

Brain Fingerprinting

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Abstract - Brain fingerprinting is used on finding that the brain generates a unique brain wave pattern when a person concurrences a familiar stimulus Use of functional magnetic resonance imaging in lie(falseness) detection derives from studies suggesting that persons asked to lie show different patterns of brain activity than they do when being truthful. Issues related to the use of such evidence in courts are discussed. This approach is currently supported by enough data regarding its accurateness in detecting deception to warrant use in court. This test uses what Farwell calls the MERMER called as "Memory and Encoding Related Multifaceted Electroencephalographic Response") response to detect familiarity reaction. One of the applications is lie detection. Farwell has invented, developed and patented the technique of Farwell Brain Fingerprinting, a new computer-based technology to identify the criminal of a crime accurately and scientifically by measuring brain-wave responses to crime-relevant phrases , words, or pictures presented on a computer screen. Farwell Brain Fingerprinting has proven 100% accurate in over 120 or above tests, including tests on FBI agents, and tests on real-life situations including actual crimes.

Key Words: electroencephalography (EEG) signals, Polygraph, electroencephalography, Farwell brain fingerprinting,

1. INTRODUCTION

In the last decade, an always growing interest towards the use of different biological signals generated, like blood pulse volume (BPV), electromyogram (EMG), electrocardiogram (ECG), electroencephalogram (EEG), Electrodermal response (EDR)[4], to cite a few, for the purpose of automatic user recognition is being witnessed in now a days. Within this framework the so-called "cognitive biometrics" refer to biometric traits which are detected during Cognitive and/or emotional brain states. Different types of biometric like physiological and behavioural biometric are available in now a days In the field of criminology, a new lie detector has

been developed in the United States of America. This is called "brain fingerprinting". This invention is supposed to be the best lie(falseness) detector available as on date and is said to detect even smooth criminals who pass the polygraph 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 or any cases.

Brain Fingerprinting is designed to determine whether an individual recognizes or identify specific information related to an event or activity by measuring electrical brain wave responses to , phrases, pictures or words presented on a computer screen. The technique can be applied only in situations where investigators(detective) have a sufficient amount of specific information about an event or activity that would be known only to the perpetrator and investigator. In this respect, Brain Fingerprinting is considered a type of Guilty Knowledge Test, where the "guilty" party is expected to react strongly to the relevant detail of the event of activity.

2. TECHNIQUES

2.1 Operation of technique- with P300

The person to be tested wears a special headband with electronic sensors that measure the electroencephalography from several locations on the scalp[2]. In order to calibrate the brain fingerprinting system, the testee is presented with a series of irrelevant stimuli, pictures and words[3], and a series of relevant stimuli, pictures and words. The test subject's brain response to these two different types of stimuli allow the tester to determine if the measured brain responses to test stimuli, called probes, are more similar to the relevant or irrelevant responses. The technique uses the well known fact that a signal known as P300[5] is emitted from an individual's brain approximately 300 milliseconds after it is confronted with a stimulus of special significance, e.g. a rare vs. a common stimulus or a stimulus the proband is asked to count. The novel interpretation in brain fingerprinting is to look for P300 as response to stimuli related to the crime in question e.g., a murder weapon or a

victim's face. Because it is based on EEG signals[4], the system does not require the testee to issue verbal responses to questions or stimuli. Brain fingerprinting uses cognitive brain responses, brain fingerprinting does not depend on the emotions of the subject, nor is it affected by emotional responses. Brain fingerprinting is fundamentally different from the polygraph (lie-detector), which measures emotion-based physiological signals such as, sweating, heart rate, and blood pressure. Also, unlike polygraph testing, it does not attempt to determine whether or not the subject is lying or telling the truth.

2.2 P300 with MERMER technology

Brain Fingerprinting utilizes multifaceted electroencephalographic response analysis to detect or find information stored in the human brain. A memory and encoding related multifaceted electroencephalographic response (MERMER)[3] is elicited when an individual recognizes or identified and processes an incoming stimulus that is significant. When an irrelevant stimulus is seen, it is insignificant and not noteworthy, and the MERMER response is totally absent.

The MERMER occurs within about a second after the stimulus presentation, and can be readily detected using EEG amplifiers and a computerized signal-detection algorithm. the technique involves the application of a series of stimuli to the accused in the form of pictures that are relevant to a terrorist act, terrorist training, crime, or expertise are presented on a computer screen or specific knowledge along with the irrelevant ones. The suspect's brainwaves based on the responses to these stimuli are measured non-invasively using a patented headband equipped with Electroencephalography (EEG) sensors.

A proprietary computer program then analyses the data to determine if the information related to the crime under question is stored in the brain. A measurable brain response known as a P300 is emitted by the brain of the criminal who has the details of the crime stored in his brain but not by an innocent suspect lacking this record in his brain. The P300 response has been extensively researched ,used and widely published in leading professional journals for more than 30 years and has gained broad acceptance. The discovery of the P300-MERMER (Memory and Encoding Related Multifaceted Electroencephalographic Responses)[6] by brain response allows the results gained through the P300 to be more accurate and 100% of such determinations have been Corrected and recognized.

2.3 Process Flow

Electrical changes macroscopically detected on the scalp using an electrode are defined as a brain wave, which is illustrated in a figure called Electroencephalogram(EEG) in

which a horizontal axis is of time and a vertical one is of voltage. The brain wave is categorized in five bands: delta (0.5-3Hz), theta (4-7Hz), alpha (8-13Hz), beta (14-30Hz) and gamma (>30Hz), respectively.

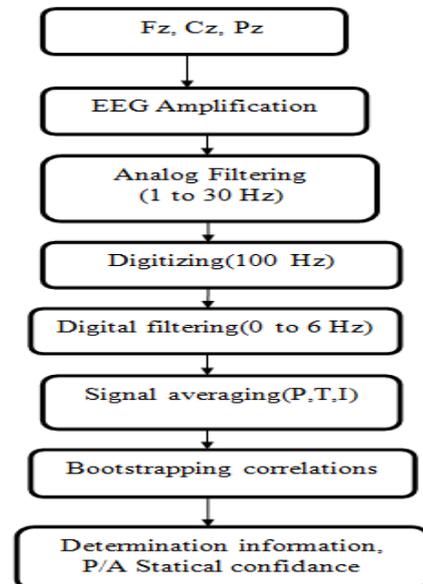


Fig-1: Process Flow

3. APPLICATION AND USES

Various applications are as follows[4]

1. Test for several forms of employment, especially in dealing with sensitive military and foreign intelligence screening.
2. Individuals who were “information present” and “information absent”
3. A group of 17 FBI agents and 4 non-agents were exposed to stimuli.
4. To detect symptoms of Alzheimer's disease, Mental Depression and other forms of dementia including neurological disorders.
5. Criminal cases.
6. Advertisements (researches are being carried on).
7. Counter-Terrorism.
8. Security Testing.

1. Medical

First generation tests have proven to be more accurate than other routinely used tests, and could be commercially available in 18-24 months. The 30 minute test involves wearing a headband with built-in electrodes; technicians then present words, phrases and images that are both known and unknown to the patient to determine whether information that should be in the brain is still there. When presented with familiar information, the brain responds by producing MERMEs[5], specific increases in neuron activity. The technician can use this response to measure how quickly information is disappearing from the brain and whether the drugs they are taking are slowing down the process.

2. Criminal justice

Brain Fingerprinting testing does not prove guilt or innocence. That is the role of a judge and jury. This exciting technology gives the judge and jury new, scientifically valid evidence to help them arrive at their decision. A critical task of the criminal justice system is to determine who has committed a crime. The key difference between a guilty party and an innocent suspect is that the perpetrator[6] of the crime has a record of the crime stored in their brain, and the innocent suspect does not. Until the invention of Brain Fingerprinting testing, there was no scientifically valid way to detect this fundamental difference.

3. Counter Terrorism

Brain fingerprinting can help address the following critical elements in the fight against terrorism:

- 1) Aid in determining who has participated in terrorist acts, directly or indirectly.
- 2) Aid in identifying trained terrorists with the potential to commit future terrorist acts, even if they are in a "sleeper" cell and have not been active for years.
- 3) Help to determine if an individual is in a leadership role within a terrorist organization.
- 4) Brain Fingerprinting testing provides an accurate, economical and timely solution to the central problem in the fight against terrorism. It is now possible to determine scientifically whether or not a person has terrorist training and knowledge of terrorist activities

5) Help to identify people who have knowledge or training in banking, finance or communications and who are associated with terrorist teams and acts.

4. Advertising

In advertising, This technology will be able to help determine what information is actually retained in memory by individuals. For example, in a branding campaign do people remember the brand, the product, etc. and how do the results vary with demographics? We will also be able to measure the comparative effectiveness of multiple media types.

5. National Security

Brain Fingerprinting Laboratories technology can detect these records stored in the brain and help identify skilled terrorists earlier than they smack, including those that are in longstanding sleeper|| cells. The technology will also be used to look up security in areas like VISA applications and the shelter of classify in sequence. In a terrorist act, verification such as fingerprints or DNA may not be available, but the brain of the executor is always there development, execute, and footage the crime. There are recollections of the offense stored in the brain of the performer and in the brains of those who helped plan the crime.

4. RESULT ANALYSIS

Using brain waves to detect guilty Working A Suspect is tested by looking at three kinds of information represented by Different colored lines:

-----Red: information the suspect is expected to know.

-----Green: information not known to suspect

-----Blue: information of the crime that only perpetrator would know.

Information Absent

Because the blue and green Lines closely correlate, suspect does not have critical knowledge of the crime.

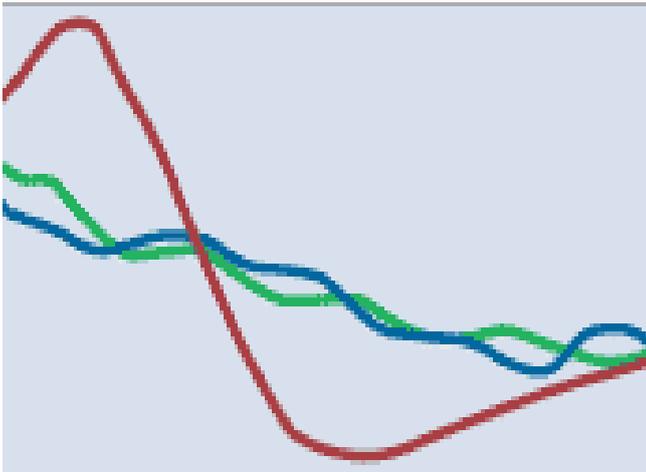


Fig-2: Information is absent

Information Present

Because the blue and red. Lines closely correlate, and suspect has critical knowledge of the crime.

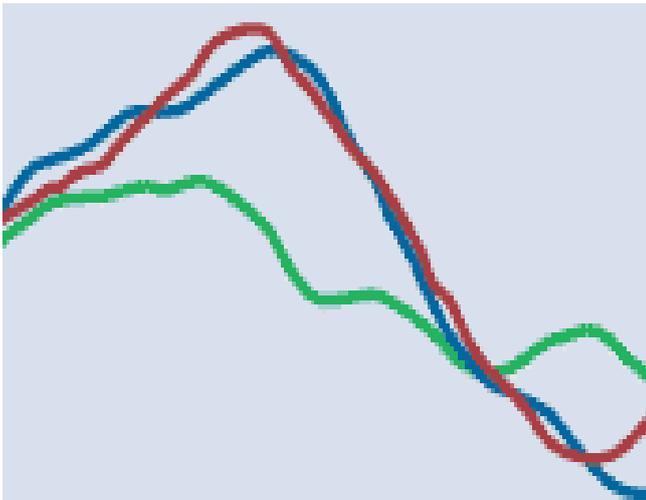


Fig-4: Information is Present

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5. CONCLUSION

Brain Fingerprinting is a revolutionary new scientific technology for solving crimes, identifying perpetrators, and exonerating innocent suspects, with a record of 100% accuracy. 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. but the 100% accuracy and high confidence level of the results, however, provide further support for results from research using brain MERMER testing.