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The role of Computer in Emotional Detection for Education and Health

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Abstract: Emotions permeate our daily lives; most of us are agree with this deferential statement that it is only in the last two decades that the psychological research community has wholeheartedly embraced the science of affect (emotion).

The field (area) of Affecting Computing (AC) expects to minimise the communicative gap between the highly emotional human and the emotionally challenged computer by developing computational system that recognize and respond to the affective state of the human mind. Affect Sensitive Interfaces(ASI) are being increasingly developed, modified or invented in large number of spheres, including Mental health, physiology, gaming and E-learning technologies. Although most of the learning technologies have traditionally concentrated on supporting cognitive processes and outcomes, researches on the role of emotions during learning is increasing in the field of education, psychology and learning technology.

Previous studies have achieved some success in detecting affect (emotion) from physiological measures, especially in controlled environment where emotions are experimentally persuaded or convinced. Facial expression, muscle activity, Heart beating, respiration, galvanic skin response, blood pressure, and body temperature have all been considered as potential physiological channels for recognizing affective states on mind. In this research, Multimodal approaches are increasingly used for affect detection for education and health. Galvanic Skin Response (GSR) (A change in the ability of the skin to conduct electricity, caused by the emotional stimulus, such as anger, cry, fright etc.) has recently attracted researchers' attention as a prospective physiological indicator of cognitive load and emotion. This paper proposes a model for the fusion of physiological signal that measure learners' heart activity and their facial expressions to detect learners' affective states while students interact with an Intelligent Tutoring System (ITS).

Key words: Emotion recognition, Affective computing, Human-computer, Physiological signals and Galvanic skin response.

I. INTRODUCTION

Most of us would agree with this deferential statement that emotion permeate our regular life, so it is bit surprising and amusing that the psychological researchers have wholeheartedly embraced the science of emotion only in last two decades.

Although most learning technology have traditionally focussed on supporting cognitive activities and outcomes. While learning, research on the role of emotion is increasing in the field of educational psychology and learning technologies

Affect Detection is most challenging problem because emotions or sentiments are very hard and difficult to perceive (unable to think clearly) and differ in expression and experience from one individual to another individual [1].

Emotion detection researchers have investigated emotion detection in prosody (the study of poetic meter and the art of versification), changes in psychological state, facial expression and text reading [2].

The aim of emotion detection in text is to infer underlying emotions, influencing the author /writer by studying their text. This is based on the fact that if an individual is in smile, it influences them to utilize affirmative words. Similarly, if a person

may seem sad, frustrated, jealous, angry, the word or sentence they bring in use signifies their underlying off/negative effects. Various important and deferential applications of affect detection have been applied or employed in the text. In the area business empowerment, the marketers can be helped by emotional detection to progress plans and ideas for customer satisfaction, article delivery system and implementation. In the field of education the efficiency, accuracy and capability of computer to automatically track attitudes and feelings with degree of human intuition has contributed to the development of text-to- speech system and **ITS**. Web communication can be provided and facilitated through text, images, Videos and voice recordings [3], [4], [5]. An emotion lexicon is a series of emotions and the words that are indicative of each word, and its prerequisite to identify emotions in the text. As of now, high quality, high coverage emotion brochure do not exist for any language. Few brochures (lexicons) for some languages are available such as the WordNet Affect lexicon (WAL) and General Inquirer (GI) which categorizes words into number of categories, including positive and negative linguistic orientation [6].

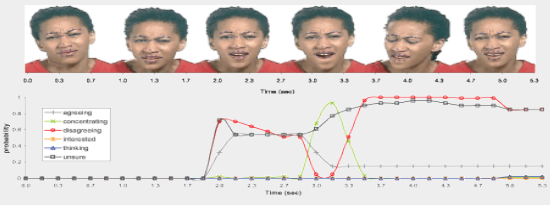
The coalition of emotion with learning technology was brought about by Rosalind's Picard in 1997 in his book (Affective Computing) . There are two fundamental tenets of emotion computing. The 1st is that it is possible for a computer to sense human emotion and systems that detect and respond to users' emotions can produce more engaging and fulfilling interactions. These systems need techniques of affect detection, which in near past being developed by using multimodal signals such as, gesture, facial expression, postures, physiology, text, and speech. The 2nd tenet is that intelligent system that model emotions can make more effective human like decisions compared to their purely rational counterparts. These systems make use of computational techniques to model how emotions generate from cognitive appraisals of real world events and sometimes communicate these emotions through [7].

II. Related Work

2.1 Emotion Detection based on computational approach

Emotions can be observed by two different methods. First distinctive approach involves the use of categorical representation, such emotions consists of labels like boredom (The state of being bored), frustration and anger. A secondary and alternative approach emphasizes the importance of fundamental dimensions of valence and arousal in understanding emotional experience. The approaches Of Dimension have been studied by emotion theorists and they suggested the existence of two fundamental dimensions valence and arousal (pleasure/displeasure and activation/ deactivation). Some other investigators and researchers have found 'dominance' as 3rd dimension necessary to represent emotional phenomena. A categorical model is employed for emotion recognition in text and video, while dimensional model is feasible in the case of speech [8].

2.2 Facial affect infer



Analysing and observing a discouraging expression

Questionnaire:

Q: - What kind of sentiments does male express often?

Ans.:- Anger.

Q: - How do they express anger?

Ans.:- Due to hard stare of eyes.

Q: - How do they express happiness?

Ans.:-Lower eyelids, lips drawn back & upper teeth exposed.

Q:- What sort of sentiments a female express often?

Ans.:- Disgust.

Q:- How do they indicate disgust?

Ans.:- Raising upper & lower lips, wrinkleless of nose.

Q:- Can we read minds?

Ans:- The answer to this question is most likely 'yes'. We may not consider it mind reading, but our proficiency and efficiency to understand what people are thinking and feeling from their facial expressions, emotional signs and gestures. People reveal their mental aptitude all the time through facial declaration, vocal nuances, signals and gestures. We have developed this ability into computers to prepare the people emotionally aware. The ability to characterise mental states to others from their behaviour and then to use that information to guide our own activity or predict those of others is known as the 'theory of mind'. Although investigation process on this theory has been encircling since the 1970s, it has recently attained attention due to the young number of people with Autism conditions, who are thought to be 'mind-blind'. That is, they have hardly interpreting other's emotions and sentiments from facial expressions and other non-verbal cues.

According to Professor Simon Baron-Cohen, a Director of the Autism Research circle at Cambridge, Our latest computer /machine system is supported on the latest research in the theory of mind. His research provides taxonomy of facial declaration and the sentiments. In 2004, He and his associates published the "Mind Reading DVD, "An Interactive Computer-based Guide" to read emotions and sentiments from the face and voice. The DVD contains videos of people revealing 412 distinctive mental and psychological states. We have developed computer programs that can read facial signs like, Gesture, Fair, Anger, Pleasure, Annoyance, Smile, Sadness Etc. by using machine vision, and then prove emotions using probabilistic machine.

The most likely compilation of the facial deceleration is then computed by using probability theory [9]

2.3 Health Care Education

Health Care education includes a practical component that does not easily translate to a typical computer tutoring system. For example, in a practical scenario for a nurse in training, the student must be able to physically interact with the patient in order to learn the appropriate response to a patient's needs. Clinical simulation environments are often used in order to reduce the number of people required to train a nurse while allowing them to receive practical experience before interacting with real patients. These simulation environments are used for the evaluation of the student nurses. During the evaluations, student nurses are video and audio recorded. This video and audio recording is a place where computational assistance can be given to the instructors. In this paper we present computational detection of emotion in a clinical simulation to help an instructor to determine if a student is at a higher risk of leaving the program. We discuss clinical simulation, video detection of emotion, audio detection of emotion. Then we characterize an experiment involving student nurses self-reporting their sentiments before and after their clinical observation. Finally, we determine the results of detecting affect in the given experiment.

2.4 Positive Affect and Health Related Processes

Negative affective states such as depression, modesty, frustration are affiliated and associated with premature mortality and increased risk of coronary heart disease, disability and diabetes. It has been advised and suggested that positive affective states

of mind are controlled, but the channel through which such effects might be mediated are weakly or poorly understood. Here, we visualise that positive affect in middle-aged life (both in men and women) were associated with reduced inflammatory, Neuro-endocrine, and cardiovascular exercises. Positive affect was determined by aggregating flitting experience samples of happiness and other such elements over a working day and was inversely related to cortisol output over the day, independently of age, gender, body mass, socioeconomic position, smoking etc. Similar patterns were observed on a holidays. Happiness, joy, pleasure etc. also inversely related to heart rate determined by using ambulatory monitoring methods over the day. Shareholders, contributors, participants and associates underwent mental stress testing in the workshop or research laboratory, where plasma fibrinogen stress responses were smaller in happier, delighted, pleasant individuals. These effects were independent of psychological disappointments. Supporting the notion that positive well-being is directly related to health-related biological processes.

Eminent or high heart rate has been shown to predict mortality and cardiovascular disease risk in prospective epidemiological studies. The associations we found with happiness in men were independent both of standard covariates and of ratings of physical activity that have previously been shown to correlate with objective energy expenditure. The meaning and interpretation of the gender differences in heart rate is not clear, but experimental epidemiological researches have investigated invariable affiliation between mortality and heart beats more in men than women.

Research in affirmative psychology has begun to document the importance of affirmative well-being to creativity, imaginativeness, leadership, and the realization of human dedication. Our findings signifies that positive affective states are associated to favourable profiles of functioning in several biological systems and may thereby be relevant to risk of development of physical illness. The participants in this study were in perfect condition of health, so no objective health outcomes were interpreted.

2.5 Using (GSR) for cognitive load, mental status and emotion

Galvanic Skin Response (GSR) have recently drawn researchers' concentration as a prospective physiological indicator of cognitive load and emotion. In the near past **GSR** has investigated concerning mental status and emotion. (Nakasone et al., 2005)[10]. have successfully used skin conductance and muscle activity for emotion detection. In another study, skin conductance was measured to differentiate between a stress condition and a cognitive load condition, seeking the ability of detecting stress states (Setz et al., 2010) [10]. Shi et al., also assessed GSR in stress and cognitive load situations and found correlations between readings of this signal and cognitive load. (Engstrom et al., 2005) found a weak effect of cognitive load on physiological signals including skin conductance. Ikehara et al., evaluated GSR in relation with two levels of cognitive load [11]. In contrast with other studies, they found skin conductance to decrease as task difficulty increases and explained it as a result of the easy task being tedious and too easy. Wilson [12] analysed several physiological measures during different steps of flights and found out an increase in EDA Electronic Design Automation response during take-off and landing which were expected to place the most cognitive demands on pilots.

III. CONCLUSION

Emotions recognition on text has wide applications. This research investigates a computational approach for scrutinise and discovering emotions in children stories based on emotional words. Instructors' assessment or feedback (human or automated) has an emotional effect on trainee (learner/student). The objective of this research was to look over or figure out approaches for the fusion of physiological and facial appearance during learning interaction. The outputs for the fusion model were evaluated against the single channels to understand the effects of multimodality. Results show that the fusion of ECG (Electrocardiogram) and facial expression improved the mean accuracy (kappa) over the face channel but not the ECG channel. Results further show that the fusion model can perform very well with super-additive effects for some learners and redundancy/inhibitory effects with others.

GSR is a non intrusive easily-captured physiological signal which is being explored as one of cognitive load measures. In this study, we investigated different time- and frequency-domain features of GSR in multiple difficulty levels of reading experiments.

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