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A REVIEW ON TEXTURE BASED EMOTION RECOGNITION FROM FACIAL EXPRESSION

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ABSTRACT
In the field of image processing it is very interesting to recognize the human gesture for general life applications. Human gestures can be identified by observing the different movements of eyes, mouth, nose and hands. This paper introduces a simple architecture for human facial expression recognition .The approach is based on texture based emotion recognition using facial expressions and using Matlab too.
KEYWORDS: *Expression recognition, Texture analysis, fuzzy logic, Texture Feature.*

I. INTRODUCTION

Emotions are normally displayed by visual, vocal, and other physiological means. One of the important way humans display emotions is through facial expressions. Facial expression is one of the most powerful ways that people bring together conversation and communicate emotions and other mental, social, and physiological cues. The real start of automatic facial expression recognition systems was initiated in the early 1990s. Since the early 1990s, Facial Expression Recognition System had enthralled many researchers from numerous disciplines, such as the fields of robotics, psychology, and computer vision. Moreover, it has gained prospective applications in areas such as human-computer interaction systems, image retrieval, face modeling, patient monitoring systems for pain and depression detection, face animation, drowsy driver detection in vehicle surveillance etc.

II. LITERATURE SURVEY

Mohammad Shahidul Islam, Surapong Auwatanamongkol [1]: This paper presents a new technique to extract the light invariant local feature for facial expression recognition. It is not only robust to monotonic gray-scale changes caused by light variations but also very simple to perform which makes it possible for analyzing images in challenging real-time settings. The local feature for a pixel is computed by finding the direction of the neighboring of the pixel with the particular rank in term of its gray scale value among all the neighboring pixels. When eight neighboring pixels are considered, the direction of the neighboring pixel with the second minima of the gray scale intensity can yield the best performance for the facial expression recognition in our experiment. The facial expression classification in the experiment was performed using a support vector machine on CK+ dataset The average recognition rate achieved is 90.1 ± 3.8%, which is better than other previous local feature based methods for facial expression analysis. The experimental results do show that the proposed feature extraction technique is fast, accurate and efficient for facial expression recognition.
M. Kalaiselvi Geetha, A. Punitha [2]: Their work concentrated on classifying facial expressions into four emotions: Happy, Disgust, Neutral and Surprise using texture features extracted from Gray Level

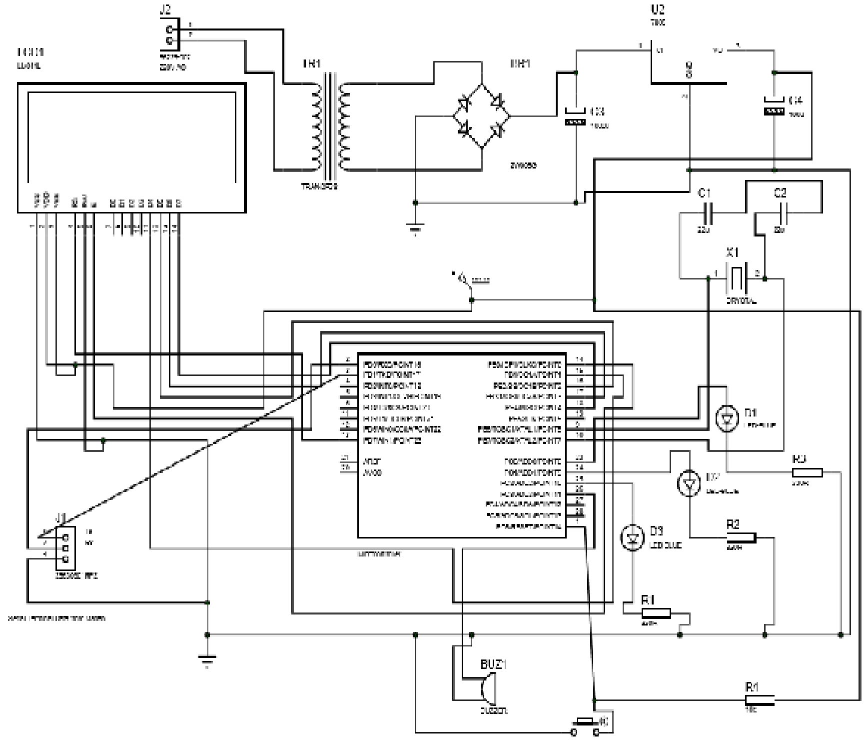
Co-occurance Matrix. The results are proving that GLCM features based SVM is giving higher classification rate of 90 %. The system can be extended to extract higher-order statistical texture feature from images and taking into account some of the strange facial expressions.

Ira Cohen, Ashutosh Garg, Thomas S. Huang [3]: In their work a new method for emotion recognition from video sequences of facial expression was explored. Emotion-specific HMM, relied on segmentation of a contiuous video into sequences of emotions (or neutral state). However, multilevel HMM, performed automatic segmentation and recognition from a continuous signal. The experiments on a database of five people showed that the recognition rates for a person-dependent test are very high using both methods. The recognition rates drop dramatically for a person-independent test. This implied that a larger database is needed for the training, and possibly the subjects should be classified according to some categories, such as ethnic background and gender. This implies the use of a different set of classes to get more robust classification. The classes can be positive, negative, surprise and neutral. This scale clusters the emotions into four categories, and can improve the recognition rate dramatically. This work relied on a database collected by Chen, but it is difficult to compare the results to other works using different databases with computers. Recognizing the emotion from just the facial expressions is probably not accurate enough. The emotional state of a person. Their work is just another step on the way toward achieving the goal of building more effective computers that can serve us better.

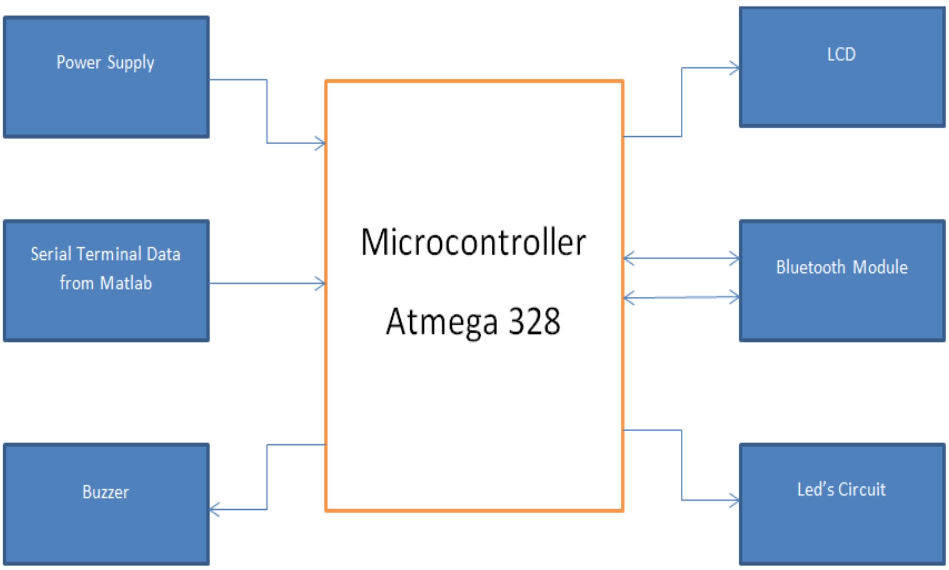
Krupali Joshi, Pradeep Narwade [4]: In Their paper they had presented emotion recognition model using the system identification principle. A comprehensive data driven model using an extended self-organizing map (SOM) had been developed whose input is a 26 dimensional facial geometric feature vector comprising eye, lip and eyebrow feature points. Their paper thus includes an automated generation scheme of this geometric facial feature vector. MMI facial expression database is used to develop non-heuristic model. The emotion recognition accuracy of the proposed scheme has been compared with radial basis function network, and support vector machine based recognition schemes. The experimental result shows that the proposed model was very efficient in recognizing six basic emotions. It also shows that the average recognition rate of the proposed method is better than multi-class support vector machine.

Carlos Busso, Zhigang Deng, Serdar Yildirim, Murtaza Bulut, Chul Min Lee, Abe Kazemzadeh, Sungbok Lee, Ulrich Neumann, Shrikanth Narayanan[5]: This research analyzed the strengths and weaknesses of facial expression classifiers and acoustic emotion classifiers. In these unimodal systems, some pairs of emotions are usually misclassified. However, the results presented in this paper show that most of these confusions could be resolved by the use of another modality. Therefore, the performance of the bimodal emotion classifier was higher than each of the unimodal systems. Two fusion approaches were compared: feature-level and decision-level fusion. The overall performance of both approaches was similar. However, the recognition rate for specific emotions presented significant discrepancies. In the feature-level bimodal classifier, anger and neutral state were accurately recognized compared to the facial expression classifier, which was the best unimodal system. In the decision-level bimodal classifier, happiness and sadness were classified with high accuracy. Therefore, the best fusion technique will depend on the application. The results presented in this research show that it is feasible to recognize human affective states with high accuracy by the use of audio and visual modalities. Therefore, the next generation of human-computer interfaces might be able to perceive humans feedback, and respond appropriately and opportunely to changes of users affective states, improving the performance and engagement of the current interfaces.

III. Circuit Diagram



IV. Block Diagram



V. Texture Feature Analysis

We recognize texture when we see it but it is very difficult to define. This difficulty is demonstrated by the number of different texture definitions attempted by vision researchers Generally speaking, textures are complex visual patterns composed of entities, or sub patterns that have characteristic brightness, colour, slope, size, etc. Thus texture can be regarded as a similarity grouping in an image. There are four major issues in texture analysis:

1) Feature extraction: to compute a characteristic of a digital image able to numerically describe its texture properties;
2) Texture segmentation: to partition a textured image into regions, each corresponding to a perceptually homogeneous texture.
3) Texture classification: refers to the process of grouping test samples of texture into classes, where each resulting class contains similar samples according to some similarity criterion. If the classes have not been defined a priori, the task is referred to as unsupervised classification.
4) Shape from texture: to reconstruct image geometry from texture information.
Approaches to texture analysis are usually categorised into
- Structural,
- Statistical,
- Model-based and
- Transform

We will take statistical method for our texture analysis- The use of statistical features is therefore one of the early methods proposed in the machine vision literature. In the following, we will use $\{I(x, y), 0 \leq x \leq N-1, 0 \leq y \leq N-1\}$ to denote an $N \times N$ image with G gray levels.

5.1 Co-occurrence Matrices

Spatial gray level co-occurrence estimates image properties related to second-order statistics. Haralick suggested the use of gray level co-occurrence matrices (GLCM) which have become one of the most well-known and widely used texture features. The $\boldsymbol{G \times G}$ gray level co-occurrence matrix ***P*d** for a displacement vector **d = (*dx*,*dy*)** is defined as follows. The entry **(i, j)** of ***P*d** is the number of occurrences of the pair of gray levels **i** and **j** which are a distance **d** apart. Formally, it is given as
Pd(i, j) = {((r, s), (t, v)):I (r, s) = i, I (t, v) = j}.

VI. GEOMETRICAL FEATURE ANALYSIS

The geometric facial features (including mouth, eyes, brows, and cheeks) are extracted using multi-state facial component models. After extraction, these features are represented parametrically. The regional facial appearance patterns are captured using a set of multi-scale and multi orientation Gabor wavelet filters at specific locations. Geometric feature extraction can be more computationally expensive, but is more robust to variation in face position, scale, size, and head orientation. In this technique feature are extracted using the size and the relative position of important components of images. In this technique under the first method firstly the direction and edges of important component is detected and then building feature vectors from these edges and direction. Canny filter and gradient analysis usually applied in this direction. Second, methods are based on the grayscales difference of unimportant components and important components, by using feature blocks, set of Haar-like feature block in Adaboost method to change the gray scales distribution into the feature. In LBP method, every face image divides into blocks and each block has its corresponding central pixel. Then this method examine its neighbour pixels, based on the gray scales value of central pixel it changes neighbour to 0 or 1. After that a histograms is built for every region and then these histograms are combined to a feature vector for the face image. Technique proposed by Kanade, also comes under this. Contraction of the facial muscles produces changes in both the direction and magnitude of skin surface displacement, and in the appearance of permanent and transient facial features.

6.1 geometric facial feature

Lips: A different lip contour template is prepared for each lip state. The open and closed lip contours are modelled by two parabolic arcs, which are described by six parameters: the lip centre position, the lip shape, and the lip orientation. For tightly closed lips, the dark mouth line connecting the lip corners represents the position, orientation, and shape.

Eyes: In order to detect whether the eyes are open or closed, the degree of eye opening, and the location and radius of the iris. Two eye states are proposed: open and closed.

Brow and cheek: Features in the brow and cheek areas are also important for expression analysis. Each left or right brow has one model a triangular template with six parameters. Each cheek has also a similar six parameter down-ward triangular template model.

Crows-feet wrinkles nasal root wrinkles: Crows-feet wrinkles appearing to the side of the outer eye Corners , Nasal root wrinkles appearing to the nasal root are useful features for recognizing lower face AUs.

VII. FUZZY EMOTION MODEL

Fuzzy Logic may be considered as a field of artificial intelligence. It proposes a type of reasoning, where logical statements are not only true or false but can also range from almost certain to very unlikely The subsystems “single expression mode" and “blend expression mode" are both implemented using fuzzy logic. Both subsystems must convert an emotion state to a contraction level for the facial muscles taking into account the intensity of the emotions. In the literature on facial expressions of emotions qualitative descriptions like “surprise then lift eyebrows” can be found. In order to take intensities into account as well these (logical) rules where transformed into fuzzy rules. The fuzzy rule approach allows us to incorporate qualitative descriptions as above with quantitative information (emotion intensity and contraction level). Moreover we still have a comprehensible rule-based system in which the logical descriptions are visibly encoded. First we model the emotion intensity by five fuzzy sets Very Low, Low, Medium, High, and Very High. The contraction level of each muscle is described by again five fuzzy sets Very Small, Small, Medium, Big, and Very Big. The fuzzy approach and its combination with neural networks have been successfully used for pattern recognition and for image indexing and interpretation. An interesting hybrid classifier was proposed in, where a combination of fuzzy-and case-based reasoning is used for recognition of facial expressions

VIII. CONCLUSION

In this work empirically evaluated Geometric points, evaluate texture pattern, use fuzzy logic for facial expression recognition, Deriving an effective facial representation from original face images is a vital step for successful facial expression recognition and in order to classify and recognize facial expression, Facial Action Coding System has been used along with Matlab and binary and multi-class classifications of face Action Units through using different methods were accomplished.

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