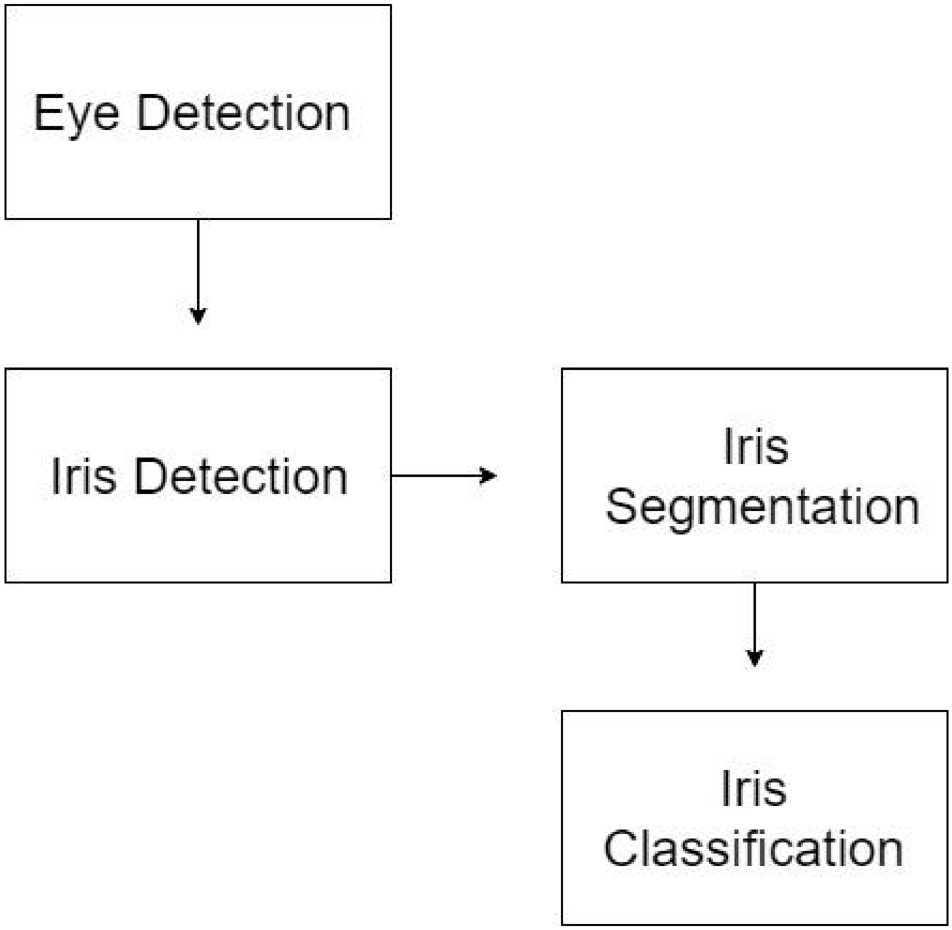
Algorithms :

- Hough transform algorithm
- CNN

8. Proposed methodology

We will use a unique approach to go about the problem. There will be major two steps:-

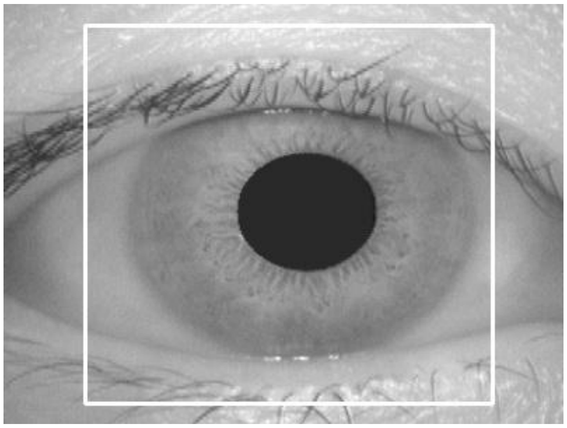
1) *Data preparation using a part of JPEG Compression algorithm:* In this step, the given dataset of Iris image will go through a series of conversions, first the RGB colour channels of the input image will be converted to YCbCr colour model. Then after it will be downsampled. After this, we will use Discrete Cosine Transformation (DCT) on each of the channels. The output of the DCT transformations will be recombined to form the YCbCr colour-modelled image. This image will be used as the input to our model in the next process.
2) *Iris recognition model:* The iris recognition model begins by detection procedure which tries to find eyes in the images collected by the camera then the second process is iris discovery in this phase iris inside eyes pictures are identified to be a guarantee that the eyes have a NumPyle iris that could be segmented in the next actions the 3rd process is iris division that will certainly be made use of to remove attributes that will certainly be utilized in the last procedure by the convolutional neural network (CNN) model to educate and evaluate iris pictures.



9. Implementation & Results

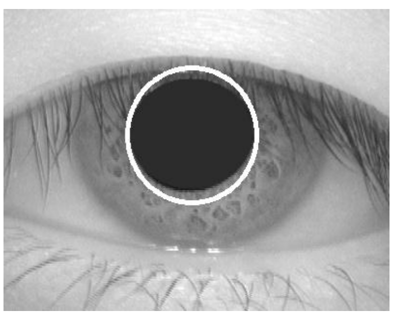
Technologies Used - Python, Numpy, numpy, keras, sklearn, opencv, Tensorflow

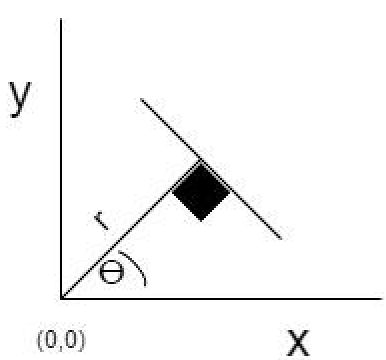
1. **Eye detection**: Eye detection has a lot of different applications. Iris acknowledgement is one of these applications. The model makes use of haar cascade classifiers to detect eyes as these classifiers are quick, do not require a lot of computational time as well as offer high accuracy. Photos that come out from electronic cameras travel through haar casacade classifiers that detect eyes in these pictures. This phase will certainly ensure that the pictures have the eye. the image will certainly pass to the next action if and just if the classifier identifies eyes.
   The figure shows the output of this process



The figure shows iris detection process output

2. **Iris detection**: Iris discovery is a very vital step in the design as without iris images training deep neural versions will wear. We can specify the iris as it's the region in between the pupil and the rest of the eyes. Hough change has a lot of applications it has been made use of to identify various patterns for instance lines as well as circles.





For each pixel (x,y), the Hough transform algorithm uses an accumulator to detect r.

Parameters -

r: distance from (0,0) i.e Origin wrt x, y axis, perpendicular to a point on line

Θ: angular orientation between r ,x

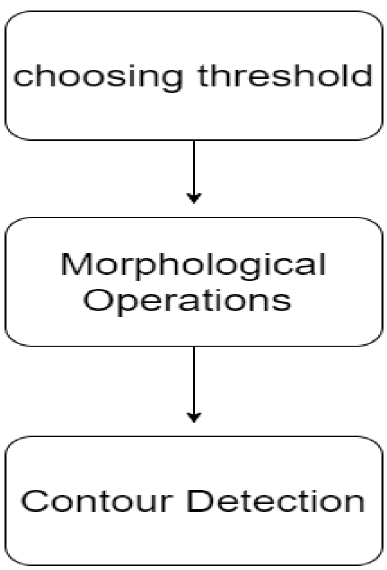
For theta (0° to 360°)

$r = x \times \cos(\Theta) + y \times \sin(\Theta)$ (1)

Accumulator(r, ϴ) = Accumulator(r, ϴ) +1

In this phase, the model takes the images detected in the last phase and applies Hough transform on these images to ensure that there is an iris inside the eyes so that to avoid the case when the eyes are closed or anything else that makes the iris doesn't appear in the image. So basically, this phase detects the iris inside the eyes and the image will pass to the next step if it successfully passes this step.

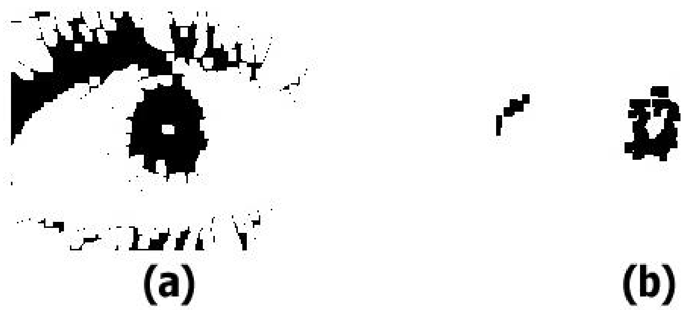
3. **Iris Segmentation**: -Iris segmentation plays the most important role in iris recognition as the features extracted from the iris segmentation process will be used in the classification process so the accuracy of classification will depend on the quality of the segmented images If the image passes the first and second steps successfully it will reach this step. In this paper, a new segmentation algorithm is introduced which contains three steps: Choosing Threshold, Morphological Process, and Contour Detection.



Iris Segmentation Architecture

If A and B represent the grayscale image and structuring element respectively in and E is the Euclidean space where A exists then :
We can define dilation as: $A+B = \{z \in E|\ A\ \}$
We can define erosion as : $A\text{-}B = \{z \in E|\ B_z \subseteq A\}$
From equations (1) and (2) we can defined opening and closing operations as:

Opening between (A, B) = ((A-B)+B)
Closing between (A, B) = ((A+B)- B)



Iris Segmentation using the above formula

4. **DCT Transformation**:- An image represented in the discrete cosine transform (DCT) form is the sum of sinusoids of varying magnitude and frequency. The discrete cosine transform of a two-dimensional image is calculated using the dct mathematical equation. For a regular image, as per the DCT property, all of the visually relevant data are to be found in just a few DCT coefficients.

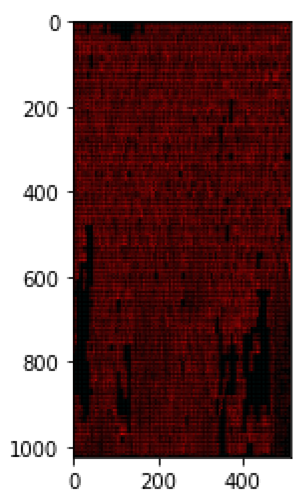


Fig. DCT image.

5. **Network Architecture**
The following is a model for CNN:

```
Model: "model_6"
__________________________________________________________________________________________________
Layer (type)                    Output Shape         Param #     Connected to
==================================================================================================
input_10 (InputLayer)           [(None, 128, 128, 3) 0
__________________________________________________________________________________________________
conv2d_68 (Conv2D)              (None, 128, 128, 8)  1184        input_10[0][0]
__________________________________________________________________________________________________
max_pooling2d_29 (MaxPooling2D) (None, 64, 64, 8)    0           conv2d_68[0][0]
__________________________________________________________________________________________________
conv2d_69 (Conv2D)              (None, 64, 64, 16)   3216        max_pooling2d_29[0][0]
__________________________________________________________________________________________________
max_pooling2d_30 (MaxPooling2D) (None, 32, 32, 16)   0           conv2d_69[0][0]
__________________________________________________________________________________________________
conv2d_70 (Conv2D)              (None, 32, 32, 32)   4640        max_pooling2d_30[0][0]
__________________________________________________________________________________________________
max_pooling2d_31 (MaxPooling2D) (None, 16, 16, 32)   0           conv2d_70[0][0]
__________________________________________________________________________________________________
conv2d_71 (Conv2D)              (None, 16, 16, 32)   1056        max_pooling2d_31[0][0]
__________________________________________________________________________________________________
up_sampling2d_21 (UpSampling2D) (None, 32, 32, 32)   0           conv2d_71[0][0]
__________________________________________________________________________________________________
concatenate_21 (Concatenate)    (None, 32, 32, 64)   0           up_sampling2d_21[0][0]
                                                                 conv2d_70[0][0]
__________________________________________________________________________________________________
conv2d_72 (Conv2D)              (None, 32, 32, 32)   8224        concatenate_21[0][0]
__________________________________________________________________________________________________
up_sampling2d_22 (UpSampling2D) (None, 64, 64, 32)   0           conv2d_72[0][0]
__________________________________________________________________________________________________
concatenate_22 (Concatenate)    (None, 64, 64, 48)   0           up_sampling2d_22[0][0]
                                                                 conv2d_69[0][0]
__________________________________________________________________________________________________
conv2d_73 (Conv2D)              (None, 64, 64, 24)   4632        concatenate_22[0][0]
__________________________________________________________________________________________________
up_sampling2d_23 (UpSampling2D) (None, 128, 128, 24) 0           conv2d_73[0][0]
__________________________________________________________________________________________________
concatenate_23 (Concatenate)    (None, 128, 128, 32) 0           up_sampling2d_23[0][0]
                                                                 conv2d_68[0][0]
__________________________________________________________________________________________________
conv2d_74 (Conv2D)              (None, 128, 128, 16) 2064        concatenate_23[0][0]
__________________________________________________________________________________________________
conv2d_75 (Conv2D)              (None, 128, 128, 64) 1088        conv2d_74[0][0]
__________________________________________________________________________________________________
dropout_6 (Dropout)             (None, 128, 128, 64) 0           conv2d_75[0][0]
__________________________________________________________________________________________________
conv2d_76 (Conv2D)              (None, 128, 128, 3)  195         dropout_6[0][0]
==================================================================================================
Total params: 26,299
Trainable params: 26,299
Non-trainable params: 0
__________________________________________________________________________________________________
```

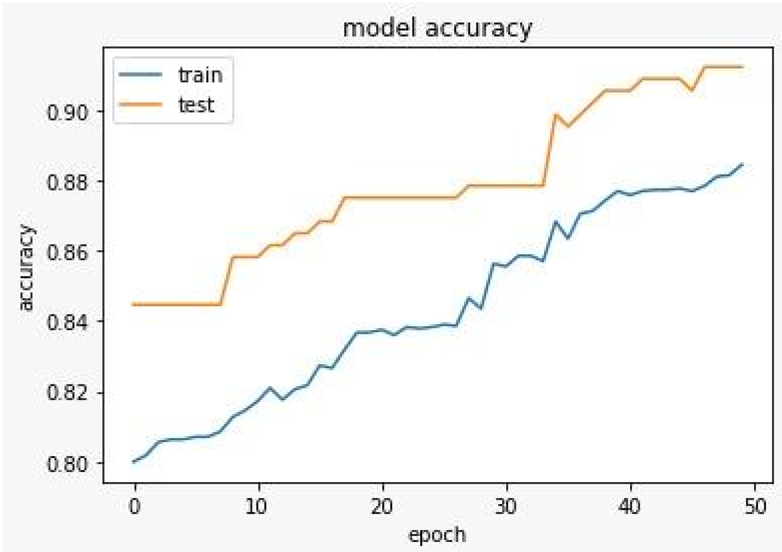
The proposed model is made up of various convolution layers. cascadeNumPyve followed an encoder-decoder typer model in which the first image is downsampled, which is used to learn lower resolution feature mapping, after which upsampling is followed to distinguish between classes and generate the mask for each class.

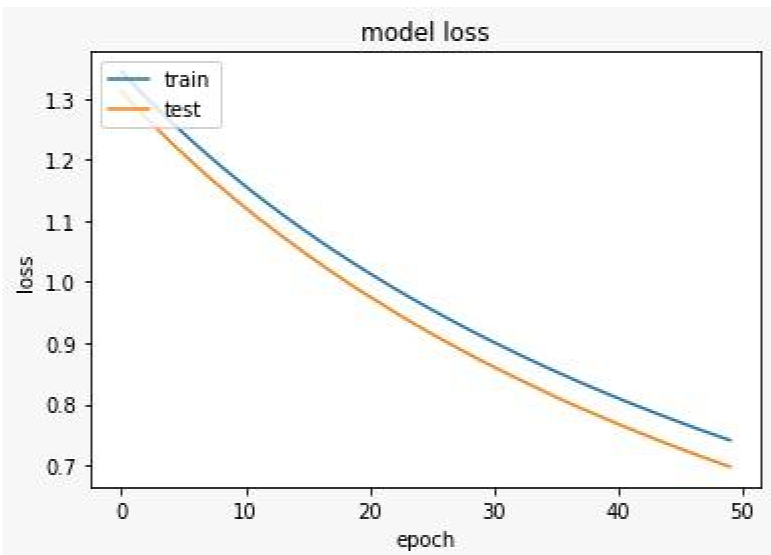
Downsampling: The input to the model is 1024 * 512 *3 dimensions image consisting of three RGB channels. The first layer consists of 8 filters of size (7 * 7), which means the output from this layer after the convolution will be of size (1024 * 512 * 8). further, this output is routed into a Max Pooling layer. This max-pooling layer applies a stride of (2 * 2). It means two of the dimensions will be halved. Hence the output from this layer will be (512 * 256 * 8).   This completes a single layer of the convolutional layers. The following layer is also a convolutional layer with 16 filters of magnitude (5 * 5). The output from this layer is (512 * 256 * 16). Again, the output is routed to a Max Pooling layer, strides (2 * 2). The dimensions are again halved along with the height and width. The output from this layer is (256 * 128 * 16). further, a convolutional layer with 32 filters of size (3 * 3) which results in size (256 * 128 * 32) is routed to a Max Pooling layer whose strides are (2 * 2). We get (128 * 64 * 32) as output from this layer. Coming to the last layer, the convolutional layer uses 32 filters of size (1 * 1) in the downsampling step. The output results in size (128 * 64 * 32).

Upsampling: Next is the upsampling process in the model. Upsampling is performed to extend the mask that has been produced, after downsampling in lower resolution, to a higher spatial resolution. The output from the last layer is upsampled using a stride of size (2 * 2) which doubles the resolution in height and width. The output from the upsampled layer is (256 * 128 * 32). This is then combined with the second last layer from the downsampling. This process is called concatenation. The result after concatenation is (256 * 128 * 64). Next is the convolutional layer which performs convolution over this output with 32 filters of kernel size (2 * 2). The output from this layer is (256 * 128 * 32). This layer is again fed into upsampling layer and concatenate the output from the corresponding layer in downsampling giving us a result of (512 * 256 * 48) which passes through a convolutional layer consisting of 24 filters of size (2 * 2). This outputs a spatial dimension of size (512 * 256 * 24), which in turn is upsampled with a stride of (2 * 2) and concatenated with its corresponding layer in the downsampling step. The output dimension is of size (1024 * 512 * 32). After that, output passes through two convolutional layers consisting of 16 and 64 kernels, followed by a dropout regularization step. In the final step, we use three kernels of size (1 * 1) to match the input size. The final output spatial dimension is (1024 * 512 * 3).

10. Experiments and Result

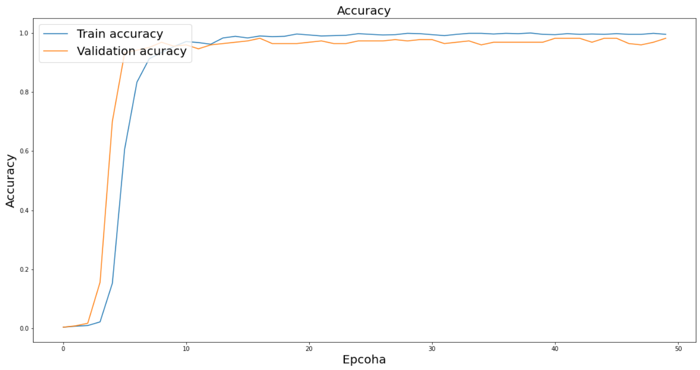
1. **Experiment 1**:- In experiment 1, we have used the Densenet Model to train and test the Casia Interval dataset. In this experiment, the DCT Transformation and the JPEG Compression is not applied to the CASIA Interval dataset. Firstly the three operations - recognition, detection and segmentation take place. After that, the Densenet CNN model is used for the classification purpose. Below is the accuracy and loss of the training and testing graph of the process -





DenseNet Model :
loss: 0.0763 - accuracy: 0.886 - val_loss: 0.0657 - val_accuracy: 0.9241

2. **Experiment 2**:- In experiment 2, we use the gg16 model and also we kept the size of the input to be (128 * 128 * 3). This is a compressed image obtained after Min-Max Normalization. As we can see, this is not quite producing the result that we wished to obtain. The kernel size in the downsampling step has been kept constant. The kernel size is (3 * 3) here. The outputs are shown below:

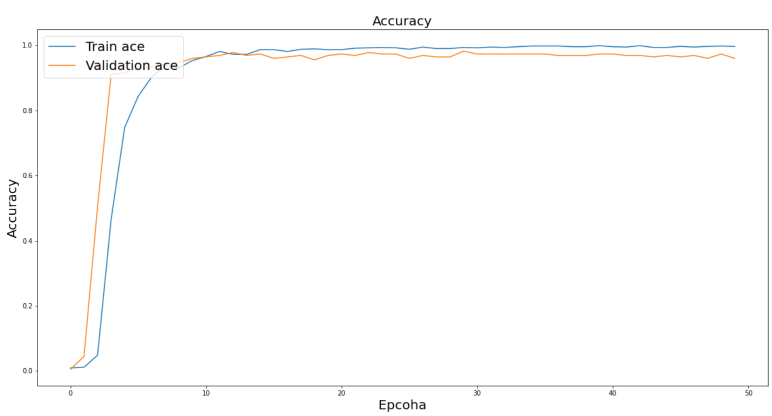


Vgg16 Model :- loss: 0.0463 - accuracy: 0.9655 - val_loss: 0.0837 - val_accuracy: 0.9421

Observation :-: The reasons for such indistinguishable results are quite obvious. The input size is too crunched up to identify individual feature mapping at a lower resolution. The kernel size might also have affected the result since it is kept constant during the whole downsampling process. As a result, the total loss is 4.73% and Accuracy is 96.%

3. **Experiment 3**:-In experiment 3, to obtain a better result as we use the CNN model and classify them into different classes with their corresponding masks, we increased the size of the input to (256 * 256 * 3). The image, as well as the mask, is compressed from its original dimension using min-max normalization. The kernel size is kept constant as in the previous experiment. The outputs are shown below:

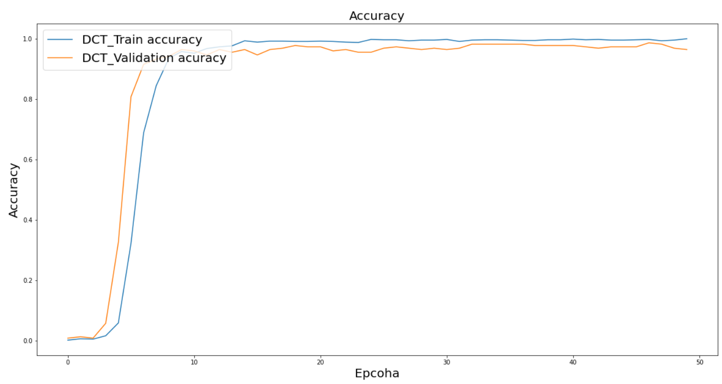
CNN Mode : loss: 0.0376 - accuracy: 0.9867 - val_loss: 0.04639 - val_accuracy: 0.9598



Observation:- The reason for this improvement is that the input has been fed with increased dimensions, plus the kernel size Loss is changing as we go deeper into the convolutional layer. This helps in distinguishing the feature map for different elements separately. As a result, the total loss is 3.73% and Accuracy is 98.45.%

4. **Experiment 4:** In this experiment, the model images that are used are DCT transformed images on the CNN model the input for the model has the dimension (1024 * 512 * 3). The kernel size has been kept the same as in experiment 2. The outputs are given below:

DCT on CNN Model :- loss: 0.0040 - accuracy: 0.9967 - val_loss: 0.1333 - val_accuracy: 0.9643



Observation:-The poor classification might have been due to the poor train-test split. Other reasons such as the increase in the input size might also contribute to the result but it is not obvious. During the downsampling process, with the size of the input increased, the low-resolution feature mapping can learn more distinctive features such as the articles and the images, which have been classified better.

So the result is 99.67% accuracy on our final model .

We have used three different CNN models for classification and applied Iris recognition and segmentation techniques on the IITD Iris dataset and the CASIA Interval Dataset. In the first experiment only simple detection and segmentation techniques are applied on the Casia Interval Dataset. It takes hours to train the complete dataset on the DenseNet Model.

In the next experiment VGG16 Model was used with min-max Normalization on the dataset which consists of both IIT Delhi and CASIA Interval Dataset. The result was slightly improved as compared to the previous model.

In the last experiment, we have applied the JPEG Compression technique with the DCT transformation on the complete dataset. This reduces the training time and with the JPEG Compression, it becomes easy to train the complete dataset on the CNN Model. The final result on the training dataset is 99.67% and it was the best result obtained concerning the available models.

11. Comparative Analysis

Reference	Method	Recognition Accuracy
Casia Iris-Thousand		
[11]	DenseNet 1	98.80%
[12]	vgg net 2	90%
[13]	Capsule 3	83.1
[14]	M-EGM 4	98.80%
[15]	Alex-Net 6	98%
[16]	MiCoRe-Net 7	88.70%
Proposed	CNN	99%
Casia Iris-Interval		
[17]	uncertainty theory method 14	99.60%
[18]	KL Tracking 16	99.75%
[19]	Krawtchouk Moments with Manhattan distance 5	99.80%
[20]	k-nearest subspace, sector-based and cumulative sparse concentration 17	99.43%
Proposed	CNN	99%
IITD v1		
[21]	HSV colour,,space 10	97.43%

[22]	shape analysis 11	95.08%
[23]	Gabor filter 12	93.90%
[24]	Sum-Rule Interpolation 13	98.00%
[25]	curve[et transform 15	97.50%
Proposed	DCT transformation	99.32%
IITD		
[26]	Dual-Hahn moments 5	97.5
[26]	Krawtchouk moments 5	94.5
[27]	fuzzy matching	97.11
[28]	MiCoRe-Net 7	96.12%
[29]	k-NN 8	94.8
Proposed	DCT transformation -CNN	99.69%

This project proposed another iris detection and recognition framework which performs high precision on various public datasets. The paper likewise proposes another iris division strategy that influences the last precision on each dataset. The execution of the proposed iris acknowledgement model is better than different techniques. The recently proposed iris division strategy performs high precision which makes huge outcomes in the segmentation step. All the strategies on iris acknowledgement centre around iris segmentation and iris division yet there are no techniques centred around ventures before that in this paper the proposed strategy takes a full excursion from recognizing iris then, at that point, extricating iris includes then, at that point, characterize the iris so the proposed iris acknowledgement framework is a full technique which can be tried on any sorts of pictures. In the table above there are various techniques and ways to deal with iris recognition and the proposed strategy performs the most elevated precision among any remaining strategies. The proposed model achieved precision on Casia-1000, Casia Iris Interval, UbirisV1 and UbirisV2 that is higher than the different models in table above.

12. Activity Schedule

Steps	Time Required	Predicted Date & Time
Requirement Verify	Done	24-08-2021
Project Planning	Done	2-09-2021
System & Detail Design	Done	17 -09-2021
Coding	Done	15-10-2021
Debugging and coding	Done	1-11-2021
Testing	Done	13-11-2021
Documentation and Final	Done	25-11-2021

13. Conclusion

In this paper, the A CNN model has been presented for segmenting and recognition of the iris, we have experimented with RGB images and DCT transformed images for our datasets. The experimental results of our model show the accuracy and loss of all 4 types of experiments we performed. The accuracy for RGB and DCT while training is 0.9866 and 0.9967. As the result, while experimenting we get the highest training accuracy while using DCT. All the methods on iris recognition focus on iris classification and iris segmentation but there are no methods focus on steps before that in this paper the proposed method takes a full journey from identifying the eyes to detecting iris then extracting iris features then classifying the iris so the proposed iris recognition system is the full method which can be tested on any types of images. Hence, this concludes all work done.

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