

Advancement in Brain Fingerprinting Technology using Voice Recognition and peaks

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Abstract

Brain fingerprinting is based on findings from brain that generates a unique wave pattern when a person encounters a familiar stimulus. In lie detection this technique was used to assess the person by showing different patterns of brain activity. It is a new computer-based technology to identify the perpetrator of a crime accurately and scientifically by measuring brain-wave responses to crime-relevant words or pictures presented on a computer screen. It has proven about 80% accuracy in over 120 tests. To make it more efficient voice recognition and peaks technology have been implemented. Voice recognition technology helps in detecting health disorders in human beings and peaks technology has been implemented to detect the speech and voice disorders which may also affect the brain waves generated by the hormones in the brain and thus reducing the efficiency of this technology. In order to make this technology more accurate voice recognition and peaks technology were implemented.

1. INTRODUCTION

Brain Fingerprinting was developed and Patented in 1995 by Lawrence A. Farwell, Ph.D., chairman of the Brain Wave Institute in Fairfield, Iowa, and former Harvard University research associate. The voice recognition technology was developed by Lenny Baum of Princeton University especially for Hidden Markov Modeling in early 1970's. The peaks technology was introduced in order to cure major communication disorders in 21st century (cf. Ruben(2000)). Brain Fingerprint technology measures how brain waves respond to specific Words or pictures flashed across a screen. This invention is supposed to be the best lie detector

available as on date and is said to detect even smooth criminals who pass the polygraph test (the conventional lie detector test) with ease. The new method employs brain waves, which are useful in detecting whether the person subjected to the test, remembers finer details of the crime. Even if the person willingly suppresses the necessary information, the brain wave is sure to trap him, according to the experts who are very excited about the new kid on the block. It is designed to determine whether an individual recognizes specific information related to an event or activity by measuring electrical brain wave responses to words, phrases, or pictures presented on a computer screen. The technique can be applied only in situations where investigators have a sufficient amount of specific information about an event or activity that would be known only to the perpetrator and investigator. This investigation may also go wrong in some cases. For example if a perpetrator or witness suffers from a brain disorder then his brain wave changes accordingly. Hence this will result in wrong inference at the end of the test. In such cases voice recognition and peaks can be used in order to detect the brain and voice disorders of the witness or perpetrator. Acoustic analysis is a tool we use in order to detect delta waves produced due to voice disorders or may be any other disorders and filter out these delta waves from the brain waves of witness and then use these brain waves for further analysis.

Farwell's brain fingerprinting originally used the well-known P300 brain response to detect the brain's recognition of the known information (Farwell and Don Chin, 1986, 1991; Farwell 1995a). Later Farwell discovered the "memory and encoding related multifaceted electroencephalographic response" (MERMER), which includes the P300 and additional features

and is reported to provide a higher level of accuracy than the P300 alone (Farwell and Smith, 2001; Farwell, 1994, 1995b). One of the applications is lie detection.

II. TECHNIQUE

A. P300

The technique uses an electrical signal known as P300 which is emitted from an individual's brain beginning approximately 300 milliseconds after it is confronted with a stimulus of special significance. "The P300 (P3) wave is an event related potential (ERP) which can be recorded via electroencephalography (EEG) as a positive deflection in voltage at a latency of roughly 300ms in the EEG."

"The P300 signal is an aggregate recording from neurons".

for example, a rare vs. a common stimulus or a stimulus the subject is asked to count (Gaillard and Ritter, 1983; Picton, 1988). The novel interpretation in brain finger printing is to look for P300 as response to stimuli related to the crime in question for example a murder weapon or a victim's face (Figures 1 and 2). Because it is based on EEG signals, the system does not require the testee to issue verbal responses to questions or stimuli.

Figure1: Architecture

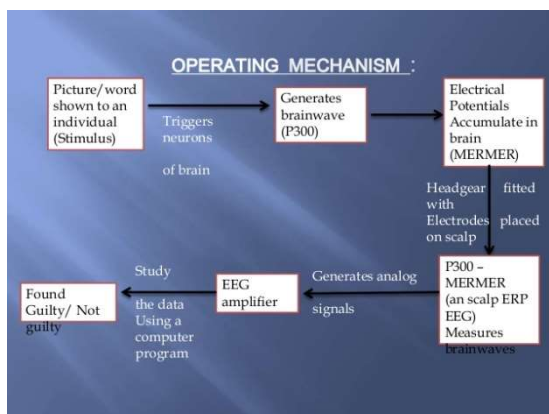


Figure 2: Victim's Stimulus

B. P300-MERMER

Dr. Lawrence Farwell improvised on the P300 Test. He recognized that the P300 is only a subcomponent of a more complicated response called a MERMER. A positive wave followed by a negative one. Tests using the MERMER produced no false negatives or positives and no indeterminate. The discovery of the P300-MERMER was one more step in the ongoing progression from very short latency evoked potentials to longer and longer latency event-related potentials as the stimuli and the processing demanded by the experimental task become more rich and complex.

What is MERMER

Memory and Encoding Related Multifaceted Electroencephalographic Response (**MERMER**) is a brain response derived from the EEG data at different sites. The main component of **MERMER** is the P300 brain wave, an evoked response that has been well studied in the scientific literature as a potential indicator of recognition.

The procedure used is similar to Guilty knowledge Test. A series of words are presented via computer to the subject for the fraction of second each are organized by the test giver to be a "Target", "Irrelevant" or "probe".

C. ELECTROENCEPHALOGRAPHY

Electroencephalography (EEG) is the measurement of electrical activity produced by the brain as recorded from electrodes placed on the scalp. Different types of stimuli are used in this technique are irrelevant, target, probe.

III. EXPERIMENTAL DESIGN

Brain fingerprinting tests are conducted according to the following scientific protocols. In a brain fingerprinting test, stimuli are presented to the subject in the form of words, phrases, or pictures on a computer screen. Brain responses are measured non-invasively from the scalp, digitized, and analyzed to determine the presence or absence of information.



Figure 3: Experimental setup

stored in the brain. Then subjected to voice recognition to trace disorders and to analyze the recognized voice sample with peaks technology to detect voice disorders and diagnose these disorders in case they are present using acoustic tool.

Three types of stimuli are presented: probes, targets and irrelevant. Probes have three necessary attributes.

1. Probes contain features of the crime that in the Judgment of the criminal investigator the perpetrators would have experienced in committing the crime.
2. Probes contain information that the subject has no way of knowing if he did not participate in the crime.
3. Probes contain the information that subject claims not to know or recognize as significant for any reason.

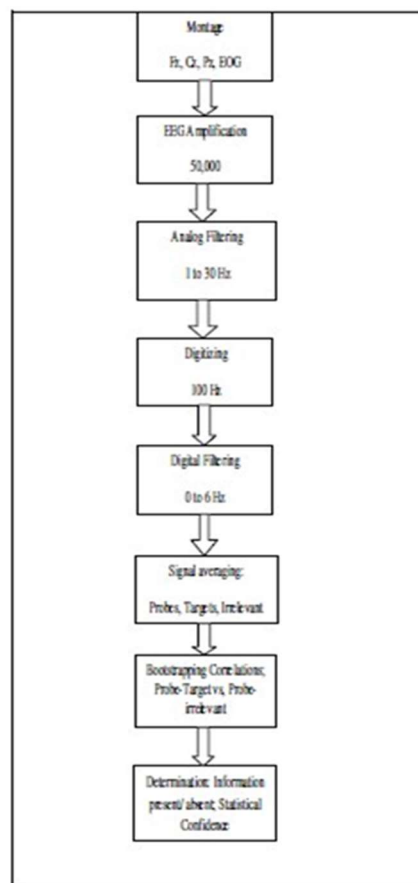


Figure 4.

IV. INSTRUMENTAL REQUIREMENTS

1. Personal Computer
2. A Data acquisition board

4. A four-channel EEG amplifier system.
5. Software developed by the Brain Fingerprinting laboratories for the data acquisition and analysis.

A Suspect is tested by looking at three kinds of information represented by Different colored lines:

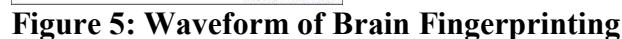
NOT GUILTY:

1. Because the blue and green
2. Lines closely correlate, suspect does
3. Critical knowledge of the crime

1. Because the blue and red
2. Lines closely correlate, and suspect does not
3. Critical knowledge of the crime.

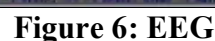
There are four stages to Farwell brain fingerprinting which are similar to the steps in fingerprinting and DNA fingerprinting:

1. Brain fingerprinting crime scene evidence collection
2. Brain fingerprinting brain evidence collection
3. Brain fingerprinting computer evidence analysis
4. Brain fingerprinting scientific result.



The various applications are as follows:

1. Individuals who were “information present” And “Information Absent”.
2. A group of 17 FBI agents and 4 non-agents were Exposed to stimuli.
3. To detect symptoms of Alzheimer's diseases.
4. Criminal cases.
5. Counter terrorism
6. Researches are being carried on advertisements
7. Security Testing



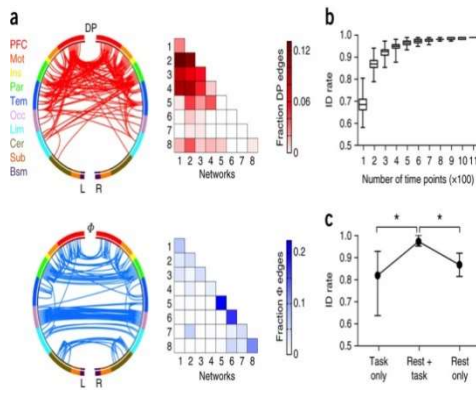


Figure 7: Functional connectome fingerprinting.

VIII.ADVANTAGES

1. Identifies criminals quickly and scientifically.
2. Record of 100% accuracy.
3. Identify terrorists, members of gangs and criminals.
4. Reduces expenditure of money and other resources.
5. Reduce evasion of justice.
6. Access criminal evidence in Brain.

IX. PROPOSED SYSTEM

In the proposed system we have introduced the voice recognition and peaks technology. The witness or perpetrator after undergoing brain finger print test his brain waves are recorded in EEG using. Then he must undergo voice recognition to test whether the witness suffers from any other disorders related to brain or any other can be detected. Then his received voice reception must be analyzed using peak technology whether the witness or perpetrator suffers from voice disorders. These disorders can be diagnosed using Acoustic tools. Then the brainwaves of the witness or perpetrator can be subjected to guilt knowledge test. The important algorithms employed here are EEG algorithm VAD algorithm respectively. EEG algorithm is for recording brain waves and VAD is for removing irregular waves (may be caused due to voice).

X.DISADVANTAGES

1. Brain fingerprinting detects information Processing brain Responses that reveal what information is stored in the subjects brain. It does not detect how that information got there, be it a witness or a perpetrator.
2. Brain fingerprinting detects only information, and not intent. The fact that the suspect knows the uncontested facts of the circumstance does not tell us which party's version of the intent is correct.
3. Brain fingerprinting is not applicable for general screening.
4. Brain fingerprinting does not detect lies. It simply detects information.

XI. CONCLUSIONS

Thus advancement in Brain Fingerprinting using voice reception and peaks technology is a revolutionary new scientific technology for solving crimes, identifying perpetrators and exonerating innocent suspects, with a record of 100% accuracy in research with government agencies, actual criminal cases, and other

applications. The technology fulfills an urgent need for governments, law enforcement agencies, corporations, investigators, crime victims, and falsely accused innocent suspects.

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