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Facial Age Estimation with Age Difference

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Abstract: Estimating human age by automation is required mainly for security purposes. But the system getting developed won't help with the correct output of ages. For increasing the accuracy, system is developed with Convolutional Neural Networks and estimating KULLBACK LEIBLER DIVERGENCE for finding the entropy loss to enhance the output efficiency. Thus the system is designed for better accuracy with the formulas driven for finding mean difference between images. It will help to overcome the age difference of the images without age labels and also train large amount of images without labels.

Index Terms— Kullback-Leibler, Convolutional Neural Network, cross entropy.

I. INTRODUCTION

Face recognition is developed for various purposes and helped in the development of artificial recognition by computer systems. For recognizing human faces, defining age classifier is a major step in this project. This project aims to increase the accuracy of the identification of human faces. The basic concept of images is drawn from pixels. Pixels are the basic forming patterns for any sort of images. Images can be segmented into pixels based on colour patterns. The process of segmenting involves various types such as binary, gray, color. Binary type is a 1-plane pattern having values 0 and1. Grey type is having shades of black and white and it is a 1-plane pattern and having values from 0 to 255. Color is having 3-plane pattern and designed from value range 0 to 256. Image processing mainly depends on this type of colour images. It is having red , green, blue planes. These planes are considered as the origin of all colour patterns . For example, Red and Green gives Yellow, Red and Blue gives Magenta, Green and Blue gives Cyan, Red and Green and Blue gives White, and secondary colours are combined to form black, Magenta and Cyan and Yellow gives Black. We can possibly form 25 lakhs of colour patterns using thes colours. Recognising these colours from images are the basic requirement. This process involves various process such as Acquisition, Enhancement, Segmentation, Recognition, Retrieval, Restoration, Fusion, Compression, Watermarking, Cryptography, Steganography, etc. Automatic recognition is one of the emerging areas of artificial intelligence. There are various types of recognition such as Handwritten recognition, Face recognition, Fingerprint recognition, Voice recognition, etc. The process of recognition gets better with years of research and development . The need for identifying human ages with more accuracy motivates the research on this project. Images are acquired from various formats such as GIF, JPG, JPEG, etc. Images can be acquired through face camera or a file of any image format. The product is developed with the implication of GLCM matrix and the KULLBACK LEIBLER divergence formula. Using these techniques, the process of recognition continues and CNN network is used to estimate the age. The process will be updated and learned with every input images.

II. LITERATURE SURVEY

2.1 IMAGE ACQUISITION

Images for the system are obtained from internet or from camera or through saved files of image formats. There are various files of image formats such as jpg,jpeg,bmp,png,etc. These images are used to develop the system with further processes. It can also be acquired through devices.

2.2 FACE RECOGNITION

In this process of identification of ages using human faces involves segmentation of left eye, right eye, nose and mouth. In this process of identification first the boundaries of face will be found and the process of identifying each parts will be continued. firstly the whole face will be identified and segmented and convert into 256*256 pixels. Then use the process of using cvision toolbox and call the face detection function to capture the image boundary and surrounded it with red rectangle(Rowley et al., 1996).Hold it for more time.

2.3 PREPROCESSING

Preprocessing involves the process of converting image required for face detection. To enhance the image, converting into black and white is essential. Finding four

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vectors for face detection namely x,y,w,h are essential. Then crop the target face into 180*180 pixels with four vector features obtained. Then convert the image having colour into grey image. Obtain the figure and hold the figure using image processing toolbox in MATLAB.

2.4 FACE AND LANDMARK DETECTION

By the same way finding the face using function in image processing toolbox, face and landmark detection also obtained from the toolbox functions. As proposed by M.D.Abdur Rahman[1] ,use detect face parts function for the process of identifying face parts. The parameters used are bbox, bbx, faces, bbfaces. Bbox is used to bound parts of each part such as left eye , right eye, nose and mouth. Finding faces with box is used for the development of program. And also images with found faces determined into array are contributed into bbx. Faces is used for the found faces stored as cell array. bbfaces is used for the found faces with boxes stored as cell array. Each part having different cropping technique. Each part obtaining four esssential features such as contrast, correlation, entropy and homogeneity(Chang and Chen, 2015). Contrast stands for the effect of pixels on the basis of colour depth. Correlation stands for the connection between two things. Entropy stands for the change in two differential functions. Homogeneity stands for the similarity in pixels. For left eye, the segmented ratio will be 5:8. For right eye, segmented ratio will be 9:12. For nose, segmented ratio will be17:20. For mouth, segmented ratio will be13:16. Display all these images combinely and calculate gray level co occurence matrix. Display the ternary Submit your manuscript electronically for review. image of the GLCM matrix. As proposal given by swathi thilakan[2], using mathematical equations define the output by describing the amount of age present in the system input. Firstly, find the Least Square(LS), Mean Absolute Error(MAE)and the mean shifted input images. Then the values of eigen vectors are calculated. Then retain the top eigen vectors. Then project the image into subspace to generate the feature vectors. Then save the loaded data and then train the network and display the age classified using the network.

III. PROPOSED SYSTEM ARCHITECTURE

The following system represents the modules of the system being developed.

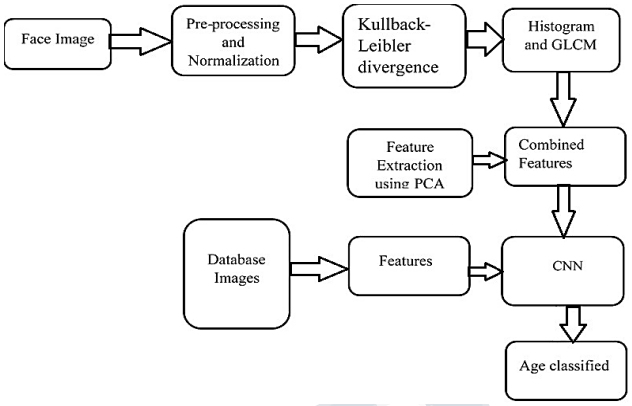

Fig.1. System architecture

3.1. KULLABACK LEIBLER DIVERGENCE

Kullback–Leibler divergence (also called relative entropy) is a measure of how one probability distribution diverges from a second, expected probability distribution. Applications include characterizing the relative (Shannon) entropy in various information systems, randomness in some of continuous time-series, and information gain when comparing statistical models of inference. In contrast to variation of information, it is a distribution-wise asymmetric measure and thus does not qualify as a statistical metric of spread. In the simple case, a Kullback–Leibler divergence of 0 indicates that we can expect similar, if not the same, behavior of two different distributions, while a Kullback–Leibler divergence of 1 indicates that the two distributions behave in such a different manner that the expectation given the first distribution approaches zero. In simplified terms, it is a measure of surprise, with diverse applications .

3.2. CONVOLUTIONAL NEURAL NETWORKS

As stated by Rowley[3], a convolutional neural network (CNN, or ConvNet) is a class of deep, feedforward artificial neural networks that has successfully been applied to analyzing visual imagery.CNNs use a variation of multilayer perceptrons designed to require minimal preprocessing.CNNs use relatively little pre-processing compared to other image classification algorithms. This means that the network learns the filters that in traditional algorithms were hand-engineered. This independence from prior knowledge and human effort in feature design is a major advantage. The classification stage is the decision making part of the recognition system. The 600 pixels derived from the resized character in the segmentation stage form the input to the classifier. In

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general the feature vector is denoted as X, and defined as X = (f1, f2,…,fd), where f denotes features and d is the total number of pixels present in the each character[4]. The number of input neurons is determined by length of the feature vector d. The total numbers of characters n determines the number of neurons in the output layer.

IV. EXISTING SYSTEM

3.1 LOCAL BINARY PATTERN

In local binary pattern , the process will be taken place by convertingthe image into black and white and then into shades of grey and find the centre point and the radius for which the amount of pixels should get surrounded. Firstly, the centre pixel value is taken and then the surrounded radius value of pixels are taken and then compare each pixel with the centre pixel and then find the difference and form a matrix with values neglecting centre value. To create a matrix with large values there is a part of centre pixels should involved. The LBP vector is developed with high set of data. But in case of high accuracy, centre pixels are necessary. This is the major drawback for the Local Binary patterns.

3.2 ARTIFICIAL NEURAL NETWORK

As stated by the research paper presented by ROWLEY[3],Artificial Neural Network (ANN) system operates in two stages: it first applies a set of neural network-based filters to an image, and then arbitrates the filter outputs. The filters examine each location in the image at several scales, looking for locations that might contain a face. The arbitrator then merges detections from individual filters and eliminates overlapping detections. The first component of our system is a filter that receives as input a 20x20 pixel region of the image, and generates an output ranging from 1 to -1, signifying the presence or absence of a face, respectively. To detect faces anywhere in the input, the filter is applied at every location in the image. To detect faces larger than the window size, the input image is repeatedly subsampled by a factor of 1.2,and the filter is applied at each scale. 1. Create an initial set of non-face images by generating 1000 images with random pixel intensities. Apply the preprocessing steps to each of these images. 2.Train the neural network to produce an output of 1 for the face examples, and -1 for the non-face examples. The training algorithm is standard error back propogation. On the first iteration of this loop, the network weights are initially random. After the first iteration, we use the weights computed by training in the previous iteration as the starting point for training. 3. Run the system on an image of scenery which contains no faces. Collect subimages in which the network incorrectly identifies a face (an output activation0). 4. Select up to 250 of these sub images at random, apply the preprocessing steps, and add them into the training set as negative examples. Go to step 2. Drawbacks over existing systems: 1. In appearance based methods, less accurate of features description because of whole image consideratioin. 2. In geometric based methods, the geometric features like distance between eyes, face length and width,etc., are considered which not provides optimal results.

V. CODING

In Image acquisition, the recognition system acquires a scanned image as an input image. The image should have a specific format such as JPEG, BMP etc.

cd Image [file,path] = uigetfile('*.jpg;*.png','pick an image file'); img = imread(file);

5.1. FACE RECOGNITION

In this process of identification of ages using human faces involves segmentation of left eye, right eye, nose and mouth. In this process of identification first the boundaries of face happens and the process of identifying each parts will be continued. Fdetect = vision.CascadeObjectDetector;
Bvectors = step(Fdetect,tinp);
figure('Name','Face Detection','MenuBar','none');
imshow(tinp);
hold on;

5.2 .PREPROCESSING

Preprocessing involves the process of converting image required for face detection. To enhance the image, converting into black and white is essential. Finding four vectors for face detection namely x,y,w,h are essential.
Freg = imcrop(tinp,Bvectors(1,:)); Freg = imresize(Freg,[180,180]); if size(Freg,3)>1 Freg = rgb2gray(Freg); end figure; imshow(Freg);
title('Preprocessing');

5.3 FACE AND LANDMARK DETECTION

By the same way finding the face using function in image processing toolbox, face and landmark detection also obtained from the toolbox functions. Use detect face parts function for the process of identifying face parts. The parameters used are bbox, bbx, faces, bbfaces.
detector = buildDetector();

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[bbox,bbimg,faces,bbfaces] = detectFaceParts(detector,img,3); figure;imshow(bbimg);
title('Face Landmark Detection'); leye = imcrop(img,bbox(:,5:8));
PTPleye = ptp(leye);
[cont1,corr1,En1,Homo1] = GLCM(PTPleye);
Feat1 = [cont1;corr1;En1;Homo1];
```

5.4 LOADING AND TRAINING DATABASES

Using mathematical equations define the output by describing the amount of age present in the system input. Firstly, find the mean image and the mean shifted input images. Then calculate the eigen vectors and eigen values. Then retain the top eigen vectors. i = 1:size(Dfeatures,2) if M==0
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N =N+1; M = 0; else M = M-1; end T(1,i) = N; end disp('Training Feature Vectors :'); disp(Dfeatures); helpdlg('Training Process Completed');

The following picture demonstrates the total output of the system being developed.

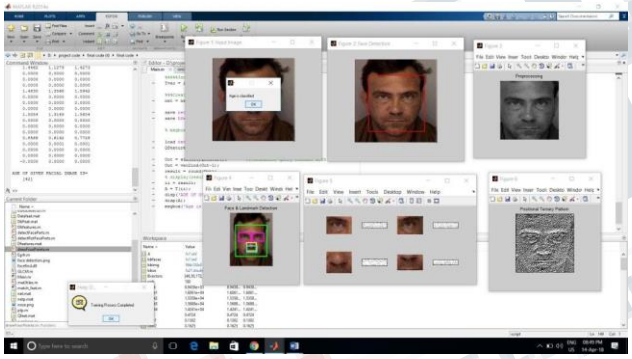

Fig.2. Final output screenshot

VI. CONCLUSION

The face recognition system with namely, Convolutional NN for recognizing human faces has been described in this paper. The feature extraction and classification tasks are performed together as a single process and additional feature of digital search is added in the proposed system unlike in typical handwritten recognition systems in which these tasks are carried out in two different stages. As a result, the proposed system is found to be less complex and allows faster recognition of faces Experimental results show that the convolutional neural network is distinctly superior to the other classifiers in recognizing the human faces Further investigation was carried out to identify the recognition rates for each faces of human. This would help to estimate the recognition rate irrespective of the ages of human. It was identified that the Convolutional NN outperformed the remaining classifiers[5]. The proposed system will find useful applications in recognizing the human faces, for security purposes and so on. Further improvements may be possible with a more complex Convolutional NN architecture but this would also increase the computation complexity. Therefore, combination of a standard feature extraction technique with convolutional NN and gullback Divergence technique may provide better solutions.

VII. REFERENCES

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