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IDENTIFICATION OF HUMAN EMOTIONS USING ECG SIGNALS

Harini Sri S[1], Anmol Sachin P.M[2], Dhanya D M[3], L.Vanitha[4]
[1,2,3] UG students, Department of Electronics and Communication Engineering
Prathyusha Engineering College

[4]Assoicate Professor, Department of Electronics and Communication Engineering
Prathyusha Engineering College

Abstract— Emotions are defined as a psychological state that occurs naturally without any sensible effort and there is physiological changes. The cognitive process, physiological arousal, motivational tendencies, and behavioral reactions are responsible for emotions. Emotion is complex feeling which results in physical and psychological changes that influencethought and behavior. Emotion modelingplays a vital role in psychology,cognitive science and engineering. The main objective of thiswork is to recognize the emotional states of human beingsusing ECG signals, which will be useful in the field of medicine, education, entertainment, education, etc. This work determines the emotional state basedon empirical mode decomposition for the detectionof emotion patterns on ECG. The emotions are classified based on the Intrinsic Mode Functions (IMF)**and the local oscillation within every mode. For efficient classification of ECG signals the noise is removed by using Fast Fourier Transform (FFT).**

Key terms: ECG, Emotion detection, empirical mode decomposition

1. INTRODUCTION:

Emotion refers to the intellectual and behavioral strategies people use to stimulate their own emotional experience. It is the general term for subjective, conscious experience that is characterized primarily by psychophysiological expressions, biological reactions and mental states. Emotion is often related andcommonly influential with mood, temperature, personality, disposition and motivation. Emotions are important in many different areas including rational decision making and purposeful behavior. Emotions are complex set of interactions among subjective and objective factors, mediated by neural/hormonal systems. Emotions can cause affective experiences such as feelings of arousal and pleasure, generate cognitive processes, active widespread physiological adjustments to arousing conditions and lead to behavior that is often expensive, goal directed and adaptive.

People's emotional state can be accessed through processing various signals. Physiological measures are often obtrusive and, hence, disregarded for user-centered applications. Human emotions are psychophysiological experiences that affect all aspects of our daily lives. Emotions are complex processes comprised of numerous components, including feelings, bodily changes, cognitive reactions, behavior, and thoughts. Various models have been proposed by considering the ways in which these components interact to give rise to emotions, but at the moment there is no single formulation that is universally acceptable. Modeling emotions is a very challenging problem that has drawn a great deal of interest from the emerging field of human-computer interaction. The objective is to design systems that can automatically identify emotional states, which would revolutionize applications in medicine, entertainment, education, safety, etc. The main difficulty in formulating these models lies in the fact that we must rely on visible manifestations of emotions to produce and verify them since the latent factors that generate emotions are unobservable. The word labels used are joy, sadness, surprise, anger, fear, etc.

2. METHODOLOGY:

The proposed consists of four steps. The first step is the synthesis of ECG signals, in which an ECG signal is generated. The dataset used in this work is from the physionet ECG data base. The synthetic ECG signal is generated from the raw data of the ECG signal. The second step is to remove the noise from the synthetic ECG signal. Thus for accurate

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emotion detection fast fourier transform is used to remove the noise. The third step is to estimate the oscillatory modes, which is called as Intrinsic Mode Functions (IMF). The noise removed ECG signal was converted into data and it is applied to the EMD algorithm to finds its IMF components. The IMF's are determined EMD algorithm. The features are extracted which is associated with the instantaneous frequency and the local oscillation of the IMFs.From the IMF signal, the features (Amplitude, Instantaneous Frequency) of the ECG signal were extracted. Based on the features we can extract the features, that is whether the persons is in joy or anger or sad or fear state.

3. RESULTS AND DISCUSSION:

The anger person ECG signal was collected from the MIT/BIH data base. By using this ECG data, the anger person synthetic ECG was generated.

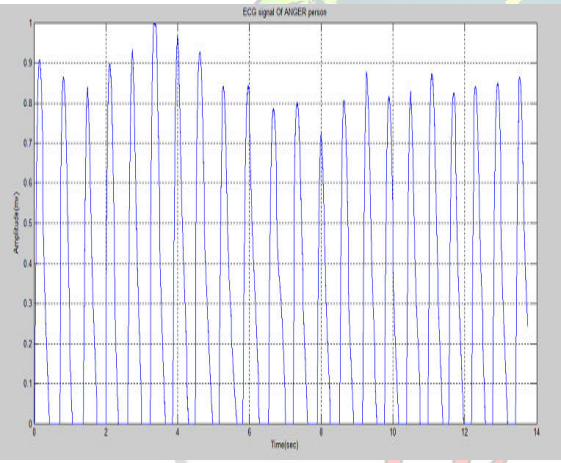

Figure 1: Synthetic generated ECG signal for Anger person

The fast fourier transform was applied on the synthetic generated ECG signal to remove noise from the ECG signal for accurate emotion detection.

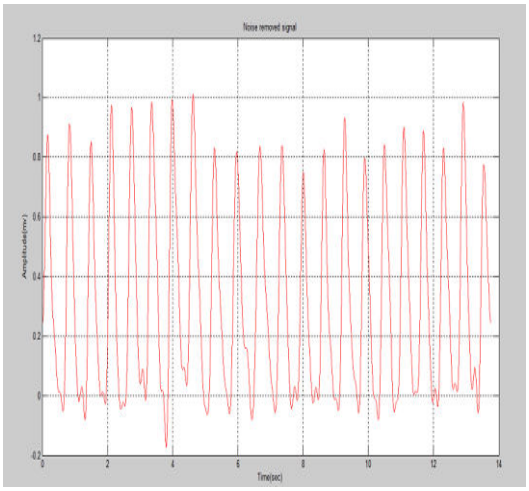

Figure 2: Noise removed ECG signal for Anger person

This noise removed ECG signal was converted into ECG raw data and it is applied to the EMD algorithm to find the IMF signal.

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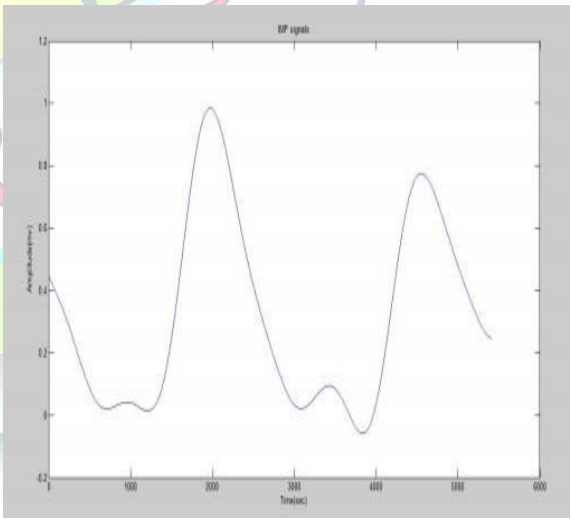

Figure 3: First IMF component of Anger person

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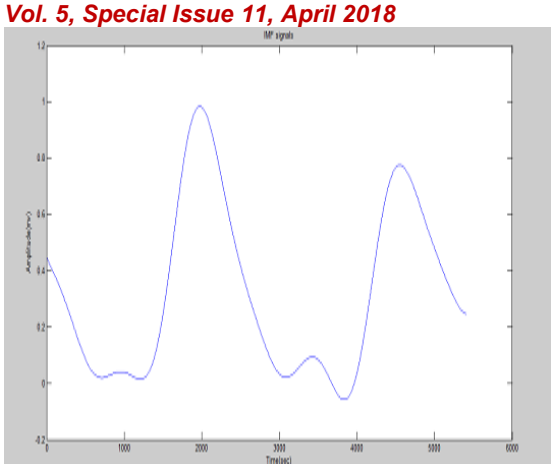

Figure 4: Second IMF component of Anger person

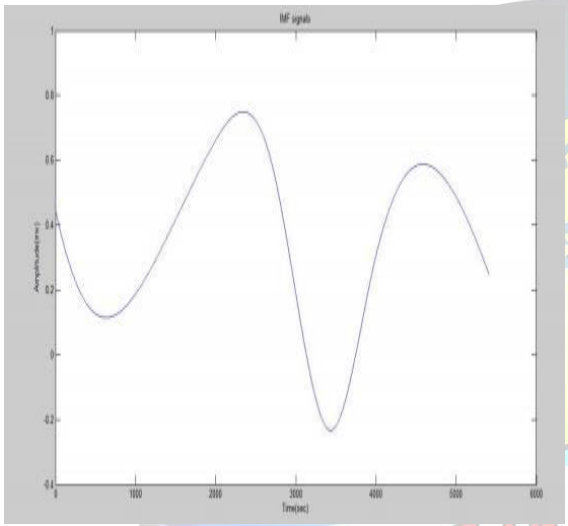

Figure 5: Third IMF component for Anger person

IMFs of order higher than three do not exhibit oscillatory activity. So we cannot consider the IMFs of order greater than three. From the IMF signal we can find the amplitude and instantaneous frequency for the feature extraction.

CONCLUSION:

The amplitude and instantaneous frequency is determined from the IMF signal. Based on the frequency and amplitude the emotions of human beings are classified. The amplitude and instantaneous frequency of ECG signal for a person with joy emotion is between (0.2mv-0.25mv)amplitude and (10 Hz-40Hz) frequency. When the amplitude values and instantaneous frequency values are above and below the particularrange of values, then it is classified as either fear, angry or sad emotional states. For the sad emotional state the instantaneous frequency is below (10-40) Hz, and the amplitude is below (0.2-0.25) mv, and for the anger emotional state the instantaneous frequency and the amplitude is beyond the particular value, that is, the instantaneous frequency is above (40-100) Hz and the amplitude is above 1.5 mv. The instantaneous frequency for the fear emotional state is in between (40-100) Hz and the amplitude value is, between the limit (0.3-1.5) mv.

REFERENCES

[1] A. Arafat and K.Hasan, “Automatic Detection of ECG wave Boundaries using Empirical Mode Decomposition” Proc.IEEE International Conf. Acoustics, Speech andSignal Processing, pp.461-464, 2009.

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[2] Leslie Cromwell, Fred J. Weibell, Erich A.Pfeiffer. "Biomedical Instrumentation and Measurement"

[3] C.Zong and M.Chetouani. "Hilbert-Haung Transform Based Physiological Signals for Emotion Recognition" Proc.IEEE Int'l symp. Signal Process Letters, vol.14, No.12,2009.

[4] J.Pan and W.J.Tompkins, "A Real-Time QRS Detection Algorithm" IEEE Trans. Biomedical Eng.,vol.32,no.3,pp.230-236,2004.

[5] M.Jones and T.Troen, "Biometric Valance and Arousal Recognition"Proc.19th Australasian conf. Computer Human Interaction. pp.191 -194, 2007.

[6] F.Honig, A.Batliner, "A. Batliner, "Real-time recognition of the affective user state with Physiological signals" Proc.Doctral Consortium Conf.Affective Computing and Intelligent Interaction.pp.1 -8,2007.

[7] FoteiniAgrafioti and DimitriosHatzinakos, "ECG pattern analysis for emotion detection" Proc. IEEE transaction on affective computing, vol.3, No.31,2012.

[8] F.Naser,K.Alvarez and C.L. Lisetti, "Emotion Recognition from physiological signals using wireless sensors for presence technologies" Int,l J. Cognition, technology and work special issues on presence, vol.6, no.1, pp.4-14,2004.

[9] M.Blanco-velasco, B.Weng and K.E. Barner, "ECGsignal denoising and baseline wander correction based on the empirical mode decomposition", Computer in biology and medicine, vol.38,pp.1 - 13,2008

[10] VanithaL,Suresh GR ,Chandrasekar M, Punita P, "Development of four stress levels in group stroop colour word test using HRV analysis", Biomedical Research 2017; 28 (1), 98-105