Crime Detection using Voice Behavior on the Basis of Collected Evidence

Anwar Ahsan

Abstract: - Human intelligence is the key to stopping terrorism, and therefore it isessential to know when the information obtained is false. This article briefly outlinesthe research on voice clueto find fraud, cheating and other crime.Voice analysis technology is most power full to find pattern of voice during the human behavior changes when he or she is true or lying. Voice pattern which is retrieve from database and relate with current situation. System is accommodating to detect deception.

Keywords: behavior; cognition; deception; detection; emotion; judgment; lying; Malfeasance; memory: voice, amplitude.

I. INTRODUCTION

"The voice is as unique as a fingerprint or a retina scan." Everything physical is composed of energy. Quantum physics has shown us that there is no such thing as solid matter. That there are just waves that interact. So your body is made up of energy and your mind and your soul and your spirit and all those things are forms of energy. The VA System tests the energy of the entire body using the voice because the voice, when you speak, vibrates your whole being. It's not just straight from your throat, out your mouth. It vibrates throughout your body and the energy field around the body. We can determine, by measuring the vibrations that come off of you when you're speaking, what energies are missing and what energies are too strong in your energetic field. Then we can use sound waves to balance that out. The voice, which we analyze with a computer, is a great indicator of vitality. The voice is one of the most powerful avenues of human expression and as such, provides a very useful analog for the systems of the body. There is evidence that the brain, in addition to being a master chemist, is a very complex tone generator and commands the systems of the body through frequency. Basically every biochemical, every nutrient, and so forth, has it's own frequency and when you speak and we measure your voice, if you're missing a vitamin, your body will absorb the frequency of the missing vitamin and it will come up as absent from your voice. So we can look for these energies that are absent from the energy radiating from your body and we can look for what biochemical are deficient and what biochemical are in excess in your body's energy. The Brain produces waveform patterns that can be measured with a variety of instruments. The voice also produces a waveform pattern that contains a great deal of frequency information that seems to relate to the physical and emotional health and balance of the speaker. Since every person's voice is unique, the resulting frequency voice analysis map when recorded and analyzed with the VA System may show indications of physical and/or emotional issues during the time of the recording.

Manuscript Received on October 2014.

Anwar Ahsan, Prof. U T Nagdeve, Dean MIET Gondia, Department of Computer Engineering, Anjuman Polytechnic Nagpur, India.

Types of Voice

The voice classified According to gender into female and male.

Female

Soprano & High Soprano- Soprano is the highest voice for a female and can also be reached by a male if he hasn't hit puberty yet. The Soprano range (on the piano) goes from the lowest possible at a B3 or A3 (just below middle C) and the highest possible D6 or D7-Flat.

Ezzo-soprano- Mezzo e soprano is the most common voice type for females and is known as the middle voice. The Mezzo-soprano range overlaps a lot through the Contralto, Alto and Soprano ranges. The range typically is the A3 (below the middle C) although some Mezzo-soprano's can reach the G below to the high C. (C6)

Alto- Technically speaking Alto is not actually a type of voice but most consider it as one. The Alto is generally the name for a singer that is either a Mezzo-soprano or a Contralto that can reach notes higher or lower than it should and has no definite range.

Contralto-the Contralto is the lowest female voice type and is truly rare in operatic terms. The Contralto range reaches from a F3 (below the middle C) but others can reach from the E (below the middle C) to the second b-flat above (b-flat5).

Famous Contralto Singers-

Male

Counter-tenor- Counter-tenor refers to the highest male voice and is rare for anyone to obtain. It ranges typically from the G3 to E5 or F5.

Tenor- Tenor refers to the most common higher voice type for males and it's range lies between one octave lower than middle C to one octave above middle C.

Baritone- Baritone refers to the most common of all male voices. It's range is from F below the middle C to the F above middle C.

Bass- Bass refers to the lowest of all male voices. This vocal range reaches from two octaves lower than middle C to the G above middle C.

II. RELATED WORK

2.1 Lie Detection

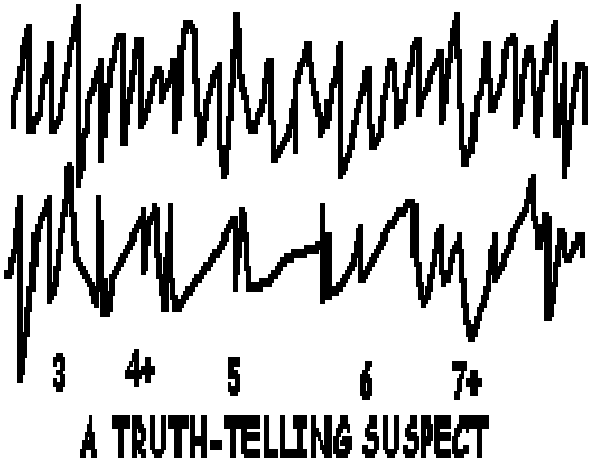
Lie detection methods have been used for years by police interrogators. Physiologically, when a suspect lies about their involvement in crime, it's fairly easy to notice a flushed face, throbbing of the carotid artery, dryness of the mouth, sundry other clues. Psychologically, verbally, and nonverbally, there are other clues and cues. The assumption behind all lie detection methods is that there's a natural interaction between mind and body, and depending upon the individual and their level of involvement, deceptive suspects will utilize certain mental, emotional, and physical defense mechanisms that are

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication Pvt. Ltd.

dependent upon the amount of stress they're under or what danger they perceive themselves to be into. Now, that's a big assumption, and the phrase "defense mechanisms" might be better called the "psychological set" to rule out any idea that the technique is psychoanalytically grounded, which it is not. Polygraph exams are believed to offer individual, rather than class, evidence because through the years, developmentally, a person develops set ways of reacting to reacting to stressful or threatening situations. During a polygraph, an examiner is always paying attention to these fundamental clues and cues, developing a sense of the suspect's values, beliefs, motives, and attitudes. The machine part of a polygraph examination is designed to pay attention to the actions of the nervous system, particularly the autonomic nervous system, and then certain sympathetic members of the autonomic system which alert the body to stress or threatening situations. The machine has components that measure the following:

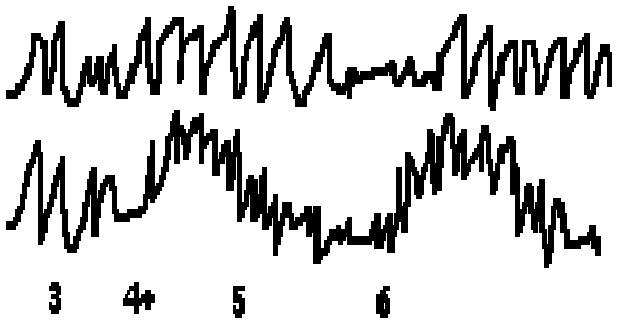
- Respiration (*pneumograph* -- pneumatic tubes, assisted by beaded chains, are fastened around the chest and abdomen of the person)
- electrodermal skin response (*galvanometer* -- two electrodes are affixed to two fingers on the same hand, and an imperceptible amount of electricity is run through them)
- blood volume and pulse rate (*cardiospymograph* -- a blood pressure cuff, of the type used by physicians, is fastened around the upper arm)

The machine is not just operated. The examiner should be a person of ability, experience, education, intelligence, and integrity who uses the machine in a predetermined manner. There are three (3) phases of the test procedure: (1) a pretest interview; (2) chart recording; and (3) diagnosis. Beforehand, the examiner is provided with all relevant information regarding the case, such as the criminal charges against the person and the statement of facts. They then spend some time alone preparing a pool of test questions that are neither too broad nor too specific. Anything calling for an opinion or belief that can change with time or motivation is ruled out as a possible test question, as is anything vague. The pool of questions should focus on a single incident, the facts, and narrowly defined issues of disputed action, not intention. During the pretest interview, the examiner will condition the subject by clarifying the purpose of the test, reassuring them about its objectivity, and/or defining terms that will be used. Also, a control question will be developed and selected. A control question is unrelated to any legal issue, but it addresses a related behavior. For example, with a crime of violence, a control question might be "Have you ever lost your question or done things you regret?" Relevant questions are those that have a direct bearing on the case, and irrelevant questions have no bearing whatsoever, but can only be answering truthfully ("Are you sitting in a four-legged chair right now?"). Generally, a series of 9-10 prepared questions are asked, allowing about 10 seconds following an irrelevant question and 15-20 seconds following a relevant or control question. It's also standard to run through all questions a minimum of three times before a diagnosis is attempted.Diagnosis is made by verifying other clues and cues with the chart. *A truthful subject's chart will show emotional attention was paid toward the control questions and deflected away from the relevant questions. A deceptive subject's chart will show emotional attention directed toward relevant questions and away from control questions.* The following illustrations might be helpful:



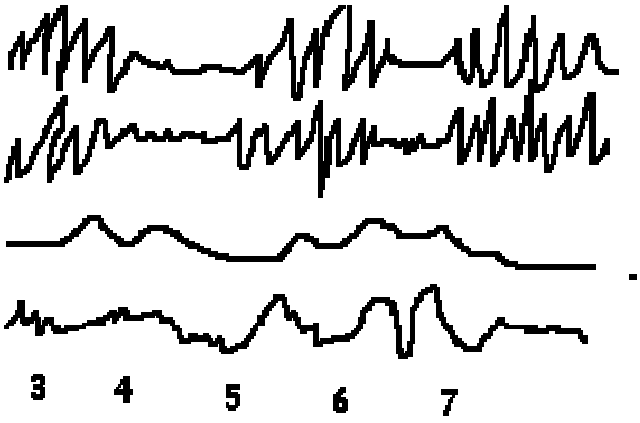
A TRUTH-TELLING SUSPECT

The top line is respiration and the second line blood pressure. Questions #4 and #7 were irrelevant, and show the most reaction.



A LYING SUSPECT

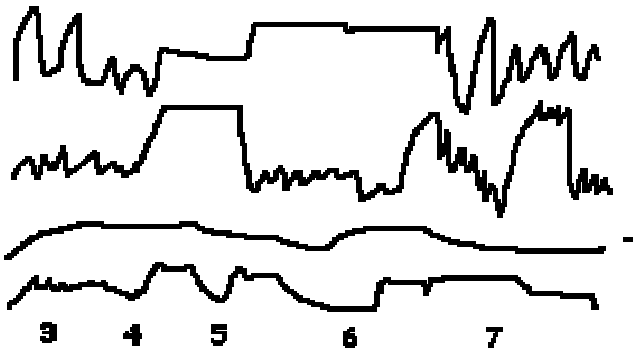
Question #4 was irrelevant and question 6 was a control question, the latter showing the most reaction. The relevant questions, #3 and #5, show emotional attention in their most common form, a steady increase or decrease in the baseline.



A DELIBERATELY DECEPTIVE SUSPECT

In cases where the suspect is trying to "beat" the polygraph or confuse the examiner in some way, you need to also look at the third and fourth lines, skin conductance and cardiovascular change. The relevant questions were #4 and #6, which show a response, but there's a lack of response to control questions #5 and #7.

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication Pvt. Ltd.



A DELIBERATELY DISTORTED SUSPECT

In cases where the suspect is trying to mislead the examiner because they are trying to feign amnesia, mental illness, or other mental block indicative of confusion, the pattern results are as above, with high-ranging plateaus. It is rare to get this kind of pattern from a truthful subject. There are only four known "countermeasures" (*ways to "beat" a polygraph test*), and these are: controlled breathing; muscle tensing; tongue biting; and mental arithmetic. These techniques have been known for years, are part of training that foreign agents undergo, and anyone who has purchased the publicly-available DVDs on them is likely on a government list in case they ever apply for a security clearance.

2.2 Behavioral Clues

Years of research have led the authors to focus solely on the most verifiable behavioral cues to lying.[4]Many studies have involved a randomly selected sample of people assigned by chance to lie or tell the truth. Unfortunately, such studies feature participants with no personal, financial, or emotional investment in the lie or any fear of exposure to sanction if they are caught. No stakes are involved—no punishment for getting caught and no reward for fooling the investigator. The authors' studies involve people motivated to act against a person or group with a different ideology, placed in a situation where they choose whether to commit a crime (e.g., steal a check made out to the group they despise), and then interviewed by a retired law enforcement officer, offering them the opportunity to tell the truth or lie. The stakes involved include facing detention, enduring blasts of white noise, or, for instance, having the stolen check donated to the group they hate. These consequences would occur if the person were not believed regardless of the truth because, in real life, consequences stem from judgments, not reality. Thus, truthful individuals often are nervous in police interrogations. The authors strive to make their research practical and analogous to real-world law enforcement situations and have found that, clearly, the behavioral cues to lying differ when people are not vested in having their story believed and have no fear of detection. The authors monitor their participants with sensors that record and analyze their facial behaviors, gestures, body movements, voice and speech characteristics, physiological indicators (e.g., heart rate, blood pressure, skin conductance, respiration), heat emanation from their faces and heads, pupil dilation, and gaze direction. In addition, the authors record their participants' spoken words and then examine their verbal statements and style. The results have demonstrated that when motivated people lie and face consequences upon detection, clues to deception emerge and appear as leakage across multiple channels. Four of these are nonverbal (facial expressions, gestures and body language, voice, and verbal style). A fifth channel of leakage is in the actual words spoken—verbal statements.

It is not the mere presence or absence of behaviors, such as gaze aversion or fidgeting, that indicates lying. Rather, it is how these nonverbal cues change over time from a person's baseline and how they combine with the individual's words. And, when just the behavioral cues from these sources are considered, they accurately differentiate between lying and truth telling

2.3 Signal and image processing for crime control and crime prevention

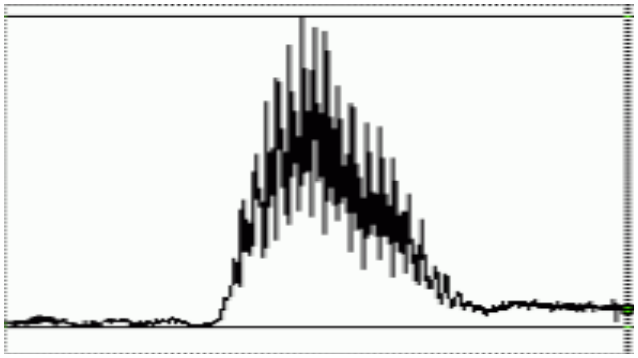
In technic we will take a critical look at the research and development of signal and image processing technologies and new applications of existing technologies to improve crime control and crime prevention. Signal and image processing techniques are used in many aspects of sensing the environment both during a crime and in the post-crime analysis of the scene. Common themes of research will be discussed with reference to applications such as: Ballistocardiogram Human Presence Detection Technology Demonstration, Electromagnetic Portal and Acoustic Systems for Concealed Weapons Detection, Uncooled Thermal Imagers to Enhance Law Enforcement Operations, Technology along the U.S. Border, In-Vehicle Voice Verification (IVVVS), Methamphetamine Cook and Detection Technologies, Radar-Based Through-the-Wall surveillance system, Speaker Identification and Voice Stress Analysis Technology Evaluation

III. PROPOSED METHOD

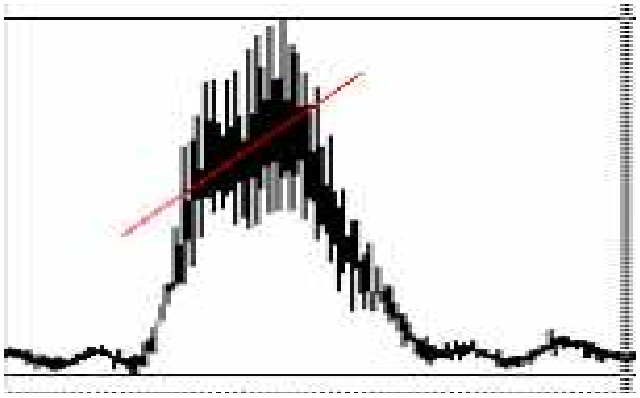
The VA System is a computer based analyzing software program. A live voice recording of only a few minutes measures one's personal, emotional and physical state of being. The VA System measures with the most advanced computer technology and analyses patterns in voice frequencies, which provide a deep view into the person's range of emotions and impulses. VA focuses entirely on the changes in the voice frequency patterns. That makes The VA System the most revolutionary system for analyzing the person behind the voice. Showing the person behind the mask. In various analyzing systems electrons are shot through the body from a certain point to another point. During that trip the required information is picked up. The information that is gathered through the voice recording with VA, is not influenced by external factors, and therefore has no effect on the results. Also a multiple choice questionnaire can be easily be influenced and is therefore not applied within VA. The foundation of VA System technology is that a person's voice emits detectable fluctuation in both AM (amplitude modulation) and FM (frequency modulation) frequencies called microtremors. When you listen to a person speaking, you hear the AM which rides atop the FM, which is undetectable to the human ear. Under the stress created from a deceptive response there is a reduction in the FM frequencies causing the microtremors to increase. It is an involuntary autonomic response detectable with a microphone and a computer

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication Pvt. Ltd.

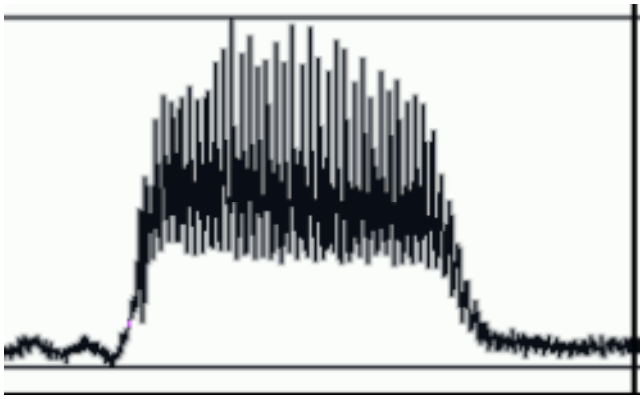
running the proper software. The skilled examiner then analyzes the person's voice patterns looking for these frequency discrepancies.



(a)



(b)



(c)

Figure 1.Waveform used to measure stress based on energy in the waveform, (a) little to no stress, (b) medium stress, (c) hard stress

VA System works in any language whether the subject is face to face or on the phone. Drugs, alcohol, and medical conditions do not affect the tests. Voice recordings that are years old can be used to solve cold cases. And, there are no known countermeasures. A person cannotmanipulate his voice frequencies the way he may be able to manipulate blood pressure, breathing, and skin response. Subjects experience less stress caused by the interrogation as only simple yes and no questions are needed. And, when face to face, the subject only has a microphone attached. When compared with a polygraph, the VSA technology is easier to use, faster to administer, less stressful, cheaper, and 98% accurate. Like the polygraph, VA Sytem is a tool for getting at the truth. Below is a comparison based on some of the factors law enforcement, attorneys, or private investigators have to consider when selecting a method to get to the truth.

Voice Stress Analysis	Polygraph
Measures anatomical (subconscious) responses	Measures physical response to questions
Non stressful interview and examination technique	Stressful baseline interview and examination technique
Examiner can differentiate between stress and deception responses	Stress responses read as deception
No inconclusive results from examination	Inconclusive examination results possible
Alcohol, drugs, and medications have no effect on exam results	Alcohol, drugs, and medication cause invalid results
No known counter measures	Multiple counter measures
Interview can be recorded, and translated for examination	Examiner must speak language of examinee
Live interview and examination take as little as 45 minutes	Live interview and examination take a minimum of 2 hours
Recorded interviews are able to be examined	Live interviews only
Consent needed for live examinations only	Consent needed for all examinations
Cold case audio and video recordings are able to be analyzed for statement validation	No cold case applications
Covert recordings are able to be analyzed	No covert application
1/4 the cost of polygraph for recorded examinations	$
1/2 the cost of polygraph for live examinations	$
VSA interview admissible in court. Examination admissibility is at the discretion of the court.	Polygraph interview admissible in court. Examination admissibility is at the discretion of the court.

IV. CONCLUSION

It was not the objective of this study to recommend one Psychophysiological Deception Detection technology over another. Rather, it was our intent to provide users with an unbiased evaluation of VA System technology along with enough information to assist them in making decisions on what type of system to employ. Our results indicated that,

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication Pvt. Ltd.

given the VA System tested, results indicate that this technology, with a trained and experienced examiner is capable of detecting deception or truthfulness in a subject at a rate better than chance. The experience an examiner has with VA System technology plays a key role in their ability to detect deception. These instruments alone are not "lie detectors". The decision as to whether a subject is being truthful or lying should only be made by a trained examiner. This decision should be based upon reviewing the data presented by the instrument, the demeanor of the subject, and other evidence from the case. VA System are capable of providing an examiner with a waveform or other response that may be a reasonable reflection of the stress level being experienced by the subject, in a majority of the cases. The correct interpretation of this indicator is the responsibility of the examiner. The goal in using a VA System or polygraph should be to convince the subject that they cannot deceive the operator, and that the instrument will detect their deception and their best avenue is to confess to the crime. This study has shown that VA Systems will produce results that trained operators can employ with confidence to obtain confessions. The results of these examinations should not be considered "proof positive" of innocence or guilt. While some consider these tools as an aid in focusing an investigation on proving someone guilty, officers should not lose sight of other suspects or evidence that may indicate otherwise. This study has also shown that when training and experience of an examiner are taken into consideration, test results indicate that over time there is a marked improvement in an examiners ability to correctly identify deceptive subjects. Likewise, the comparison between the two analysts of different skill levels also indicates that experience may be a factor in improving accuracy. Observations made during the study of other analysts seems to indicate that the more opportunities one is given to run tests, examine charts and receive feedback (ground truth), the better the examiner becomes.

REFERENCES

[1] O. Lippold, *Physiological Tremor*, Scientific American, Volume 224, Number 3, March 1971.
[2] D. Lykken, *A Tremor in the Blood, Uses and Abusesof the Lie Detectors*, New York, McGraw-Hill, 1981.
[3] National Research Council of the National Academies, *The Polygraph and Lie Detection*,WashingtonDC,National Academies Press.
[4] Anderson, J.C., &Gerbing, D.W.,Structuralequation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin*, Vol.103, No.3, 1988, pp.411-423.
[5] Avolio, B. J., Zhu, W., Koh, W., & Bhatia, P., Transformational leadership and organizational commitment: mediating role of psychological empowerment and moderating role of structural distance.*Journal of Organizational Behavior*, Vol.25, 2004, pp.951-968.
[6] Bettencourt, L.A., Change-oriented organizational citizenship behaviors: the direct and moderating influence of goal orientation. *Journal of Retailing*, Vol.80, No.3, 2004, pp.165-180.
[7] Bhal, K.T., & Ansari, M.A., Leader-member exchange-subordinate outcomes relationship: role of Voice and justice. *Leadership and Organization Development Journal*, Vol.28, No.1, 2007, pp.20-35.

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication Pvt. Ltd.