

A Brief Review on Detection of Anxiety in Humans and Its Importance

Anupama Soni¹, Rahul Verma²

¹M. Tech Student, CCEM, Raipur, Chhattisgarh, India

²Assistant Professor, CCEM, Raipur, Chhattisgarh, India

Abstract: *In this paper present a brief review on detection of anxiety in humans and its importance. Anxiety identified as an indicator of deception, embarrassment and shame. Anxiety normally associated with skin coloration of face and affects skin surface temperature, can be used to detect stress levels in humans and potential indicators of human lies. Facial based approach for detecting anxiety are unnoticeable and do not require the subject cooperation. It is an important topic in computer vision, forensics or biomedical application. Anxiety detection assumes that guilt manipulation results in measure of behavioral changes that distinguish truth tellers from deceivers, but various methods offers a non-contact approach of measuring physiological feature.*

Keywords: Anxiety, Physiological, Polygraph, Embarrassment, Guilty Knowledge, Deception

1. Introduction

The ability to detection of anxiety is a highly desirable quality. Anxiety has been defining as an indicator of shame, embarrassment and deception. Basically, associated with the skin coloration of the individual face, a deception response also affect face skin surface temperature. The anxiety is prevalent and the result of concealing the truth cover a broad range of severity. The attempt of deception at one extreme o harmless white lie will have minimum effect, however on the other extreme human lives could be in danger. So, continues unabated research have been pursuit to, get accurate identification of deceit.

Numerous studies have shown that both ordinary and trained expert people are poor at discriminating between the liars and truth tellers and an average person performance is slightly better than. Various evidence indicates that difference between cognitive processes will frequently make liars experience a different mental state then a truth tellers. The criminals or liars may experience feeling of fear, embarrassment, anger, guilt and shame more often than truth tellers.

The application of this anxiety detection method as part of improving the monitoring system, in medical care unit is carried out through the analysis of the patient face behavior. The goal of facial expression recognition is to develop a system for the classification of facial expression from video input. Develop of an automated system to recognizes facial expression is a challenging task. It is an important topic in computer vision, forensics or biomedical application. Anxiety detection assumes that guilt manipulation results in measure of behavioral changes that distinguish truth tellers from deceivers, but various method offers a non-contact approach of measuring physiological feature.

Basically, two main related problem of facial expression recognition are:

- Detection of an image and segment as a face.

- Extraction of information from the facial expression.

And at classification of the expression.

Facial expression recognition from video scenes is an important topic in computer vision, various application in area such as video conferencing, forensics, biomedical application, machine vision, clinical improvement prediction etc.

2. Importance

The field of detection of anxiety is widely discussed in the scientific community as well as in applied research [7]. The measure of anxiety is play an important role in many interpersonal situations and now several behavioral, verbal and psychophysiological cues are examined as potential indicators of human lies.

The most systematic application and importance of these idea was done in forensic science. Although it plays a key role in everyday life. Detection and measure of anxiety has mostly been attributed to the forensic domain, basically we will concentrate mainly on forensic application.

3. Application

When individuals who commit, a crime are questioned, they often show involuntary physiological response to remembered all details related to that crime. This phenomenon is the basis for the concealed information test, due to this phenomenon shows the importance to detect anxiety in participant [11].

This method is used a criminal expression verification, using polygraph instrument in criminal's investigation are perform and there are several types of tests using the polygraph have been developed. The one such type test is "concealed information test". The concealed information test is so much effective when traditional polygraph measure is applied.

Volume 6 Issue 5, May 2017

www.ijsr.net

[Licensed Under Creative Commons Attribution CC BY](https://creativecommons.org/licenses/by/4.0/)

The guilty knowledge test [7] and its form the guilty action test are basically psychophysiological questioning technique, its goal to detect guilty knowledge of witness in criminal cases. By using a guilty action test that examined the identification of guilty and innocent participants in a mock crime prototype.

4. Literature Survey

K. Harmer et al; in their paper [1], title “Automatic blush detection in “concealed information” test using visual stimuli” presented, Ability to detect anxiety is a highly desirable quality. The act of deception is prevalent and concealing the truth covers a broad range of severity. On one half a harmless white lie will have minimal repercussions. However, at the other extreme, human lives could be in danger. Therefore, research continues unabated in the pursuit of accurate identification of deceit. When a person is attempting to conceal the truth, the emotional response may be manifest in measurable physiological characteristics. The blushing has been identified as one of these characteristics as has, among others, heart rate, respiration rate, perspiration and blink rate. If any combination of which can indicate any thing. On the face of participant, blushing has seems a trivial task. Mostly it is simple matter of analyzing the temperature and coloration of the skin with respect to the time stress is presented to the subject. In fact, on this topic much research performed the blush response to a stressor in the fields of psychology and psychophysiology. Yet these approaches either require contact with the subject by using the transducers. Although when thermal images are used, the region of interest is often manually segmented. Unfortunately, at present, there does not appear to be an abundance of fully automated segmentation methods is available. This is suggesting that researchers, at this time, are content with manual segmentation that is where a practical implementation is not necessary. However, as the interest in the field and detection accuracy increases, here fully automated systems will follow which will require a general-purpose segmentation algorithm. To develop a segmentation algorithm which is fully-automated, the ROI need to be identified. The state that the action of anxiety is shown more from the cheeks, ears and forehead than from any other body part. The supraorbital vessels of the forehead are formed by using the Hough transform in the forehead region to reveal the approximate location of the vessels. Active contour method is applied to calculate the central lines of the vessels before extracting the boundaries. Whereas in periorbital region is extracted by using the eye location as a point of reference to define the initial periorbital region that is then tracked throughout the footage. The problem with using the forehead or periorbital regions is occlusion. The forehead can easily be covered by hair and the periorbital region is often covered by spectacles. Typical in real-life scenario, subjects will have varying their hairstyles, headwear and spectacles. The most visible ROI is the space around the maxilla. The maxilla region can also be visible in people with full beards. This region is used as the region of interest. Here, the exact

method of segmentation is not described. So, in this paper, an algorithm is outlined which can be used to extract ROI in thermal images. The next section of this paper presents the proposed method segmentation algorithm, as per followed by the proposed blush detection criteria. So, this is followed by the experimental results with respect to an application employing visual stimuli to elicit a blush response. Finally conclusions are drawn with remarks about possible improvements.

Peter D. Drummond et al; in their paper [2], title “The significance of blushing for fair- and dark-skinned people” presented, Since, difficult to detect blushing in people with dark skin, their experience of blushing may differ from people with fair skin. When investigate this particular issue, cheek temperature and forehead blood flow was measured in suspects during mental arithmetic. Particularly females blushed more intensely, and also reported greater self-consciousness when singing. Vascular responses are not differing between groups. Whenever, when skin tone is moderated the association between vascular responses and ratings of self consciousness, fear, blushing propensity and blushing intensity of negative evaluation. These findings that embarrassing social encounters support the notion that the visibility of blushing influences the nature of emotions experienced.

However, when blushing is often critical to detect in dark-skinned color, where it produces a further darkening of skin tone or is not visible at all. So, the subjective experience of blushing could be small different in dark- and fair-skin, color people. The judgments by observers in blushing, based on embarrassment in facial expressions, combine with increases in cheek blood volume but not with increases in cheek temperature. So, the increase in temperature may inform the blusher about blushing some time after others have noticed the response. The blush is often seen before it is felt; people who are discuss about the blushing they focus on the reactions of participants to confirm that they are blushing or not. This is applying particularly to the people with fair skin where the blush is clearly revealing. At present study had three aims. The first is to compare self-consciousness and physiological signs of blushing in all people with fair or dark skin color. It is known that blushing may be easier to detect with fair skin, it was that fair-skinned subjects would feel more self-conscious and blush more easily than dark-skinned subjects in embarrassing situations. Addition, it was hypothesized that dark-skinned subjects would elect more closely than those with fair skin on physiological cues such as facial warmth to identify when they were blushing. After that the second goal was to find out the relationship between fear of negative evaluation, blushing propensity, physiological signs of blushing, and skin tone. Since blushing is one of the features of social deception, it was thing that fear of negative evaluation would relate more closely to blushing propensity, so in fair-skinned people where blushing is easily seen. The final goal of this experiment was to calculate whether blushing propensity scores of blushing differed between fair and dark skinned color people. It was

conclude that the cultural expectations would decrease blushing propensity scores and possibly also physiological signs of blushing in dark-skinned.

Ahmed Elgammal et al; in their paper [3], title “Skin Detection a Short Tutorial” presented, the detection of skin is the process of finding skin colored pixels and area in an image or in video. This process is mostly used as a working step to find the regions that potentially have human faces and limbs in images. Number of method in computer vision approaches have been developed for skin blush detection. Basically a skin detector transforms a given pixel into an appropriate color space and after that uses a classifier of skin to label the pixel whether it is a skin or a non-skin pixel. A skin classifier is define as a decision boundary of the skin color whether in the color space based on a training database of skin-colored pixels.

The skin color and textures are important point that people use it to form variety of culture-related aspects about each other. Skin color and the texture can be an indication of race, health, , beauty, age, wealth etc. However, such system vary across cultures and across the history. In images or in video, skin color is an indication of the existence of humans in such media. Therefore, in the last two decades extensive research have focused on skin detection in images. Skin detection means detecting image pixels and regions that contain skin-tone color. Most the research in this area have focused on detecting skin pixels and regions based on their color. Very few approaches attempt to also use texture information to classify skin pixels. As will be described shortly, detecting skin pixels are rather computationally easy task and can be done very efficiently, a feature that encourages the use of skin detection in many video analysis applications. For example, in one of the early applications, detecting skin-colored regions was used to identify nude pictures on the internet for the sake of content filtering. In another early application, skin detection was used to detect anchors in TV news videos for the sake of video automatic annotation, archival, and retrieval. In such an application, it is typical that the face and the hands of the anchor person are the largest skin-tone colored region in a given frame since, typically, news programs are shot in indoor controlled environments with man-made background materials that hardly contain skin-colored objects. In many similar applications, where the background is controlled or unlikely to contain skin-colored regions, detecting skin-colored pixels can be a very efficient cue to find human faces and hands in images. An example in the context of biometric is detecting faces for face recognition in an controlled environment.

Ming-Zher Poh et al; in their paper [4] title “Non-contact, automated cardiac pulse measurements using video imaging and blind source separation” presented, Remote measurements of the cardiac pulse can provide comfortable physiological assessment without electrodes. However, attempts so far are non-automated, susceptible to motion artifacts and typically expensive. In this paper, we introduce a new methodology that overcomes these problems. This novel approach can be applied to color video recordings of the human face and is based on automatic face tracking along

with blind source separation of the color channels into independent components. Using Bland-Altman and correlation analysis, we compared the cardiac pulse rate extracted from videos recorded by a basic webcam to an FDA-approved finger blood volume pulse (BVP) sensor and achieved high accuracy and correlation even in the presence of movement artifacts. Furthermore, we applied this technique to perform heart rate measurements from three participants simultaneously. This is the first demonstration of a low-cost accurate video-based method for contact-free heart rate measurements that is automated, motion-tolerant and capable of performing concomitant measurements on more than one person at a time.

Nurit Gronau et al; in their paper [5], title “Behavioral and Physiological Measures in the Detection of Concealed Information” presented, The authors examined the incremental validity of the reaction time measure beyond that of skin conductance response in the detection of concealed information. Participants performed a Stroop-like task in which they named the color of critical and neutral words. Results show that the SCR highly differentiated between the relevant and neutral words. However, the RT demonstrated a significant differentiation only when the critical words denoted personally significant items for e.g., one’s own name and not when they denoted crime-relevant items related to a simulated crime. In both cases, combining the two measures yielded no advantage over the use of SCR alone. Thus, although behavioral measures may differentiate between relevant and neutral information in some cases, their practical use is questionable.

If the participants physiological responses to the relevant alternative are consistently larger than to the neutral alternatives, knowledge about the event for e.g., crime is inferred. If the information about the event has not leaked out, the probability that an innocent suspect would show consistently larger responses to the relevant than to the neutral alternatives depends only on the number of questions and the number of alternatives per question. Hence, the probability of false-positive outcomes can be controlled such that maximal protection for the innocent subjects is provided.

Bruno Verschuere et al; in their paper [6], title “Autonomic correlates of social anxiety and embarrassment in shy and non-shy individuals” presented, When a mock crime experiment was performed to test whether it enhanced responding to concealed information during a polygraph examination is due to orienting or defensive responding. Some people shown their response in one or two crime test. When compared to control image, participants showed heart rate deceleration and enhanced electro dermal responding to pictures of the crime they had committed. Pictures related to both crimes were presented while heart rate, magnitude of the skin conductance response, and reaction times to a secondary probe were measured. Probe reaction times did not different significantly between crime and control pictures. The present findings support the idea that the orienting reflex accounts for the enhanced responding to concealed information. Theoretical and practical implications of the orienting account are discussed.

Matthias Gamer et al; in their paper [7], title "Psychophysiological and vocal measures in the detection of guilty knowledge" presented, Guilty Actions Test, are psycho physiological questioning techniques aiming to detect guilty knowledge of suspects or witnesses in criminal and forensic cases. Using a guilty actions test, then we find that the validity of various physiological measures for the identification of guilty and innocent participants in a mock crime scenario. Electro dermal, respiratory, and cardiovascular measures successfully differentiated between the two groups. A logistic regression model based on these variables achieved hit rates. In contrast to these results, the vocal measures provided by the computerized voice stress analysis system were shown to be invalid for the detection of guilty knowledge. All rights reserved. The field of detection of deception is widely concern in the community as well as in research community. Embarrassment is supposed to play an important role in numerous interpersonal situations, and until now several behavioral, verbal, and psycho physiological cues have been examined as potential indicators of human lies. The most systematic implementation of these ideas was done in forensic science, where deception can entail serious consequences and the inability to detect deceit may harm society. Although it certainly plays a crucial role in everyday life, detection of deception has mostly been attributed to the forensic domain. Therefore, we will concentrate mainly on forensic applications. Two lines of research, which overlap with each other in varying degrees, so can be differentiated.

Stefan G. Hofmann et al; in their paper [8], title "Autonomic correlates of social anxiety and embarrassment in shy and non-shy individuals" presented, Social anxiety and embarrassment are closely related constructs, both of which are relevant to the study of shyness. To examine the psycho physiological correlates of anxiety in relation to shyness, we measured autonomic arousal heart rate, respiratory sinus arrhythmia, skin conductance level, and blushing response in shy and non-shy participants while they performed tasks designed to show either social deception or embarrassment. After that the results indicated that social anxiety and embarrassment are difficult to disentangle at the autonomic platform. Here anxiety may be an important psycho physiological detector of shyness and anxiety.

Bashar A. Rajoub et al; in their paper [9] title "Thermal Facial Analysis for Deception Detection" presented, Thermal imaging technology can be used to detect stress levels in humans based on the emitted heat from their face skin. In this paper, presented use thermal imaging to monitor the per orbital region's thermal variations and test whether it can offer a discriminative signature for detecting deception. We start by presenting an overview on automated deception detection and propose a novel methodology, which we validate experimentally on thermal responses some lies and truths extracted from all participants. The novelty of this experiment lies in scoring a larger number of questions per subject, emphasizing a within person approach for learning from data, proposing a framework for validating the decision making process, and correct evaluation of the generalization

performance. A nearest neighbor classifier was used to classify the thermal responses using different strategies for data representation. We report an ability to predict the lie and truth responses based on a within-person methodology and five fold cross validation. Our results also show that the between person approach for modeling deception does not generalize very well across the training data.

Jeffery F. Cohn et al; in their paper [10] title "Automated Facial Expression Recognition System" presented, The interrogations are a critical practice in the information gathering process, but the information collected can be severely compromised if the interviewee attempts to mislead the interviewer through the use of deception. Being able to quantitatively assess an interview subject's emotional state and changes in emotional state would be a tremendous advantage in being able to guide an interview and assess the truthfulness of the interviewee. Each of these expressions is racially and culturally independent. Recent advances in facial image processing technology have facilitated the introduction of advanced applications that extend beyond facial recognition techniques. This paper introduces an Automated Facial Expression Recognition System. A near real-time, next generation interrogation tool that has the ability to automate the Facial Action Coding System process for the purposes of expression recognition.

5. Conclusion

This study examined the Detection of Anxiety in Humans and Its Importance or application and its contribution in psychophysiological detection. The present study is based upon detection of concealed information for, the participants who enacted a mock crime was presented with crime video or measure heart rate, probe reaction time is measured, skin detection.

References

- [1] K. Harmer, "Automatic blush detection in "concealed information" test using visual stimuli," 2010 International Conference of Soft Computing and Pattern Recognition 978-1-4244-7896 IEEE
- [2] P. D. Drummond and H. K. Lim, "The significance of blushing for fair- and dark-skinned people," *Personality and Individuality Differences*, vol. 29, pp. 1123 - 1132, 2000.
- [3] A. Elgammal, C. Muang, and H. Dunxu. *Skin detection - a short tutorial*, 2009.
- [4] M.-Z. Poh, D. J. McDuff, and R. W. Picard. Non-contact, automated cardiac pulse measurements using video imaging and blind source separation. *Opt. Express*, 18(10):10762– 10774, May 2010.
- [5] N. Gronau, et al., "Behavioural and physiological measures in the detection of concealed information," *Journal of Applied Psychology*, vol. 90, pp. 147 - 158, 2005.
- [6] B. Vershuere, et al., "Autonomic and behavioural responding to concealed information: Differentiating

- orienting and defensive responses," *Psychophysiology*, vol. 41, pp. 461 - 466, 2004.
- [7] M. Gamer, et al., "Psychophysiological and vocal measures in the detection of guilty knowledge," *International Journal of Psychophysiology*, vol. 60, pp. 76 - 87, 2006.
- [8] S. G. Hofmann, D. A. Moscovitch, and H.-J. Kim. Autonomic correlates of social anxiety and embarrassment in shy and non-shy individuals. *INTERNATIONAL JOURNAL OF PSYCHOPHYSIOLOGY*, 61(2):134–142, AUG 2006.
- [9] Bashar A. Rajoub, "Thermal Facial Analysis for Deception Detection," *IEEE TRANSACTIONS ON INFORMATION FORENSICS AND SECURITY*, VOL. 9, NO. 6, JUNE 2014
- [10] Andrew Ryan, "Automated Facial Expression Recognition System," 978-1-4244-4170©2009 IEEE
- [11] D. A. Pollina, et al., "Facial Skin Surface Temperature Changes During a "Concealed Information" Test," *Annals of Biomedical Engineering*, vol. 34, pp. 1182 - 1189 2006.
- [12] M. Rubinstein. Analysis and Visualization of Temporal Variations in Video. PhD thesis, Massachusetts Institute of Technology, Feb 2014.
- [13] S. J. Russell and P. Norvig. *Artificial intelligence: a modern approach* (3rd edition). Prentice Hall, 2009.

