CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
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Project Number
J0714

Project Title
Sound Detector Radar

Abstract

Objectives/Goals
The goal of this project is to find out the location of an object based on the sound it makes.

Methods/Materials
The theory of this project is to place 5 microphones in two perpendicular rows like a cross to capture the sound signal, measure the sound delays between the microphones, calculate the distance differences, and apply the 3-D Pythagorean Theorem to find the location of the sound source.
To hold the microphones in place, I used a piece of wood. With the help of my dad, I was able to cut and drill the wood into the shape I wanted it. Then I inserted all the necessary equipment.
However, the magnitude of a captured sound signal is not big enough for my computer to read. So, I created two circuits and inserted them to my wooden board. The first circuit would amplify, or magnify, the sound waves to a readable size. The second circuit would turn the curvy waves, into rectangular waves, which are binary signals, so that my computer can read it.
Finally I hooked this all up to my computer and programmed with Visual Basic.net to read the sound waves automatically and calculate it.
The materials needed for this project are wood, speakers, a breadboard, resistors, capacitors, comparator chips, OP AMP chips, a Data Acquisition Board, an USBee connector, and microphones.

Results
I am glad to say that after all my hard effort put into this project, it actually worked a lot of times. Some of the computer-calculated distances were really close to the actual distance, such as 45 inches and 44 inches. It was a bit disappointing to find that some of the calculated distances were incorrect.

Conclusions/Discussion
Half the time, I was able to get the correct data because the original sound source was not interrupted by other sound waves. However, the other half of the time was not so lucky because I picked up other sound waves and it corrupted the calculations. To overcome this weakness, I could program the computer to recognize only a certain patter of waves. That way, the other sound waves cannot interfere. This project could be use if you wanted to know how far away a moving object is, like a dog, based on the sound it makes. I've found out that this kind of thing is used in the navy. Submarines use detectors to measure the frequency of the ocean waves to see if anything has disturbed it. Also GPS satellites are very similar to the project I've created. Speed guns from the police, also work like my project.

Summary Statement
This project is to find the location of a certain object that makes some sound.

Help Received
Father helped me cut the wood and design electronic circuits.