CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

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Project Number
S1501

Project Title
Sonic Collisions

Abstract

Objectives/Goals
By investigating the properties of constructive and destructive interference the capabilities of sound cancellation can be demonstrated. Sound travels through a substance and creates waves that propagate and resemble a sinusoid. These waves can be changed in order to create different phase relationships that react with each other. In the case of speakers, switching the input and output wires can create the inverse of a sinusoid that is exactly 180 degrees out of phase with an in phase sinusoid.

Methods/Materials
Source signal produced by a sine wave oscillator.
Source split and passed through 2 identical power amplifiers.
Sound produced by connecting identical speakers to each amplifier.
Detect sound level and phase by using an oscilloscope comparing the source signal and that picked up by a microphone with signal boosted by its own microphone amplifier.

Results
We discovered that noise cancellations occur at specific points. By presenting an identical tone that is in phase through two identical amplifiers, one connected with reverse polarity, the tones become 180 degrees out of phase with each other.

Conclusions/Discussion
Through empirical data collection we were able to demonstrate sound cancellation through phase relationship alteration through physical repositioning of the speakers. We not only proved our theory correct, but we were able to achieve a greater understanding of the properties of constructive and destructive interference.

Summary Statement
Investigating the properties of constructive and destructive interference of sound waves.

Help Received
Dad helped acquire equipment.