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RECOGNIZE HUMAN EMOTIONS: RECOGNITION FROM DCT

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ABSTRACT

The ability to recognize emotion is one of the hallmarks of emotional intelligence, an aspect of human intelligence that has been argued to be even more important than mathematical and verbal intelligence. This paper proposes that machine intelligence needs to include emotional intelligence and demonstrate results toward this goal: developing a machines ability to recognize human emotion from given facial parameter. We describe difficult issues unique to obtain reliable affective data and collect a large set of data from a subject and experience each of two emotional states. This paper presents techniniqus for feature extraction and use algorithm for classification, which is on kernel based. We got 100% recognition accuracy on three classes of emotion, including neutral.

Keywords : *DCT, Mean, Entropy, Energy, SVM.*

1. INTRODUCTION

Human- Computer interaction will be more affective if a computer knows the emotional state of human. Facial emotion contains much information about emotion so if we can recognize facial emotion. However, it is difficult to categorize facial expression from static images. Neural Network may be suitable in this problem because it can improve its performance given more examples. More over, we do not need to know much about the features of the facial expression to build the system. The system will generalize the features itself, given enough examples.

In this paper, we investigate the performance of neural network on this problem; at the same time compare different ways of training the network.

I found that system gives 100% recognition result for known & unknown examples. We have tried for different network & found that svm is most suitable for this pattern recognition problem with learning rate 0.01.

In section 2, I will talk about development of facial parameter set, Kernel based classifier use for recognition in section3 and in section 4, simulation, result by using Neurosolution[11].

1.1 Related work

Pantic Rothkrantz identify three basic problems in facial Expression analysis approach needs to deal with: face detection in facial image, facial expression data extraction and facial emotion classification. Most previous system assume presence of a full frontal face view in the image being analyzed to give the a boost algorithm to exhausticaly pass a search sub-window over the image at multiple scales for rapid face detection. Scales for rapid face detection. Essa & Pentland uses the eigenfaces method via principle component analysis (PCA)[2] To perform data extraction Littlewort et al use a bank of 40 Gabor wavelet filters at different scales. In the final step of expression analysis expression are classified according to some scheme. The most prevalent approaches are based on the existence of six basic emotions as argued by Ekman and facial action coding system (FACS)[5] developed by Paul Ekman & Frisen, which codes expression as combination of 44 facial movements called Action unit.

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1.2 Development o Facial Parameter

Face parameter can be defined in many levels of details. They range from detailed description of the materials property of the face, to the underlying structure and material property of the facial physiology. In one extreme. The parameter can describe the appearance of the face such as how much the brow is raised, how many wrinkles are on the forehead and whether there are side burns. Since the space of the facial appearance is very large the number of parameter to describe all the variation in details often becomes in tractable. Various statical techniques have been developed for compressing the large amount of information to some manageable size. For instance cropping of image and calculation of mean, dct entropy & variance parameter of that image. These parameters are very useful for application like compression, filtering and facial recognition.

If the physical property of this parameter can be simulated accurately, we can produce any kind of facial appearance using physical lows. Physical simulation of biological material is skill an active research areas.

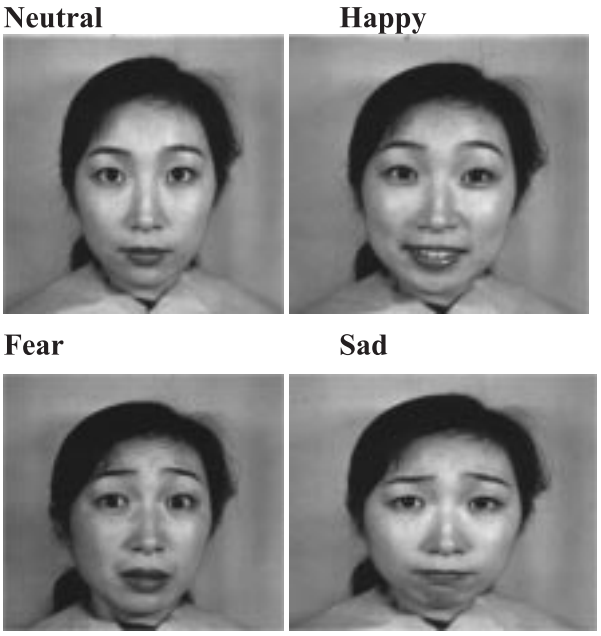

Figure 1 : Japanese Female

The Japanese female facial expression database[7] has been selected as basis for doing the training and recognition of the expression. The cropping techniques have been carried out to determine the best parameter to recognize expression.

2. KERNEL BASED CLASSIFIER[8]

This is more sophisticated learning m/c is obtain by implanting a nonlinear mapping from the input to another space followed by a, linear discriminate function. This is based on 'Cover Therom' Any pattern recognition problem is linearly separate in a sufficiently high dimensionally space called feature space, using nonlinear transformation.

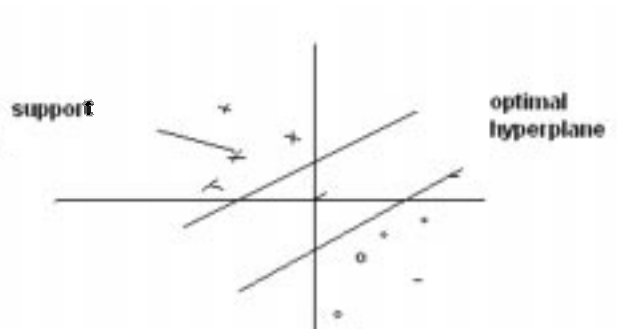

Figure 2 : Optimal hyper plane

2.1 Support vector machine[8]

Goal is to find the optimal hyper plane for non separable Pattern.

According to covers Therom

Multidimensional space may be transformed into a new feature space where the patterns into linearly separable with high probability by satisfying two condition

1) Transformation is nonlinear

2) Dimensionality of the feature space is high.

Hyper plane acting as the decision surface as follows.

$$\sum_{j=1}^{mi} Wi\varphi j(x) + b = 0$$

$\{Wi\}_i^m$ - Linear weights connecting to feature space to the output space

b = bias
mi dimension of feature space

By using Langrangian function w is define by

$$\omega = \sum_{i=1}^{N} \alpha idi\varphi(xi)$$

$\varphi(xi)$ = feature space

Xi = input pattern

Bi taking inner product of two vector the optimal hyper plane is given by

$$\sum_{i=1}^{N} \alpha idi\varphi(xi)\varphi(xi) = 0$$

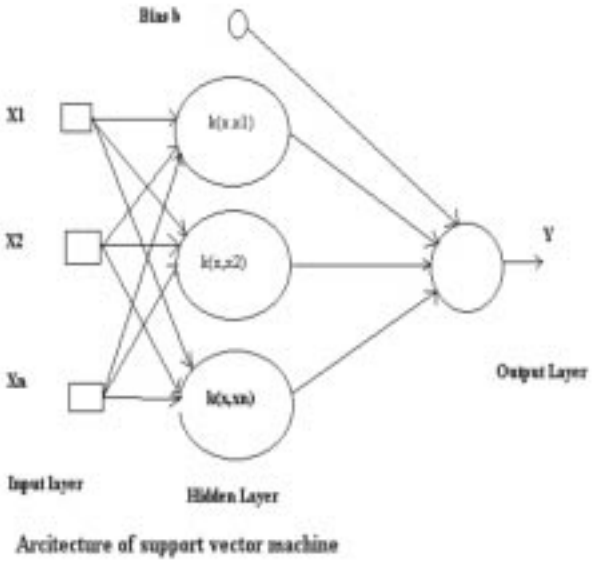

Figure 3 : SVM

3. SIMULATION

Import dataset – Input vector x
Tag data for input as well desired
Save
Tag rows by %
Training 60%
CV 20%
Test 20%
Create Open Network
SVM

Input PEs = 31 —— no of parameter
Output PEs = 2 —— neutral / happy, fear / neutral , sad / neutral
Exemplar = 12 —— Training input
Step size / learning rate 0.01
Epoch = 1000
Stopping Criteria – minimum – for training set MSE

CONCLUSION

In this paper, we discussed recognition of emotional expression on the face. By observing the control parameter over a wide range of facial motion. We can then extract a minimal parameter representation of facial control. We also developed Intelligence machine, which recognize the mood of operator

3.1 Result

Table 1 : Neutral & Happy emotion classification

Output / Desired	*Happy*	*Neutral*
Happy	6	0
Neutral	0	6
Performance	*Happy*	*Neutral*
MSE	0.044407372	0.048359549
Max Abs Error	0.291147709	0.291432451
Percent Correct Training	100	100
Percent Correct Testing	50	100

Table 2 : Neutral & fear emotion classification

Output / Desired	*Fear*	*Neutral*
Fear 6	0	
Neutral 0	6	
Performance	*Fear*	*Neutral*
MSE	0.020783105	0.022577808
Max Abs Error	0.197532131	0.198530696
Percent Correct Training	100	100
Percent Correct Testing	100	100

Output / Desired	*Sad*	*Neutral*
Sad	6	0
Neutral	0	6
Performance	*Sad*	*Neutral*
MSE	0.215462971	0.233563152
Max Abs Error	0.524326852	0.527594636
Percent Correct Training	100	100
Percent Correct Testing	100	100

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