Lie Detection based on Human facial gestures

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Abstract: Facial behavior of deception has developed as an imperative subject in observation research. In this paper, we assess the facial conduct of deception focused around some of the signals identified in the literature. To start with, we present a short study of deception cues in facial behavior. At that point, we run a pilot study, with one-to-one interview with balanced situation, under controlled and exploratory conditions. Emulating the standard practice, the test has been intended to join three stages. Phase one: help session, in which the baselines are made for every member. Phase two: session, in which the members are obliged to answer addresses on two points - one truthfully and one erroneously. Phase three: reporting toward one self-session, in which the members are obliged to report the ground truth for stage two. Once the information of pictures of facial conduct was gathered, it was broke down and contrasted with the facial behavior prompts identified in literature. For measurable examination, a non-parametric sign-test was chosen. The results demonstrated that there is potential in applying facial behavior as the signs in predicting deception. At last, an examination on future work present more unpretentious facial actions analysis is presented. In this thesis, we have worked on facial action points and expression analysis. We will take a shot at the strategies to decrease the lapse in Lie Prediction. We have likewise taken mind that utilizing Simple Computer Webcams, one can have the capacity to utilize our System. In this dissertation, we focus on building an algorithm which can predict a Lie and a dataset which consists of different facial actions that are observed on the face during a Lie. We have investigated that micro expressions cannot be controlled for every emotions. So, we have approached towards various techniques to collect the action units and expressions that can be helpful for Lie observation on the face.)
Keywords: lie detection, facial action units, facial gestures, real time lie prediction.

I. INTRODUCTION

A developing subject of enthusiasm for security organizations is the discovery of human practices that may uncover a single person as having planned malicious goal; for example by attempting to cheat authorities to enter a nation unlawfully, pirate products into or out of a nation, being included in a vindictive demonstration, for example, a terrorist attacks, or as harboring the plan to complete such a malignant act at a later time. Such a capacity will help in the fear of suspect people, before they find themselves able to complete malicious acts.

Modern Technology can detect modifications in facial patterns and movement in both the visible and thermal fields. This motivation of this project is to exploit those capabilities by beginning development of a real-time dynamic passive profiling technique to assist security officers as a decision aid. Different literature articles were reviewed to establish

behaviors that can be used for the identification of malicious intent: modeling these behaviors, patterns and cues helpful as a tool for detecting suspicious individuals. A rich FACS-coded (Facial Action Coding System) database with high quality thermal images was established from the baseline data to support future development of a tool for operational detection of cues to malicious intent. This will also aid the computer vision community as there is currently a data deficit in this area.

II. LITERATURE SURVEY

A. Traditional polygraph test[1]

A polygraph (used like a lie detector) measures various physiological indices like respiration, pulses, blood pressure, and skin conductivity while interrogation with the subject. The belief using

polygraph is that it produces physiological responses for deceptive answers that can be differentiated from non-deceptive answers; the polygraph is used as a lie detector .Factors measured during polygraph test: Breathing rate, Heart Pulse, Blood Pressure, Perspiration . Best Accuracy is achieved in it but it is the inconvenient approach for lie detection.

B. LVA (Layered Voice Analysis) [3]

 Israel based Company Namesysco developed LVA Tool to detect brain activity traces using the voice and classify them in terms of stress, excitement, deception . Central Forensic Science Laboratory, Ahmedabad is one of the current user of LVA and they have undergone various successful operations.

C. Thermal Imaging Cameras [4]

 Professor Hassan Ugail , University of Bradford used Thermal Imaging Cameras and computer software to recognize untruthful faces. It measures flushing, blood flow patterns near the eyes along with that the system also picks clues such as nose-wrinkling, slips of the tongue, blinking, and lip-biting.

D. ;Brian Scanner as a Lie Detector [2]

 Different parts of brain is used when people lie. Different Scanners MRI like functional magnetic resonance Imaging Scanners Detected by can detect which parts of brain are used during a lie observation.

E. Using High Speed Cameras[5]

 Expensive Cameras are used for Detecting Micro Expressions from video frames .It can Predict Lie based on the emotions analyzed from various facial action points.

III. THE PROPOSED TECHNIQUE AND ALGORITHM

Our goal is to detect facial Action Units and Facial points. Design and Develop Lie Detection System using Facial Expressions Analysis of Facial Action Units and expressions observed on face during a Lie. People lying involuntarily produce psychological pressures along with rapid heartbeat, blood pressure, palms sweating, slight body temperature rose , muscle trembling, respiratory rate and capacity slightly abnormal Most Interesting points Changes in facial

Expressions Transition from the normal behavior. Humans voluntarily and involuntarily conveys simple facial expressions like contempt , anger, disgust, fear, joy , happiness, surprise, and sadness on their faces. Most of humans develops micro-expressions based on certain physiological responses when attempting to deceive another person.

A. Visual Clues of a Lie

Various Micro expressions are expected to be delivered unknowingly followed after a lie. Forehead wrinkles are observed on the foreskin of head with eyebrows drawn upwards and causing short lines on forehead due to emotion of stress. Oral Lie is a part of a lie during any conversation .If the person thinks and creates a lie during a conversation, his eyes shift to the left with mouth open. Visual Lie is observed when some person is asked a question and he gathers time for thinking for formation of a lie which brings his eyes to the left.

B. Intel Realsense3d Camera

U sing Intel Realsense SDK and Features like Face Detection and Tracking, 78 Facial Landmark points tracking, Tracking head positions (By Roll , Pitch and yaw) on real time basis was very convenient . We tracked Visual Lie , Oral Lie , Overhead Wrinkles that are the basic expressions observed on the Suspects during a lie.
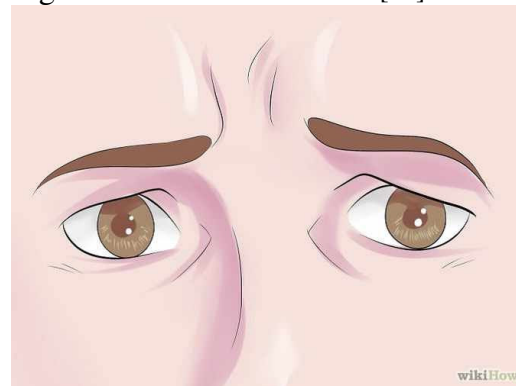

Figure : Forehead Wrinkles [10]

Figure : Visual and Oral Lie [10]

Figure : Intel Realsense 3d Camera

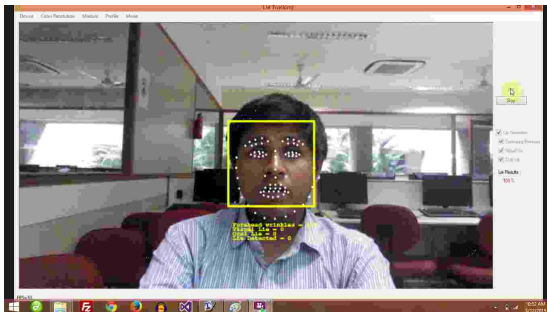## IV. REALTIME DETECTION OF FACIAL VISUAL CLUES OF A LIE

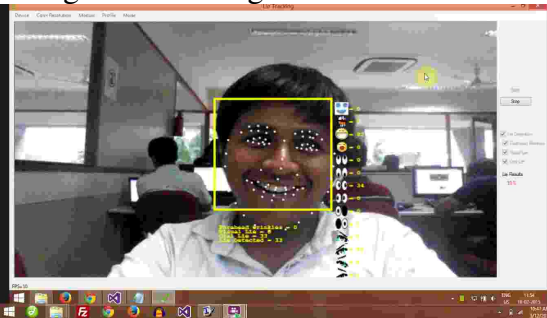Figure : Tracking Forehead Wrinkles

Figure : Tracking Oral Lie

V. CONCLUSION

Human emotion on the basis of facial micro-expressions is an important topic of research in psychology. It is believed that the developed system can be useful in many areas where psychological interpretation is needed such as in police interrogations, airport and homeland security, employment, and clinical tests. Real time Lie detector seems very helpful for day to day analysis. It can be used for identifying suspect, but cannot be used as a foolproof evidence for a lie.

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