

Research on Patients with Depression of Facial Expression Recognition based on Facereader6 Software

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Abstract

With the information society, the level of modern high-speed development, in order to adapt to constantly improve the economic standard of living, people are facing the pressure and thus the greater the incidence of depression showed a rising trend. The facial expression recognition based on the data of Facereader6 software, application SVM algorithm facial expression data in patients with depression feature extraction classification. Therefore, the law face expression feature extraction in patients with depression, according to the input different facial expressions to identify facial expressions in patients with depression. Population will suffer from depression in intervention and prevention have significant social role and practical significance.

Keywords: Depression Facereader6 SVM algorithm

1. Introduction

In today's such a high emphasis on emotional intelligence information society, the smooth and efficient communication between people has become an important symbol of personality is perfect harmony. Depression is the individual self-awareness and self-evaluation are very low a negative emotional experience, in today's society a lot of concentration, pressure generally increases are particularly common.

With the understanding of the emotions, the study of emotions pay more and more attention by society, the characteristic of external behavior of emotions is called expression. And facial expressions to convey the information that a lot of sounds can't shape, it is a very important way of communication in human interaction. Psychologists. Mehrabian believes that emotional expression language = 7% +38% +55% facial expressions, tone of voice, facial expression and shows the close relationship between emotional expression. And face recognition technology is computer science, pattern recognition technology in the field of one of the most important breakthroughs. This is exactly the facial expression recognition research significance. Thus, the depression do not only affect the normal life, academic, but also affect social interaction between people.

Facial expression of human emotions is the most direct way, in interpersonal relationships, and facial expressions to convey the mood of the individual information is an important medium of communication with others. Through facial expressions, people can not only understand the mental state of others, it can also be inferred figures mental activity. Previous studies have shown that foreign personality affects facial features, then the group with depressive personality traits are different with the normal population will not appear on the facial features? This paper studies facial expressions and explore the characteristics of depression group, to provide reference for future research.

The depression expression recognition flowchart was shown in Figure 1. First, select 13 depressed patients facial photograph, and depression facial expression photograph input Facereader6 expression recognition software, extract the appropriate joy, anger, sadness, surprise, disgust, fear or six pictures of expression data to application SVM algorithm to extract facial features corresponding with severe depression, and finally entered a variety of facial expressions do classification, extraction with depression in patients with facial expression output.

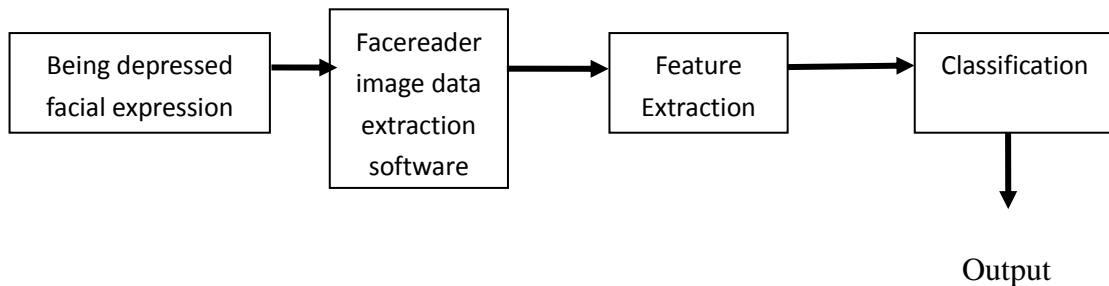


Figure 1. Expression Recognition of Depression

2. Facereader6 Collection of Facial Expressions

FaceReader6 is the premier professional software for automatic analysis of 6 basic facial expressions (happy, sad, scared, disgusted, surprised, and angry), as well as classifying neutral and now contempt. FaceReader6 also provides gaze direction, head orientation, and person characteristics, such as gender and age. Detailed analysis of facial action units is also available. The software immediately analyzes your data (live, video, or still images) saving valuable time. It's available as software, but also as an online application. Read on to learn more about the new features version 6 offers you. You can easily import the data obtained facial expression analysis system to observe the behavior of recording and analyzing system (The Observer XT), the software is designed to collect, analyze and describe integrated system of observation data.

In addition, the facial expression classification data can be exported to other databases and software program for analysis, data export format is Microsoft Access, Excel or plain text format. The facial expression analysis system detects facial expressions can be accessed by other applications in real-time, this feature makes the system suitable emotional computing and human-computer interface design has become the ideal research tool. In other words, it allows other software programs to synchronize the instant response to a user's emotional state.

Open Facereader6 interface shown in Figure 2. The facial expressions of different photos into the software; and the camera can also be mounted in front of the notebook, with software to connect, in 50 seconds to make participants feel free expression, the software can be real-time facial expression participants identified, accuracy rate can reach 98%. Figure 3 is a participant in real time face recognition image, Figure 4 shows the expression recognition participants real-time results. The facial expression of disaggregated data exported in plain text format, so that the application of the facial expression data analysis and extraction features.

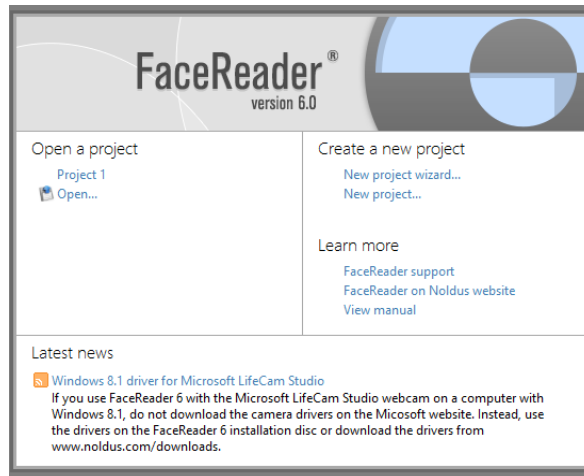


Figure 2. Facereader6 Interface

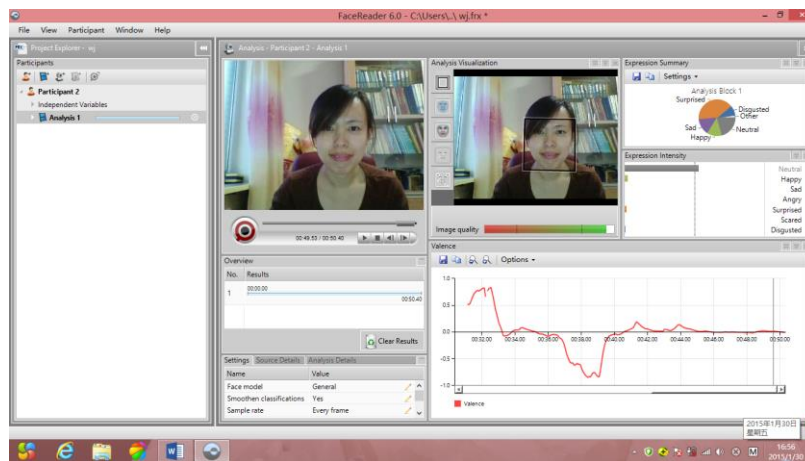


Figure 3. Facereader6 Expression Recognition Image

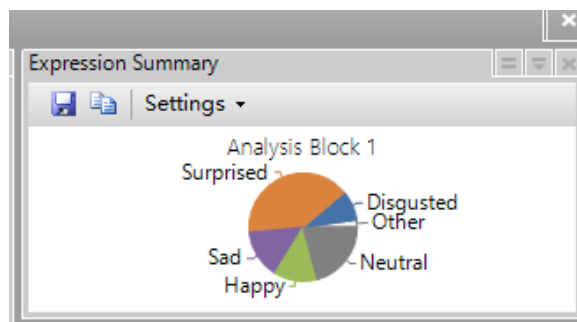


Figure 4. Facereader6 Expression Recognition Results

This paper selects 13 patients with depression facial expression pictures, photos into Facereader6 expression recognition software, the application of the above process, as well as to ensure the effectiveness of the expression recognition software, and within 50 seconds for the participants to make a joy, sadness, surprise, disgust four valid expression, 1 participant in the effective time to make face recognition shown in Figure 5.

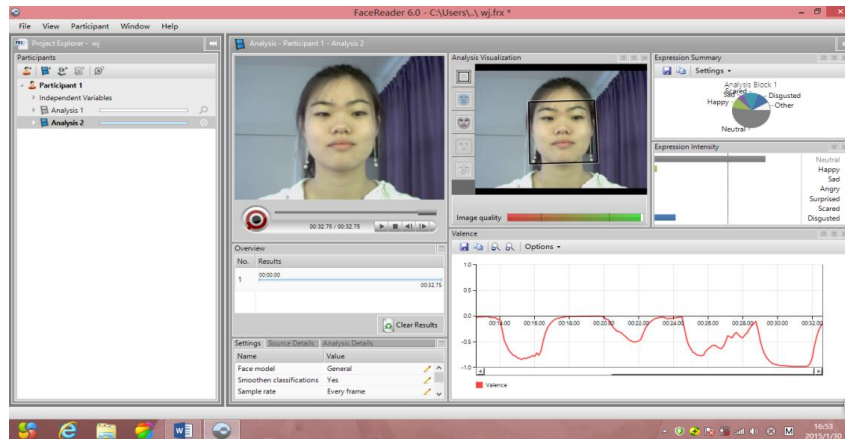


Figure 5. Participant in the Effective Time to Make Face Recognition Results

By FaceReader 6 software will be 13 participants effective depression expression recognition results 50 seconds to save the pure text format, through MATLAB software simulation of the comparative results shown in Figure 6.

MATLAB is a master in engineering and scientific computing software, this article is using its powerful image processing functions, to obtain the expression of image preprocessing, then apply the wavelet analysis toolbox inside a discrete wavelet analysis to get the expression image features .

Through the figure 6, one of the 13 participants can be seen , in the 50s to joy, sadness, surprise, disgust of the four effective expression through the MATLAB software simulation.

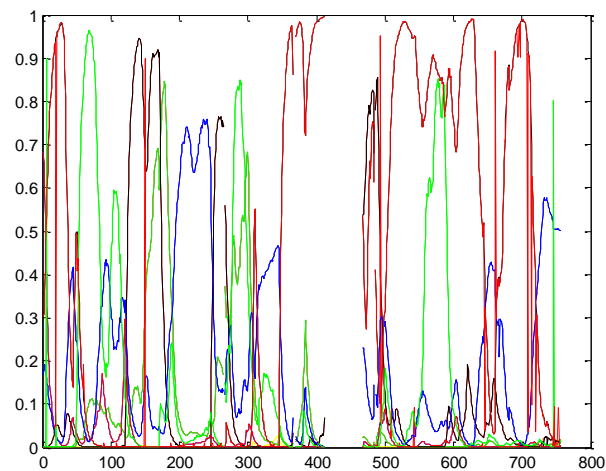


Figure 6. Wink Comparison Participants to Make Effective Time

3. Depression Expression Feature Extraction

The traditional signal analysis is based on the Fourier transform of the above, non-stationary signals the most basic and critical nature of the time-frequency localized nature, but only the Fourier transform is a global transformation, only the information signal frequency domain and therefore can not represent the signal. The wavelet transform is part of time-frequency analysis of one of the wavelet transform, inheritance and development of localized thinking Gabor windowed Fourier transform, and overcomes the windowed Fourier transform window size does not vary with frequency shortage, this paper wavelet transform extraction of depression facial features.

When multi-resolution digital image observation and processing, discrete wavelet

transform is a mathematical tool of choice, in addition to having an effective, highly intuitive description framework and the resolution of the image storage, but also help us understand the spatial domain and frequency image domain characteristics.

3.1. Wavelet Transform Theory

If a given function $\psi(t)$, if:

$$\psi_{a,b}(t) = \frac{1}{\sqrt{a}} \psi\left(\frac{t-b}{a}\right) \quad (1)$$

a, b are constants, $a > 0$, when a given integrable signal $x(t)$, and therefore $x(t)$ of wavelet transform:

$$WT_x(a,b) = \frac{1}{\sqrt{a}} \int x(t) \psi^*\left(\frac{t-b}{a}\right) dt \quad x(t) \in L^2(R) \quad (2)$$

When the system to enter a size $M \times N$ image, its discrete transform, can be expressed as:

$$T(u,v,\dots) = \sum_{x,y} f(x,y) g_{u,v,\dots}(x,y) \quad (4)$$

The x, y is variable space; u, v, \dots is the transform domain variables. If $T(u,v,\dots)$ given, $f(x,y)$ the general discrete inverse transform are available, and therefore $f(x,y)$ available general discrete inverse transform:

$$f(x,y) = \sum_{u,v,\dots} T(u,v,\dots) h_{u,v,\dots}(x,y) \quad (5)$$

Get it. $g_{u,v}$ and $h_{u,v}$ in these equations are respectively called transform and inverse transform nuclei. They decided to transform to the nature, the computing complexity and main purpose. Transform coefficient $T(u,v,\dots)$ can be seen f as $\{h_{u,v,\dots}\}$ a series of expansion coefficient. In other words, the sequence of inverse transform nuclear for deployment defined group of functions. So arbitrary function of discrete wavelet transform

$$f(x,y) = \int_R f(t) \overline{\varphi_{m,n}(t)} dt \quad (6)$$

Called continuous wavelet transform (CWT). $\psi(t)$ also known as the basic wavelet or mother wavelet. $\psi_{a,b}(t)$ is the mother wavelet, after a family function and telescopic displacement produced, referred to as wavelet basis. Therefore, from the point of view the frequency domain, wavelet transform with different scales as roughly equivalent to the effect of using a band-pass filter to filter the signal.

In this paper, MATLAB software feature image wavelet toolbox Facereader6 software to extract data depression expression recognition, these four basic expressions for the discrete wavelet transform feature image obtained after the treatment. Application of MATLAB software for discrete wavelet transform process is shown in Figure 6.

Feature expression processed provides a better feature vector which has the characteristics for classification expression for the latter. Discrete wavelet transform processing obtained as shown in Figure 7.



Figure 7. Feature Image

3.2. Expression Recognition

For face organ complexity, and therefore it can not be directly detected edge, for feature extraction with an elastically deformable template to show its superiority. In this paper, the elastic pattern recognition method of expression feature extracted image classification. The basic idea is: Select the number of feature points on the image to create a flexible template with a certain topology, extracting feature vectors on each node is defined similarity function to calculate the degree of similarity of feature vectors and topology, through the pursuit of similarity maximize to complete. Elastography feature points as shown in Fig8.



Figure 8. Elastography Feature Points

4. Results Analysis

Characteristics expression recognition rate averaged results from an elastic template matching method was 75%. As you can see the conclusion, the recognition rate of the highest, disgust and surprise of recognition rate is relatively lower, and the facial expressions of the People's Daily is also relevant .

So we can see the results for patients with depression of different severity obtained vary. For patients with mild depression recognition rate is relatively low, and the recognition rate for patients with severe depression has improved.

5. Summary

In this paper, Patients with depression in expression data extraction and save the data to a text based Facereader6 software, the application of wavelet transform to extract facial features in patients with depression, and elastography application identification methods for the identification.

Therefore, explore and study facial expressions characteristic of depression groups to fill the gaps in this field, providing a reference for future research. Expression Recognition of this study is primarily based on Facereader6 . The application of wavelet

analysis in MATLAB software toolbox for expression image preprocessing, feature expression extracting. in particular the severity of the impact of depression and to give the average recognition rate of 75%. Future work will study better expression feature extraction method, Make the facial expression recognition rate increased.

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