International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE)
Volume 3, Issue 9, September 2014

Result Analysis of Image verification using Gabor filter bank along with Hidden markov model

Rakesh Kumar Mishra, Anand Swaroop Khare, Sourabh jain

ABSTRACT : **Image verification system is a mechanism of identifying various faces against some stored pattern faces. It takes input an image of a human being face and searches for a match in the stored face images. If there is match, the user can see the result as face verified or not verified. Outsider cannot generate any type of modification in the stored image records. The vendor of the system has authentication to renew the storage records. Gabor-based face representation has achieved enormous success in image verification. In particular, the use of HMM (Hidden Markov Models) in various forms is investigated as a recognition tool various for matching the input face image to the template images.Current image verification techniques are very dependent on issues like background noise, lighting and position of key features (i.e. eyes, lips etc). In this dissertation the system developed uses the hidden Markov model (HMM) in various forms is investigated as a recognition tool and critically evaluated**

Index Terms **HMM(Hidden Markov Model),DRT(Discrete Random Transform)**

I. INTRODUCTION

A face recognition system is accepted to identify faces present in images automatically. It can operate in two modes (1) face verification and (2) face identification. Face verification involves a one to one match that compares a query face image against a template face image whose identity s being claimed. Face identification involves one too many matches that compares a query face images against all the templates images in the database to determine the identity of the query face.

The performance of face recognition system has improved significantly where illumination, expression, occlusion and so on vary considerably. Face recognition is a visual pattern recognition problem. The faces as a object subject to vary illumination, pose, expression and so on is to be identified based on its two dimensional image. A face recognition system generally consists of four modules detection, alignment, feature extraction and matching.

In this dissertation for Face recognition I have used two methods: (1) Gabor filter and (2) hidden Markov model (HMM). A hidden Markov model (HMM) is a statistical Markov model in which the system being modeled to be Markov process with unobserved (hidden) states. In a hidden Markov model, the states are not directly visible, but output, dependent on the state, is visible. In this dissertation hidden Markov model is used to match a test facial image with an appropriate reference image and Gabor filter is commenced on convolving a face image with a series of Gabor filter to extract the sequence of Gabor features from facial image. Discrete Radon transform (DRT) is generated to remove a series of feature vectors from an image.

II. Design of system

For the purpose of feature extraction Gabor filter technique is developed in this dissertation. The volume of the image processing and feature extraction involves the computation of the discrete Radon transform (DRT) of all images . The projections of each image at different angles are obtained by calculating its DRT. The DRT is very similar to the Hough transform (Kaewkongka et al. (1999)). All of these projections constitute a feature vector in an observation sequence after some further image processing (normalization).

Modeling with HMM tends to be quite flexible. In this system to model a specific facial image two different techniques have been used. Each facial image is modeled by an observation sequence that represents the person most representative training image as in the case of the DTW-based system. It acts as a pattern for the image. While each facial image is modeled by an HMM of which the states are organized in a ring in the case of the HMM-based system.

For the purpose of matching the distance between a test image and a model for the claimed image is obtained. The DTW-based system matches the similarity between the observation images of the claimed facial image, by first aligning these observation sequences. This alignment is important to achieve rotation invariance and is discussed in more detail in further chapter.

ISSN: 2278 – 909X

III. HIDDEN MARKOV MODEL(HMM)

In a regular Markov model, the state is directly visible to the observer, and therefore the state transition probabilities are the only parameters. In a *hidden* Markov model, the state is not directly visible, but output, dependent on the state, is visible. Each state has a probability distribution over the possible output tokens. Therefore the sequence of tokens generated by an HMM gives some information about the sequence of states. Note that the adjective 'hidden' refers to the state sequence through which the model passes, not to the parameters of the model; even if the model parameters are known exactly, the model is still 'hidden'.

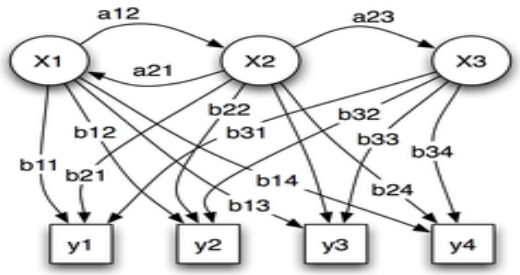


Figure 1 : Probabilistic parameters of a hidden Markov model Where x states, y -possible observation. a - state transition probabilities, b - output probabilities

IV. PROPOSED ALGORITHM

In this dissertation I have merged two technique/ algorithm:

- Gabor filters.
- Hidden Markov model.

V. WHY WE USE GABOR FILTER

In image processing, a **Gabor filter**, named after Dennis Gabor, is a linear filter used for edge detection. Frequency and orientation representations of Gabor filters are similar to those of the human visual system, and they have been found to be particularly appropriate for texture representation and discrimination. In the spatial domain, a 2D Gabor filter is a Gaussian kernel function modulated by a sinusoidal plane wave. The Gabor filters are self-similar: all filters can be generated from one mother wavelet by dilation and rotation .

J. G. Daugman discovered that simple cells in the visual cortex of mammalian brains can be modeled by Gabor functions. Thus, image analysis by the Gabor functions is similar to perception in the human visual system.

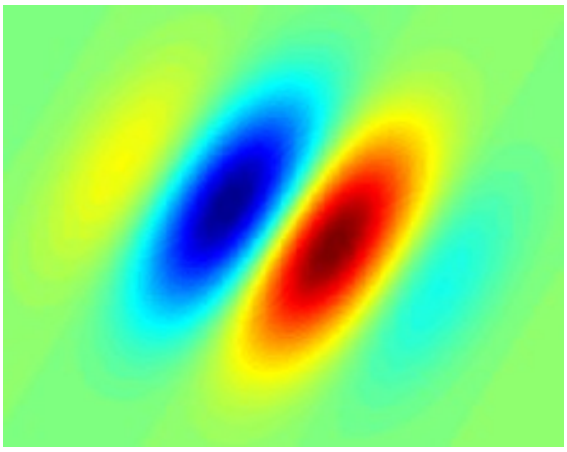


Figure 2 : A two-dimensional Gabor filter

Its impulse response is defined by a harmonic function multiplied by a Gaussian function. Because of the multiplication-convolution property (Convolution theorem), the Fourier transform of a Gabor filter's impulse response is the convolution of the Fourier transform of the harmonic function and the Fourier transform of the Gaussian function. The filter has a real and an imaginary component representing orthogonal directions

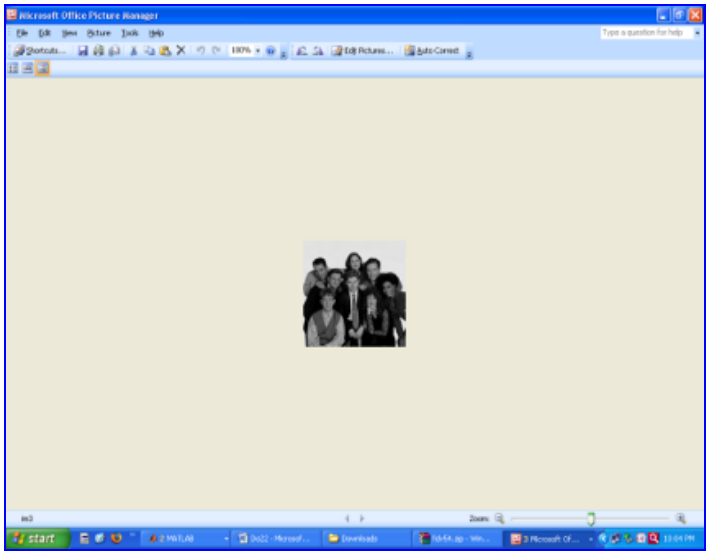
A set of Gabor filters with different frequencies and orientations may be helpful for extracting useful feature.

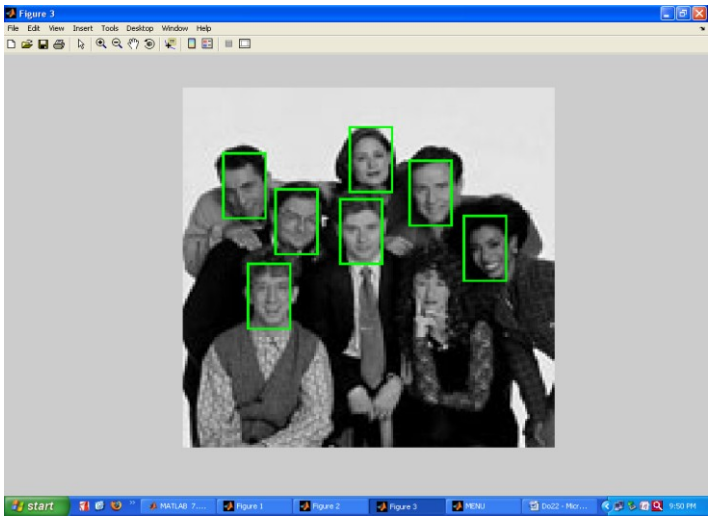
VI. RESULT

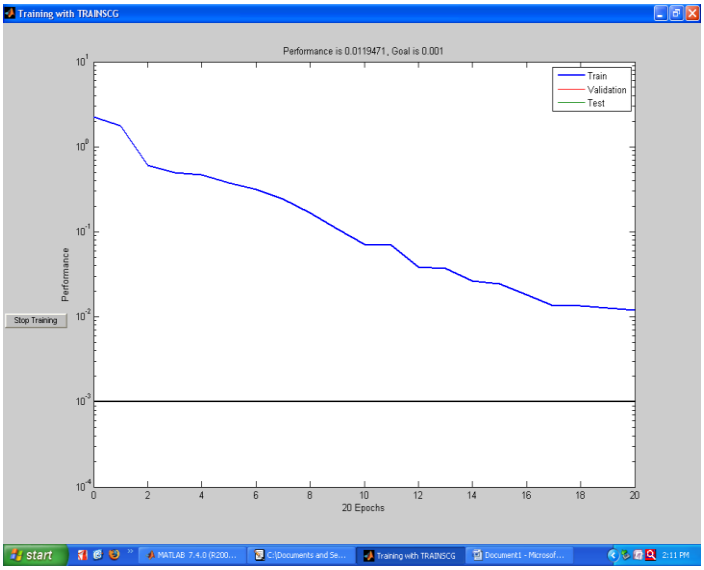
Gabor filters for feature extraction and DRT to extract the series of feature vectors are used in this dissertation. The scheming of Gabor filter is free to the difference in size of the face image used; the size is limited to the matrix dimension 8 x 5. The features are extracted during the convolution of the face image through the filter; the size of characteristic matrix depends on the image size dissimilarity.

Without considering the Gabor filter the DRT is performs directly to the image, the size of feature vector depends on the image size. For different values of observations, position and feature length, it is obvious that the presentation of the scheme will differ.

ISSN: 2278 – 909X







1)

I. CONCLUSION

In ths dissertation, study in Hidden Markov Model facial image verification system is done. Investigation of HMM as a facial recognition tool is used and HMMs topologies are also used as a face classifier against available database. The feature extraction method is based on the GABOR features extraction and the calculation is done with help the DRT. For detection a set face image is used in the training of HMM. The images in the training set represent frontal faces of different people. The uniform segmentation is replaced by Viterbi segmentation. Face detection of test image that contains more than one face is done by looking within each rectangular window in the test image extracting the observation vectors, and computing the probability of data inside each window given the face model.

REFERENCES

1. Barua, S. (1992). Neural Networks and their Applications to Computer Security. Proceedings of the SPIE - International Society for Optical Engineering, pp. 735-742
2. Bastos, L.C., Bortolozzi, F., Sabourin, R., and Kaestner, C. (1997). Mathematical Modelation of Handwritten Signatures by Conics. Revista da Sociedade Paranaese de Matem´atica, vol. 18, pp. 135-146.
3. Beylkin, Gregory, (1987) Discrete Randon Transform. IEEE.
4. Bhuiyan, Al-Amin,(2007) On Face Recognition using Gabor Filters. IEEE.
5. Bracewell, R.N. (1995). Two-Dimensional Imaging. Prentice Hall.
6. Coetzer , B. M. Herbst , J. A. du Preez " image Verification Using the Discrete Radon Transform and a Hidden Markov Model", EURASIP Journal on Applied Signal Processing 2004:4, 559–571
7. Vahid Kiani, Reza Pourreza & Hamid Reza Pourreza "image verification Using Local Radon Transform and Support Vector Machines." International Journal of Image Processing (IJIP) Volume(3), Issue(5)
8. MettaMadhavi, Dr.R.V.Krishnaiah, "Effective Implementation techniques in image Verification" M.Tech, Department of CSE, D.R.K.college of

ISSN: 2278 – 909X

engineering and technology, Hyderabad, India., Volume 5, Issue 4 ,2012, PP 25-30

9. Daramola Samuel et. Al. "Novel Feature Extraction Technique For image Verification System", International Journal of Engineering Science and Technology Vol. 2(7), 2010, 3137-3143L.

10. Auckenthaler, R., Carey, M., and Lloyd-Thomas, H. (2000). Score Normalisation for Text-Independent Speaker Verification Systems, Digital Signal Processing, vol. 10, and pp.42-54.

11. Barua, S. (1992). Neural Networks and their Applications to Computer Security. Proceedings of the SPIE - International Society for Optical Engineering, pp. 735-742

Rakesh kumar mishra PG student at ojaswini institute of management & technology demoh, Madhya Pradesh.

Anand Swaroop Khare HOD, electronics & communication department ,OIMT damoh Madhya Pradesh

Sourabh Jain HOD, electrical & electronics department, OIMT damoh, Madhya pradesh

ISSN: 2278 – 909X