REVIEW ON LIE DETECTION SYSTEM

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Abstract: *In this paper, we demonstrate that we can use non-invasive physiology sensing to detect stress and lying, within the context of Artificial Neural Network (ANN). We show how simply derived non- invasive physiological features such as voice pitch variation, and heart rate variability are correlated to a number of high stress situations found in real life. Using these features, we can develop simple linear models that can be used to identify stress and bluffing.*

Keywords – ANN, stress, voice pitch variation, heart rate.

I. INTRODUCTION

The National Institute of Occupational Safety and Health states that stress is becoming the most prevalent reason for worker disability A 1992 UN report referred to as job stress "The twentieth Century Epidemic", whereas the world Health Organization expressed in 1996 that stress was a "World Wide Epidemic" .Researchers estimate job stress costs American industries between $200 and 300 billion annually. Given the mounting social prices of stress, the possibility of automatically identifying and monitoring stress levels for intervention purposes is compelling. This is notably true for people that often had high stress environments, such as financial traders or emergency workers. In such things, faulty performance as a result of acute stress can lead to million dollar losses of or even the loss of life.

Given the implications of stress on work performance, there has been recent interest in observation the work performance of people underneath stress. Specifically, studies in behavioral finance gift physiological proof that even the foremost sea-zoned securities bargainer exhibits vital emotional response as measured by elevated levels of skin electrical phenomenon and vessel variables throughout bound transient market events [Lo & Repin 2002, Lo et al. 2005]. Other studies have supported the proof linking feeling with commerce performance [Steenbarger 2002]. These studies indicate that psychophysiology and stress are intimately linked, and it is possible to infer one from the other.

We wish to demonstrate that non-invasively derived physiology and behavioural sensing can be correlated with various stressful events in poker tournaments. Specifically, we'll be viewing at subjective reports of stress levels, bluffing, and all-in things as outcomes and correlating these things with physiology options mass over the hand.

II. LITERATURE REVIEW

Whereas ancient clinical physiology observance focuses on distinguishing correct physiological responses (e.g. ECG traces during a heart arrhythmia), long-term monitoring enabled by minimally invasive sensing provides the ability to correlate con-textual measures over time to a person's behaviour and internal state. Research has shown that it's potential to correlate minimally invasive physiology measures to spot notions of a person's intentions and emotional state like interest, happiness, and stress [Picard 2001, Picard et al. 2001].

In specific, accurately distinguishing human intention like lying has been notably contentious given its inherently subjective nature. The idea of the „lie detector" has invariably captured the imagination and interest of the favoured press since it had been fabricated over 100 years a gone in 1902 by James Mackenzie. The first version fabricated by Mackenzie, was additionally known as the medical instrument tool as a result of it checked out a variety of physiological phenomena like a person's rate, respiration rate, blood pressure, and skin electrical phenomenon whereas someone is questioned. Though a report released in 2002 by America's National Academy of Sciences indicated that poly-graphs are not completely reliable (better as a measure of stress than veracity), there is no doubt that a range of physiological phenomena are often correlative to lying.

If such a ambiguous factor as telling the reality will be foreseen and related to basic physiological options like those analyzed by a medical instrument, it's not a

large leap of religion to think about mistreatment physiology to quantify a person's different internal states like stress, frustration, interest level, excitement, attention, drowsiness, and have an effect on [Picard 2001, Picard et. al 2001].

In fact, there's analysis to indicate that these items will in truth be accurately quantified, and moreover that these measures will demonstrate a high degree of correlation and

concordance among interacting groups of people, whether being stimulated while passively watching a movie [Madan et al.

2004] or the extremely concerned interaction dynamics of a medicine patient and a healer [Marci 2002].

Barbour's article about the polygraph and the privacy tort contributed to understand cons of polygraph. The aim of the article was that showing polygraph misuses, detail information about using polygraph in law enforcement, explaining what a polygraph is, what a polygraph test includes, weaknesses of detection of truth, and validity and reliability of it. The films which are about finding a suspected and criminal person helps to accommodate the idea of identifying guilty through using polygraph. On the other hand, it did not work as seeming in the films. Sometimes, it causes many innocent people are accepted as a guilty. There was an evident about it; a woman was killed in front of her boy. After the horrible event, the boy was accepted suspected person, and he took polygraph test. Because of he was sad about his mom's death; the polygraph assumed that he was guilty. After police officer found another evidences, they were convinced that he did not kill her mother. Moreover, people who are in doubtful condition are worried and scared about taking polygraph testing. Because they try to convince employees about they are innocent. And their endeavor causes physiological change in their body, and the result of it, they are accepted offender. By looking all of them, the polygraph is not useful test for lie detecting. According to this paper, there is no specific physiological symptom for lying, and there is no appropriate machine to detect liars (Barbour, 2002).

Ekman had done a study about specific micro expression to detect lies. Pauses and speech errors, raised pitch of voice, louder speech, sweating, blinking, faster/shallower breathing, whitening of the face are some examples of clues. There are some unreal facial expressions of emotion as well. For example; happiness should involve eye muscles, otherwise it is false, asymmetrical facial expressions occur, and fear and sadness involve a characteristic forehead expression especially involving the eyebrows. Ekman also developed 38-item lying checklist to become detecting lies in easier way (Ekman, 1996).

Voice Stress Analysis was another scientific method to use implying perpetrators. It was better method than polygraph. Lies can be detected through analyzing speech processes of persons. A tremor in speech give clue to the person is lying. Conversely, it cannot be assumed that objective method to lie detection. Because of many people have problem when they speak with foreign people, and they can experience a tremor in their speech. We cannot generalize it in whole events. The VSA also was not used to be as a lie detector.

Lastly, catching liar is important issue in criminal and forensic area. Hence, deception is common in legal area. Throughout history, many methods have been used to determine deceptions. Some of them could measure to physiological changes in human body when lying process occurs, but they also include limitation to evaluate conditions. For example, they needs to physical contact to human body and it creates uncontrollable fear and anxiety situation to people. So, they have not been accepted lie detector. On the other hand, Ekman et al found a different method without contacting with people; it is done by looking humans' behavioural and emotional expression. This method also includes some limitation, but it can be accepted more reliable than other. To sum up, legal area still needs much more reliable and valid method of lie detection system.

III. CONCLUSIONS

These initial results indicate that it is possible to correlate stress, lying (in the context of bluffing), and interest with a variety of physiological features. Using Artificial Neural Network, we have been able to identify high stress situations to within about 82% accuracy.

We can even discover lying with regarding seventy one accuracy.

Essentially, we tend to demonstrate that we are able to establish these events from easy aggregative physiological options non heritable throughout the period of the events in question from non-invasively derived sensing.

FUTURE ENHANCEMENTS

In the future we want the research of this project to go one step ahead in order to learn from its previous results and come up with more accurate decision making skills. In addition, we want to increase the accuracy level by replacing our hardware system with high resolution DSLR cameras and take multi angled shots for capturing the emotions more

precisely. More importantly, given the right technologies, we would like to capture and analyze raw EEG data from the brain, collect and examine voice and speech data and also include a thermal sensor 34

DETERMINE THE CHANGE OF TEMPERATURE IN ONE'S BODY WHILE ANSWERING CERTAIN QUESTIONS. WE ALSO WANT TO TEST THIS MODEL ON A MINIMUM NUMBER OF 100,000 PEOPLE AND CREATE A HUGE DATASET. WE BELIEVE IF ALL THESE FUTURE RESEARCHES COULD BE DONE PROPERLY, ONE DAY WE WILL HAVE A LIE DETECTOR THAT CAN DETECT LIES 99% OF THE TIME OR MAYBE EVEN A 100%.

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