# CALIFORNIA STATE SCIENCE FAIR
# 2015 PROJECT SUMMARY

**Name(s)**
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**Project Number**
**J0702**

**Project Title**
## Creating Three-Dimensional Sound Using Mono Audio Recordings

**Abstract**

**Objectives/Goals**
Movies have progressed dramatically over the years, but no one has produced inexpensive 3-dimensional sound. I love film and the process of post-production sound. The purpose of this project was to determine if I could create a program in which a user can record a sound using one microphone and alter the perceived location and distance of the sound. Based upon my research on "holophonics" and sound-localization, I believe that could create a program using C#, in which a user can record a sound using one microphone and make the sound three-dimensional by varying the direction and the distance of the apparent sound. I believe that the sounds created to stimulate orientations within 15 meters will be recognized 95% of the time, and I believe the sound orientations simulates as 15-100 meters away, will be recognized 85% of the time. I tested a variety of people to see if the direction I tried to simulate could be correctly identified.

**Methods/Materials**
After performing preliminary tests to simulate distance and direction of sound on a coordinate plane, I created a program using C# that would allow someone to record a sound using one microphone, and create a three-dimensional sound, whose location could be easily changed. I recorded a total of 20 sounds and incorporated them into the program. I then tested 80 participants to verify the accuracy of the simulated sound location.

**Results**
According to my results, the program was successful in creating three dimensional sound. I tested 80 original sounds, all taken from the same distance (10 cm.) away from the microphone. I converted them all to three-dimensional sound. Each sound was simulated both between 0-15 meters and 15-100 meters away. 80 people were tested for to see whether they could identify the direction of the sound.

**Conclusions/Discussion**
The sounds that were simulated as 15 m away or closer in any direction were recognized 99% of the time. For the sound simulated to be between 15 m to 100 m away, the accuracy decreased slightly to 97.4%. Overall the sounds had an accuracy rate of 98.2%, which means the simulation appeared to be successful.

**Summary Statement**
I created a program in C# using a single microphone that could alter the human perception of the distance and location of a sound.

**Help Received**
Thanks to my science teacher for her guidance, and my father for helping me record the sounds.