CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
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Project Number
22021

Project Title
Voice Stress Analysis Under Low-Stress Conditions Using an FFT Analyzer

Abstract

Objectives/Goals
The purpose of this project is to test whether lies, made under low-stress conditions, can be detected using a Fast Fourier Transform (FFT) analyzer to analyze the dominant frequencies of discrete portions of a response. The hypothesis is that lying causes stress, which causes increased frequencies in the sound of a voice, which an FFT analyzer can detect.

Methods/Materials
A control question test (CQT) was devised in which each subject was given a set of 12 cards (8 control and 4 test questions). Each card had either a #2# or a #3# printed on it. At least one of the cards also had the word #lie# printed under the number. For each of the cards, the subject was asked the question, #Is the number printed on the card a 2?# The subject was instructed to tell the truth in response to every question unless the word #lie# appeared on the card. During questioning, the subject#s verbal responses were recorded directly onto a computer to obtain a high-quality recording. The responses were viewed with sound-editing software (Cool Edit) in a waveform, and an FFT analyzer was used to analyp dominant frequencies along the waveform. The frequencies of a control (truthful) response were compared to the frequencies of each test response to determine whether the test response was a lie.

Results
The sound of the voice during a deceptive response under low-stress conditions generally had increases in frequency (Hz) that could be detected using a Fast Fourier Transform (FFT) analyzer.

Conclusions/Discussion
The results indicate that the hypothesis was correct. Given the results of this experiment, a voice stress analyzer could be developed, using an FFT analyzer, to compare discrete samples of control and relevant responses. The program should indicate the net difference in frequency so the user can gauge the probability that the response is deceptive. To develop such an analyzer (an FFT-VSA), VSA experts should collaborate with FFT experts. It would also be helpful to determine, using an FFT analyzer, whether the changes in the frequencies of the voice due to the stress of lying are different than the changes that are caused by the stress of other emotions such as fear, anger and nervousness.

Summary Statement
In this project, an FFT analyzer was used to detect changes in the voice while lying under low-stress conditions.

Help Received
Received demonstration from local police department on the use of its voice stress analyzer; received information from military experts about current studies on voice stress analyzers.