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Face Detection based on Skin Color in Image by Neural Networks

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Face detection is one of the challenging problems in the image processing. A novel face detection system is presented in this paper. The approach relies on skin-based color features extracted from two dimensional Discrete Cosine Transfer (DCT) and neural networks, which can be used to detect faces by using skin color from DCT coefficient of Cb and Cr feature vectors. This system contains the skin color which is the main feature of faces for detection, and then the skin face candidate is examined by using the neural networks, which learn from the feature of faces to classify whether the original image includes a face or not. The processing is based on normalization and Discrete Cosine Transfer. Finally the classification based on neural networks approach. The experiment results on upright frontal color face images from the internet show an excellent detection rate.
Keywords- face detection, skin color segmentation, compressed domain, neural networks.

I. INTRDUCTION

Face detection is an active area of research spanning disciplines such image processing,, pattern recognition and computer vision .face detection and recognition are preliminary steps to wide of applications such as personal identity, video surveillance etc. the detection efficiency influences the performance of these systems, there have been various approaches for face detection, which classified into four categories (i) knowledge based method (ii) feature based method (iii) template matching method (iv) appearance based method .

In the compressed domain chrominance, shape and DCT(Discrete Cosine Transfer) information coefficient was combined by Wang and Chang to achieve high-speed face detection without decoding of the compressed video image. The proposed technique derived in their works direct access content and extraction features in compressed domain instead of pixel domain. The algorithm works directly on the DCT coefficient parameters, DCT coefficient as a feature based compression reduce spatial redundancy and captures the compact information about the patterns .color information is used as the main detection clues. The objectives of this research are to develop better normalization method and also aim to improve the segmentation that will assist and quick detecting faces from Images. And also to implement a classifier face based on neural networks for face detection.

II. FACE DETECTION IN IMAGE

Many techniques for face detection in image were classified into four categories:-

A. Knowledge based method

It dependence on using the rules about human facial feature .It is easy to come up with simple rules to describe the features of a face and their relationships. For example, a face often appears in an image with two eyes that are symmetric to each other, a nose, and a mouth. , and features relative distance and position represent relationships between feature. After detecting features, verification is done to reduce false detection. This approach is good for frontal image; the difficulty of it is how to translate human knowledge into known rules and to detect faces in different poses.

B. Image Based method

In this approach, there is a predefined standard face pattern is used to match with the segments in the image to determine whether they are faces or not. It uses training algorithms to classify regions into face or non-face classes. Image-based techniques depends on multi-resolution window scanning to detect faces, so these techniques have high detection rates but slower than the feature-based techniques. Eigen-faces and neural networks are examples of image-based techniques. This approach has disadvantage of being simple to implement, but it cannot effectively deal with variation in scale, pose and shape.

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C.   Features Based method

This approach depends on extraction of facial features that are not affected by variations in lighting conditions, pose, and other factors. These methods are classified according to the extracted features. Feature-based techniques depend on feature derivation and analysis to gain the required knowledge about faces. Features may be skin color, face shape, or facial features like eyes, nose, etc.... Feature based methods are preferred for real time systems where the multi-resolution window scanning used by image based methods are not applicable. Human skin color is an effective feature used to detect faces, although different people have different skin color .Facial Features method depends on detecting features of the face. Some users use the edges to detect the features of the face, and then grouping the edges. Some others use the blobs and the streaks instead of edges. For example, the face model consists of two dark blobs and three light blobs to represent eyes, cheekbones, and nose. The model uses streaks to represent the outlines of the faces like, eyebrows, and lips .Multiple Features methods use several combined facial features to locate or detect faces. First find the face by using features like skin color, size and shape and then verifying these candidates using detailed features such as eye brows, nose, and hair.

D.   Template Matching method

Template matching methods use the correlation between pattern in the input image and stored standard patterns of a whole face / face features to determine the presence of a face or face features. Predefined templates as well as deformable templates can be used.

III.   FACE DETECTION ALGORITHMS

Information of skin color in a color image is a very popular and useful technique for face detection. The obvious advantage of this method is simplicity of skin detection rules that leads to construction of a very rapid classifier. We can use color information as a feature to identify a person's face in an image because human faces have a special color distribution that differs significantly, although not entirely, from those of the background objects .By using threshold techniques, skin color pixels are identified by the presence of a certain values which corresponding to the respective ranges of skin color. Otherwise, the pixel is classified as non skin color .The system being designed into four main categories, preprocessing, segmentation, feature extraction and classification using neural networks.

A.   Pre-Processing

In fact, processing skin color is faster than other facial features , collecting a data set of skin face by cropping or cutting manually the image skin face and non-skin face to get a dataset of face and non-face. Different people have different skin color, while the difference lies mostly in the color intensity not in chrominance color itself. The suitable color space to model skin color and a void variation of lighting condition of Color space.

B.   Segmentation Skin Color

Skin color information is very important features for many researches, however the accuracy of skin color detection is important for face detection .In this paper we convert the image from RGB to cyber .where
are RGB is sensitive to the variation of intensity. Many skin detection methods ignore the luminance component of the color space, to achieve independent model of the differences in skin appearance that may arise from the difference of human race, and also reduce the space dimension. After collecting a different human faces and analyzing the histogram distribution sample skin color values of chrominance component to represent the likelihood of the pixel belonging to the skin region.

C.   Feature Extraction

Discrete cosine transform is used widely in many application and mainly used in the compressed data domain and forms the basis well known JPEG image compression format. Jiang el.al introduced a simple low cost and fast algorithms that extract dominant color feature directly from DCT rather than in the pixel domain. The extracted DCT Coefficient can be used as type of a signature of which might be useful for recognition task, such as facial expression recognition .

D.   Classification

Neural networks are often used in face detection , Rowley, Baluja , Kanade proposed a face detection methods based on neural networks, that could discriminate between face and non face on large dataset images. In our system , we use (MLP) multi layer

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perception back propagation neural networks in order to training data set and classify features that are extracted using DCT (Discreet Cosine Transfer coefficient) .after divided into blocks of size8x8 pixels). Training using a vector obtained from 18X27 training data set of 8x 8 pixel block for true oval face may usually guarantees that only pixels the face are used as input to neural networks, however, to produce an output of 0.9 for the skin face and 0.1 for the non-skin face after repeatedly presented input samples and desired targets, compared the output with the desired and measuring the error and adjusting the weights until correct output for every input. The main advantage of choosing Back propagation neural networks the simplicity and capability in supervised pattern matching.

IV.   NEURAL NETWORKS

Neural networks have been applied in many pattern recognition problems like object recognition .there is many image based face detection using neural networks the most successful system was introduced by Rowley et al as using skin color segmentation to test an image and classify each DCT based feature vector for the presence of either a face or non face . The neural networks used in this paper back propagation neural networks was chosen because of simplicity and its capability in supervised pattern matching. The structure of the neural network with three layers , the input layer is a vector of 1xn DCT coefficient vectors of neuron from each image either face or non face image , the hidden layers has n neurons , and the output layer is a single neuron which is 0.9 if the face is presented and 0.1 otherwise. The neural networks is trained using DCT coefficient feature vectors after skin face color candidate obtained from the segmentation stage, which are the DC and the first three zig-zag order AC's features samples from each blocks 8x8 pixels of an manually cropped image 18x27 pixel of face and non-faces to classify each feature vector as output value 0.9 for a face and 0.1 for non-face.

V.   EXPRIMENTS AND RESULTS

We show in the section a set of experimental results to presents the performance of the proposed system , the experimented was implemented using Matlab Version 7.2 on the Intel Pentium(4) 2.80Ghz 1.00GB of RAM and Windows XP operating system . This section presents results of experiment applied on the unknown input test image containing a face or non-face.Starting with sliding overlapping window 18x27, by overlap scanning the window , where different overlap parameter used 1,2 up to the half pixels , in our experiment 9 pixel is the half of the window it might be maximum overlap, then each part of the unknown test image is scanned using slide window
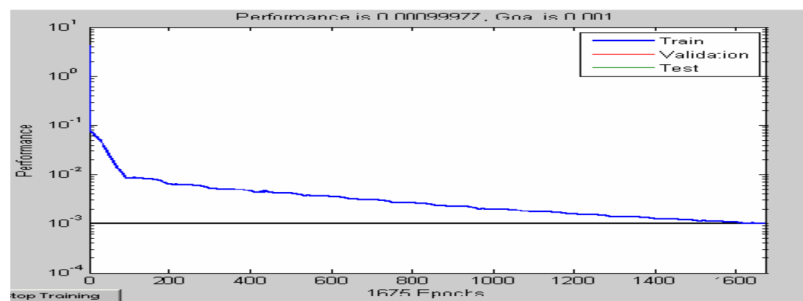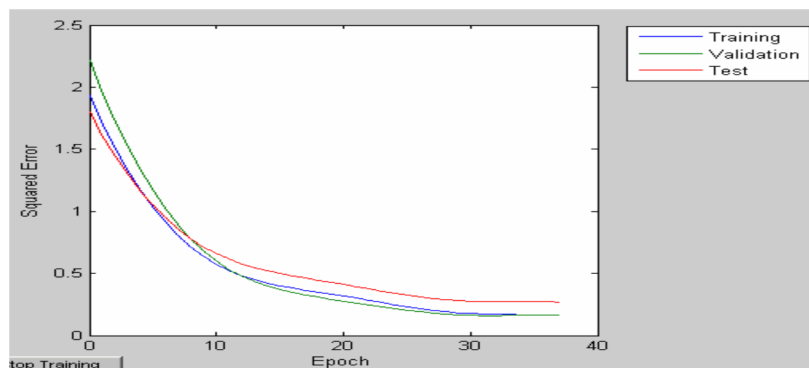

Fig. a Training performance

Fig. b NN's trained with the training, cross-validation and testing

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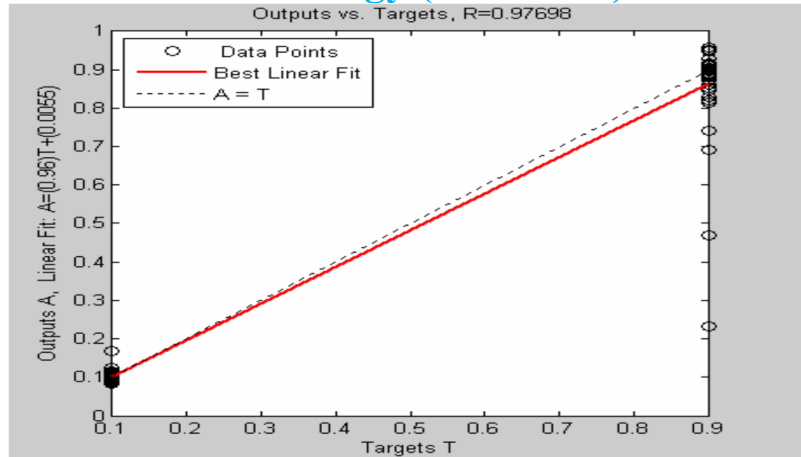

Fig.c Linear regression

and extracted the DCT features and feed it to the trained neural networks of the dataset of images . However the neural networks tested with the trained neural networks and classify it to see if the part containing a face or non face. The experiment results shows that our face detection system is reliable that neural networks able to detect and classify pattern features accurately under different overlap sliding scan window over the unknown input test image. The converge response of training dataset shows accurate and excellent face and non-classification as in fig.a . In fig.b the result is reasonable, since the test set error and the validation set error have similar characteristics, and The next step is to perform some analysis of the network response. By putting the entire data set through the network (training, validation and test) to perform a linear regression between the network outputs and the corresponding targets as shown in fig.c, according to the excellent response of the Back propgation neural networks with the target desired ,the classification performance provides a comprehensive excellent picture of the classification performance of the classifier.

VI.   FUTURE WORK

There are a number of directions for future work. The main limitation of the current system is that it only detects upright faces looking at the camera. Separate versions of the system could be trained for each head orientation, and the results could be combined using arbitration methods similar to those presented here. Preliminary work in this area indicates that detecting profiles views of faces is more difficult than detecting frontal views, because they have fewer stable features and because the input window will contain more background pixels. We have also applied the same algorithm for the detection of car tires and human eyes, although more work is needed.

Even within the domain of detecting frontal views of faces, more work remains. When an image sequence is available, temporal coherence can focus attention on particular portions of the images. As a face moves about, its location in one frame is a strong predictor of its location in next frame. Standard tracking methods, as well as expectation-based methods can be applied to focus the detector's attention. Other methods of improving system performance include obtaining more positive examples for training, or applying more sophisticated image preprocessing and normalization techniques.

One application of this work is in the area of media technology. Every year, improved technology provides cheaper and more efficient ways of storing and retrieving visual information. However, automatic high-level classification of the information content is very limited; this is a bottleneck that prevents media technology from reaching its full potential.

VII.   CONCLUSIONS

This paper proposes a new algorithm for face detection in the compressed domain , extracted DCT coffecient vector features after segmentation a face skin candidate using skin color information along with back propgation neural networks classifier. we have divided the problem into three stages pre-processing ,segmentation ,and classification using back propagation neural networks. The system has been tested on a dataset of upright frontal color face images from the internet and achived excellent detection rate..These methods as a future work, will improve the detection of faces in compressed images to be use for face image retrieval based on skin color and also we may split the features DC's and AC's and feed it as two inputs to the neural networks.

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REFERENCES

[1] H. Rein-Lien, M. Abdel-Mottaleb, and A. K. Jain, "Face detection in color images,"

[2] H. A. Rowley, S. Baluja, and T. Kanade, "Neural network-based face detection,"

[3] F.Smach,M.Atri,J.Miteran and M.Abid " Design of a Neural Networks Classifier for Face Detection" in Journal of computer Science .

[4] Lamiaa Mostafa,Sharif Abdelazeem " Face Detection Based on Skin Color Using Neural Networks"

[5] V. Vezhnevets, V. Sazonov, and A. Andreeva "A survey on pixel- based skin color detection   techniques".

[6] L. Ma and K. Khorasani "Facial expression recognition using constructive feed forward neural networks".

[7].an introd6. http://en.wikipedia.org/wiki/neuraluction to neural computing .Aleksander and morton,H. nd edition

[8]. http://en.wikipedia.org/wiki/neural

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