

An in Depth Study of Emotion Analysis

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Abstract: This study deals with the study of emotion analysis. Nowadays, emotion recognition technique is greatly explored in the field of pattern recognition. The pulse of a person can be known by the intensity variation in emotion leading to the judgment of the temperament of a person. There are various methods available for emotion recognition like voice, face, heartbeat etc. Each technique is useful in various walks of life. When techniques like EEG (Electroencephalography), blood pressure count and face expression recognition are used together it seems to provide greater recognition rate and efficiency. The efficiency and recognition rate is good and the chances of a flaw or misclassification to occur is negligible. When there is a technique giving accurate and effective results why have a second thought on the kind of technique to be applied.

Keywords: Blood pressure, EEG, efficiency, emotion, face

INTRODUCTION

Emotion can be best defined as the mannerism of expressing heart's mood or feelings or desire. It helps us in finding what kind of a mood a person is in. Emotion classification can be done based on two parameters. Either classification based on type of emotion namely positive and negative or method for emotion identification namely facial expression and external devices. Positive Human Emotions are exhilarated, hopeful, happy, delighted, joyful, thrilled, capable, confident, good, great, excellent, etc. Negative Human Emotions are worry, overwhelmed, tired, exhausted, stressed, frustrated, angry, sad etc. Physical devices can be the use of EEG signals, sphygmomanometer.

There are various measures by which we can detect emotions. We can know by measuring the EEG of a person, pulse rate, brain responses to external stimuli, the intensity of speech etc. Emotion is a psychological experience of an individual's state of mind with the environment. Emotion is associated with mood, temperament, personality, disposition, motivation and many other factors. Motivations direct and energize behavior, while the kind of emotion affects component to motivation, either positive or negative. To get a deep insight, theories such as James-Lange theory, Neurobiological theories, Cognitive theories etc can be used. Hence, techniques like face recognition, EEG and pulse rate are taken into consideration for obtaining better efficiency and accuracy. It is very easy to pretend as though the person is happy when he is actually sad or

fearful but it is very difficult to alter the heart beat rate and pulse rate.

VERSATILITY IN METHODS FOR EMOTION ANALYSIS

Speech: Speech and voice seems to go hand in hand but it's not as it seems to be. Speech method tells or rather measures the intensity with which words are uttered. The stress on each word of a sentence seems to vary. E.g. "Please leave me alone" is a sentence which is said in frustration but the stress on each syllable seems different. It can best be implemented in hospitals and a sensor connection to the reception can help doctors to nurse the patients immediately.

Voice: It is another kind of emotion recognition technique. Purely based on loudness, the kind of emotion is judged irrespective of words. E.g. if the voice of a person seems to be sharp and shreak it implies that the person is furious, if loud and rhythmic then happy, fluctuation in voice means fearful, low pitch seems to indicate sadness and so on. This can best be implemented in places where mentally challenged people are taken care because they speak and act in a contrary manner.

Face: Seeing the face of a person it can be inferred what kind of a mood a person is in. E.g. fear, angry, sad. Whatever the mind feels with respect to external environment or stimuli the face indexes it. Any kind of classification technique could be used to identify what

kind of an emotion is being expressed. This is the most common technique.

Heartbeat: The heartbeat of a person is monitored as the expression or emotion keeps changing. When you are fearful the heartbeat rates reaches the pinnacle, when neutral it remains normal and so on. The heartbeat can better help us classify what emotion is being performed.

The above mentioned are the various techniques researchers commonly use for the identification of the emotion.

LITERATURE REVIEW

Ashish and Mohan (2010) proposed that how a driver's emotion can have an impact on his performance. They come to a conclusion by finding that 97.4% accuracy was obtained for three of the stress levels. To recognize emotional states two kinds of features are required. One is acoustic and another is linguistic. But Ashish and Mohan (2010) doesn't consider linguistic as it becomes a problem when multi-linguistic case is considered. Noise cancellation techniques coupled with gender classification is used. But this system does not have any automatic gender detection. Here SVM along with SMO (Sequential Minimal Optimization) is used for classification.

Daniel *et al.* (2006) specified that there are both children and adults with Autistic Spectrum Disorders (ASD). These people did not show any signs of automatic facial expression. This was recorded when various expressions were shown to people and the activity of the cheek and brow was monitored by Electromyography (EMG). This test was done for both typical and ASD people. It concluded that automatic mimicry, which is a basic feature of social interaction, is impaired in autism.

Hugo *et al.* (2005) suggested that there is possibility to measure simultaneously brain and heart rate to identify where neural activity predicted the magnitude of heart rate to various facial expressions. John *et al.* (2003) proposed an ability scale named Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT) with which they experts and general people identified the same test answers or not and how far it was reliable.

Ljubomir *et al.* (2002) measured subjects to International Affective Picture System, stimuli with low, moderate and high arousal. EEG, skin conductance response and heart rate were recorded while the subjects viewed and rated pictures.

Paul *et al.* (1998) proposed that functional Magnetic Resonance Imaging (fMRI) was used to find whether the amygdala in the brain of human is activated to response by external stimuli or not. They were able to find whether the person was happy or sad using signals. If the signal

level in the amygdala increases it means it is fearful masked face and when the signal decreases it means it is happy face which is masked. They have tested for people with anxiety disorders. As people with this disorder show activation in amygdala with other symptoms, it serves to be the reason behind using of masked presentations. Peter *et al.* (2004) explained about the psychosocial cues that patients present to medical practitioners.

Sell *et al.* (2000) conducted experiments on subjects who were opiate addicts. Positron Emission Tomographic (PET) scanning was done to those persons and the investigation of patterns of brain activity was considered in the presence and absence of heroin. Simina *et al.* (2009) proposed a different kind of technique namely fusion of visual and acoustic information. Different classifiers namely Support Vector Machine (SVM), Naive Bayes and K-Nearest Neighbor were used for training and testing. Length normalization and sub-sampling techniques were applied. Three types of database were used. They were acted emotions, natural spontaneous emotions and elicited emotions. The outcome was good only for acted emotions but not for others. Two sets of features are extracted from same person and fused. Dimitrios and Constantine (2006) explained emotion analysis in detail which included the resources, the features and methods used and available for emotion analysis.

Watarur *et al.* (2001) made an investigation if early visual processing of stimuli was boosted by signals of emotions or not and concluded that the hypothesis was true and suggested that the activity could be used by the amygdalar re-entrant projections.

The above mentioned are the various streams in pattern recognition where research study is going at full pace.

PROPOSED WORK

Proposed work is mainly based on the second kind of classification. We have seen that it is classified as face expressions and using EEG signals. There are chances that when a person is sad they try to pretend as though they are happy based on the environment around. So it is not advisable to judge the emotion based only on the facial expression performed. So in many cases misclassification is possible. If facial expression coupled with EEG signals and blood pressure reading, the recognition rate alone won't be great but also the efficiency would reach the pinnacle. The following will explain the consequences likely to occur if only facial expression is taken as a parameter.

Firstly, the application of human emotion recognition in hospitals is considered. Emotions are common in human beings which tend to change from time based on

the occurrences that take place. If a person is in negative temperament then his blood pressure would rise definitely. In such a case if he is tested and medicines are administered which is heavy in dosage then it will cause ill effect on the person. Such a happening cannot be prevented if only a particular aspect is considered and decisions taken.

Second application is in crime branch. If someone has ransacked a bank then by facial expression it is highly impossible to find the culprit. Instead, if facial expression along with the measuring of blood pressure and EEG then with great ease we can find the person. This is because the suspect will have increased blood pressure and EEG level. This can be used by police department in finding the thief amongst many of the thieves.

Third application is in industries where persons who handle machines should be highly watched. This is because a person who handles nuclear reactors or while launching a missile it is a must to monitor the person. Persons may be deviated totally or in some other mood because of personal problems. In such a case if the machine is mishandled it only leads to a mishap which includes loss of capital and lives of mass.

Last, is in case of driving. If the system is administered in cars, trucks, buses and other vehicles, once the driver is to start the emotion of the person can be monitored and if any symptoms of shivering is seen then it gives an indication which tells that the person has no homeostasis and can likely lead to fortuity. This can serve as an alarm.

All the above mentioned applications clearly tell that facial expression alone will not suffice in determining the nature of emotion. It should be implemented along with the measuring of blood pressure and EEG count taken into consideration. Once the values are known they act as feature vector and they are given into any classifier. It would be beneficial to use Support Vector Machine (SVM) which is considered to be the best classifier. This would produce the recognition rates devoid of errors. A slightest of the misclassification also cannot be acceptable as the life of person is at stake.

CONCLUSION

This study tells that there are so many variations in the method with which the emotion can be analyzed. Though there are various options posed, there can only be a single method that proves to be the best. In order to bring the best method to spotlight this study has been evolved. The methods like face, speech and voice can be helpful in emotion recognition. But the short coming is that most people don't express their sadness in their face and disguise themselves to be happy. People would have met with an accident but they hide that feeling while they would not have recovered from that shock at brain. Though face and voice can be altered, the EEG, blood pressure can never be voluntarily changed by a person.

Thus, EEG signals, blood pressure reading and facial expression collectively would provide a best tool if applied in the field of emotion recognition.

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