Layered Voice Analysis as a Forensic Psychological Tool in the Detection of Deception: A Case Study

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Abstract— *Layered Voice analysis is a forensic psychological tool that aids in the investigative processes. The tool detects the physiological, cognitive and emotional deviations which may be associated with deception. LVA has been used in interrogations, interviews, both groups as well as one-on-one sessions. Lying behavior takes place in order to avoid punishment, to protect the real suspect and various other reasons. Lie-detection or truth verification methods are used as corroborative evidence that will help in serving justice to the victims or in conducting fair trials at the court. Offline or Online analysis is done either in real-time or of recorded audio files. The present paper analyzes an offline recording of an interview involving an investigative journalist and a social activist suspected to have been an associate to be the accused in a fraud case. In this study, the parameters and process of LVA will be discussed, the results and findings of the above case will be presented. Implications and usefulness of this investigative tool will be explained.*

Keywords— *Forensic Psychology, Deception, Lying behavior, Truth verification, Forensic Investigative tool, Layered Voice Analysis.*

I. INTRODUCTION

Forensic Psychology is an area that is gradually emerging in the field of Forensic Science in India [1]. The Indian Government has been taking initiative to facilitate efficient investigations of serious and heinous crimes, with improving focus on research in the areas of forensic psychology, neuropsychology and psycho-socio genesis of criminal behavior and relevant matters, with exchange of technology [1]. There have been widely established, and some ongoing, methods to study deception. Body language experts have done innumerable researches on lying behavior, paving the way for the development of lie detection tools in the earlier years. Behaviour Analysis Interview, Statement Validity Assessment, Reality Monitoring, Scientific Content Analysis, different Polygraph tests, Voice Stress analysis are some of the methods that have been useful to investigators and researchers, drawing worthwhile results and information in the area of deception. The Psychophysiological Detection of Deception (PDD) systems measure variations in emotional stress as is done in Polygraph [2]. The combination of results by the trained examiners determines whether the response of the subject is deceptive or non-deceptive. A careful pre-test interview and question formulation coupled with a thorough post-test interview; the examiner should be able to convince the subject to reveal their deception. Given the human nature of the subjects, there can be variance expected in their reactions to the questions and in the amount of stress displayed [2]. Lying behavior is of two kinds. One is concealment of information, the other is fabrication of information. There are several reasons for lying behavior, some

of the common reasons are to avoid punishment, to cover up for someone, to avoid punishment and so on.

Layered Voice Analysis, LVA, is Nemesysco's technology, developed by Amir Liberman that enables a better understanding of mental state and emotional profile of a suspect in a given moment by detecting the emotional cues in their speech. LVA technology works by measuring uncontrolled vocal biomarkers from the human voice during speech. Emotional parameters that LVA measures include excitement, enthusiasm, assertiveness, aggression, fatigue, stress and fatigue. LVA segments and evaluates narrative audio data automatically and displays a message in regard to the subject's current mental state [4]. LVA technology detects various psycho-physiological reactions that deviate from an individual's baseline psycho-physiology indicative of changes in the perception that will facilitate an interrogation examiner to follow new indications and leads [3].

II. CASE STUDY

The background case - Mr. X is a well-known 'antique dealer' who is well bonded with big personalities and suspected to have big dealings with them. Ms. Y, an expatriate, was suspected by the police that she knew more about Mr. X's dealings and was not revealing or was concealing a great amount of information regarding the case when she was interrogated at her residence from Italy. Followed by which an investigative journalist working in a reputed news channel in Kerala staged an interview with Ms. Y claiming it to be a request from the channel to be a part of the discussion panel regarding the case since she knew Mr. X. Not knowing the purpose, she agreed to be a part of the discussion. According to the reports Ms. Y has introduced Mr. X to a number of senior police officials and the interview by the news channel was staged to extract any information on her involvement in the Rs 6 crore scam case. The arrangement by the news channel was similar to a panel discussion with few other participants with fake designations.

In this case study, the interview arrangement has been extracted for the offline LVA analysis. It was a 45-minute video with the interrogation between the journalist and Ms. Y. The interview started with general questions pertaining to her career and her link to Mr. X. the audio file indicates how the tone and pitch of Ms. Y changes as and when the journalist posed questions that were specific to the case. A number of times during the interview, it is observed how Ms. Y becomes defensive at questions that were unpleasant and twisted the questions and manipulated in her favor. The fear and anxiety in

her voice could be observed. When asked about dates and specific details she ascribed her confusion to forgetfulness.

III. RESULT AND DISCUSSION

The authors tested the media record file available in the public domain using LVA (Layered Voice Analysis). LVA is a widely used tool that has various purposes such as security that has a unique mathematical process to detect different types of patterns and abnormalities in speech flow and classify them in terms of stress, excitement, confusion and other relevant emotional states.

The system processes the automatic segmentation and cuts the audio file into vocal segments of 2 seconds each. The analysis of each segment is done by the examiner, separating the voice in target from the noise, if required.

After the offline analysis is done, segment by segment, the system generates automated scores and displays scores on various parameters.

A report entailing an extensive analysis of the segments was generated as shown in Figure 1. The statements marked relevant were individually analyzed. The detection summary, high risk and suspected summaries, and final analysis have been discussed in the report. Voice graph as shown in Figure 2 depicts the graphical representation of the voice analysis.

Segment by segment analysis verifies detection of deception patterns which correlates with the subject's verbal and non-verbal cues. Moreover, the suspected segments marked relevant by the examiner aids the LVA system in the analysis that paves the way for further investigation,

Moreover, the results are to be interpreted in a combination of all the parameters. Here, we emphasize on the cognitive and emotional parameters and their correlation with the cognitive overload theory.

SOS and Cognitive overload reflected higher on statements the subject turned defensive and seemed not to disclose much information.
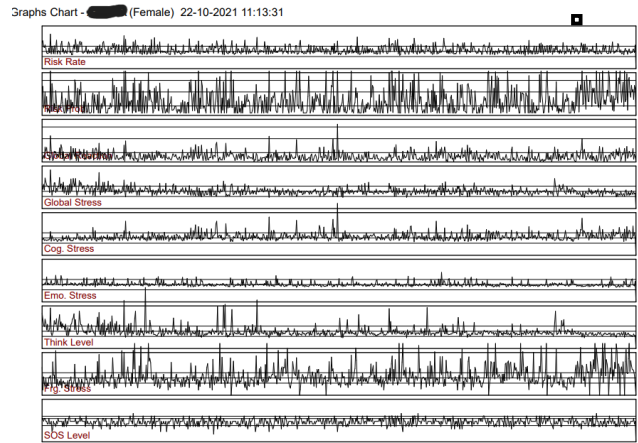

Fig. 1. The LVA report generated after the offline analysis

Fig. 2. Voice graph

IV. CONCLUSION

According to the theories of deception, there are four general ways to detect lying behavior. Investigators could measure physiological responses, measure brain activity, observe their behavior, or analyze their speech. These four ways to detect deceit have different theoretical underpinnings as to why differences may occur between truth-tellers and liars [7].

Zuckerman et al. in 1981 had proposed the influential Four-Factor theory of deception that suggests that deception involves generalized arousal, anxiety, guilt and other emotions following deception, cognitive component and liar's attempt to appear honest or innocent by controlling verbal and non-verbal cues [10].

Lying behavior can be defined by any behavior that fabricates the real story or involves concealment of important facts of the real story. Lying behavior, such as blatant lies are harmless and one may engage in such acts to not hurt their person or some valid reason. But deception during any unlawful activity that may cause harm or is detrimental to society requires it to be detected to avoid any serious threat to the nation. Fabricating a story involves giving wrong details while concealment of information involves deliberate omission of important details. Commission or omission of information may be to protect one from being convicted, to prevent from being punished or evade an arrest, or to misguide investigation processes to safeguard the offenders' ultimate goals.

There is a cognitive activity occurring when a person has to recall an event. The cognitive activity is higher when the person is lying or trying to conceal some information. This is because the information processing takes place at different levels [6]. The liar has to keep track of what and how much information is known to the interrogator, they have to remember what they had said earlier so that it is in line with what they say now, they have to control their nonverbal behavior that may spill out any guilt or anxious feelings. The load also depends on the kind of information he or she lies about or hides. For example, the cognition, emotion and information processes will differ for blatant or white lies as compared to lies or concealment of information that is serious in nature and could be harmful. One of the traditional ways of detecting deceit was recalling the story in question in a reverse order [6] as compared to stories
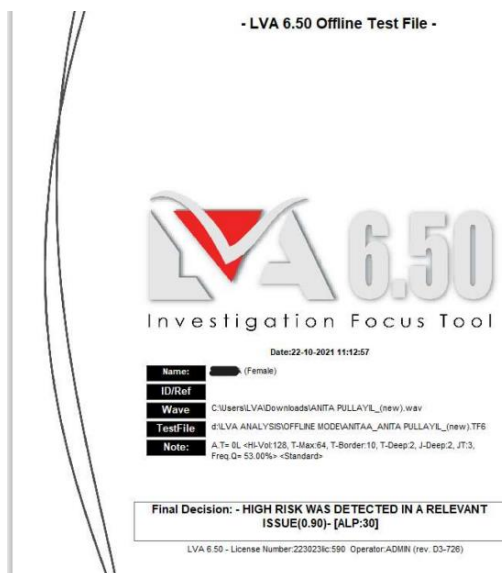
recalled in a chronological order. Only truth tellers are likely to report stories in a reverse order.

The reports of LVA analysis indicate that High risk was detected and individual segments analysis also show inaccuracies and high stress for statements that were suspected to be not truthful. LVA has been equipped in detecting deception and also facilitates in guiding further investigation. However, the use of such lie detection methods is highly accurate with highly skilled examiners.

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