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Designing of new proposed technique for lie Detection using EEG Signals

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Abstract - **The proposed system is designed to make EEG database of criminals during the investigation by crime branch. System will be detecting the criminals on the bases of thought related to crime to be stored in brain, when the question related to the crime will be asked automatically remind the past event. The whole system will be tested after complete the investigation by crime branch.**

Keywords - **EEG, Lie detection, Brain fingerprint, BEOS**

I. INTRODUCTION

Various scientific tools are presently used to interrogate a person for investigator. The fundamental difference between a terrorist and an innocent person is that the terrorist has detailed knowledge of terrorist activities and an innocent person does not. A terrorist has committed a crime, received training in terrorism or worked with others in planning terrorist attacks. The innocent suspect does not have this type of information stored in his brain [1]. The scientific tools are in use, like the psychological test, Narco test, Polygraph test, Brain Mapping, Functional Magnetic resonance imaging, Calcium tracking, Electroencephalogram, Eye scans, Micro expressions, Scanning brain with light etc.

II. METHODOLOGY

1) **Psychological Test:** Psychological tests are usually administered and interpreted by a psychologist. These tests assess and evaluate the information that is given by the criminal to the examiner. The information is taken either in the form of answers to interview questions or as answers on paper or on a computer to specific questions. The accuracy of a physiological test depends on how carefully and seriously the answers are given. Hence, no psychological test is ever completely reliable because the human psyche is just too complicated to know anything about it with full confidence. That's why there can be uncertainty about a case even after extensive testing [2].

2) **Narco Test:** Narco Analysis is a diagnostic and psychotherapeutic technique that uses psychotropic drugs, particularly barbiturates, to induce a stupor in which mental elements with strong associated affects come to the surface. The narco analysis test lowers a subject's inhibitions by interfering with his nervous system at the molecular level, in the hope that the subject will more freely share information and feelings. In this state, it becomes difficult though not impossible for him to lie. The subject is not in a position to speak up on his own but can answer specific but simple questions [3].

3) Polygraph Test: Polygraph Test is based on interaction between the mind and body. It is conducted by various components or the sensors of a polygraph machine, which are attached to the body of the person who is interrogated by the expert. The machine records the blood pressure, pulse rate, respiration, muscle movements and electrical resistance of the skin. Polygraph test is conducted in three phases: a pretest interview, chart recording and diagnosis. There is a lot of variability in how different people react when lying first of all. The act of being measured tends to produce anxiety, which creates the possibility of false positives. The worst part is that there are people out there who are so good at lying that they believe their own lies (or at least are in large part non-reactive) and thus don't perturb the polygraph [4]

4) Functional Magnetic Resonance Imaging Test (fMRI): In fMRI test, the subject usually alternates between performing a mental task and resting while repeated images of his brain are rapidly captured. Areas of the brain in which there are strong correlations between the performance of the task and the MRI signal time course are then identified as having been involved in that task. When the subject starts to perform the task, neuronal activity increases in the required parts of the brain. These areas require additional energy, which is provided by an increase in the regional blood supply. This increase in blood flow leads to an increase in the blood oxygenation level, which, in turn, changes the magnetic properties of the blood and hence the MRI signal. fMRI has a major drawback: It measures blood flow, or haemodynamics, which is an indirect measure of neural cell activity. It turns out that haemodynamics basically introduces a delay of five seconds. So fMRI is not able to detect fast variation [5].

5) Micro expressions: Scientists agree that the face tells tales about the person. Psychologists are busy codifying facial movements into micro expressions called the 'facial action coding system' (FACS). FACS is the most

promising lie detection technology which is the least technologically dependent. It costs much less than other 'device-oriented' techniques, and is much easier to train people to use it. It is also the only technique that can be easily used in a natural setting [5].

III. Proposed Techniques

The human brain emits electrical signals called 'event-related potentials,' which can be tracked with a high-density electroencephalogram machine and sensors attached to the face and scalp. Telling the truth and then a lie can take from 40 to 60 milliseconds longer than telling two truths in a row, because the brain must shift its data-assembly strategies. Psychologists working on the technology believe it is 86 per cent accurate [7]. To improve accuracy the proposed system will be developed as shown in figure 1. The system consist of several stages i.e. database design Brain Signal acquisition, Pre-processing, Feature extraction, Feature matching, testing and recognition.
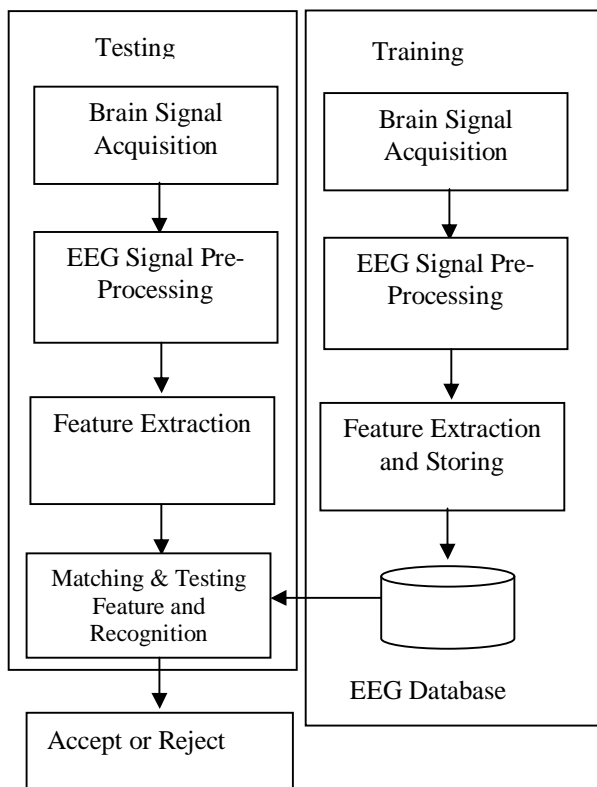

Fig. 1 Block Diagram of Proposed System

EEG Database: The database of criminal people will contain record ID, age, gender, length of EEG, handedness, History and report. Corresponding features will be stored in the database.

Brain Signal Acquisition and Pre-processing: The recording, for each criminal, will be captured for 30 minutes. The different parameters of the EEG machine will be set as follows: lower filter 1Hz, high filter 70Hz, sensitivity at 7µV, channel 17, sweep speed 30mm/s, Montage set BP PARA (R) for all the experiments. Subject will be asked question related to crime and future plan, also not to give the answer verbally. Subject will be asked to close the eyes during experiment. Electronic signal will be filtered and sampled to remove artifacts occurred due to heat bit.

Feature Extraction: Feature extraction is the series of steps involved in extracting the information related to feature. The feature of the criminals will be the thought related to crime to be stored in brain, when the question related to the crime will be asked automatically brain will take time to remind the past event, duration of this event will be feature for the system.

Testing: Using the data obtained in the feature extraction stage, we will try to detect signature of the desired feature. In testing phase any new coming subject will be compared with previous database. When subject will confirm, he is criminal then whole corresponding will be stored in the database.

IV. Conclusion
Conclusion: Proposed system is useful to investigation agencies. With the help of this technique, a new area in security and investigation will be stated.

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