CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)
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Project Number
34014

Project Title
Stove Alert! A Programmed Safety Device to Aid People with Hearing Loss

Abstract

Objectives/Goals
Currently ¼ of all older people cannot hear over 4 kHz sounds, which is the sound that stove timers commonly make. The main goal of this project is to create a device that plays a lower pitched sound when it hears that higher pitched one.

Methods/Materials
First, I developed python code that created a sound recorder, a sound analyzer, and a sound player. Then, I viewed a sonogram that showed that stove alarms beep at 4.0 kHz. After that, I constructed code to listen and detect 4.0 kHz sounds with a bandpass filter, then I played a lower frequency sound. Later, I created a small device. Then, I tested it in a kitchen while an alarm was playing and/or people conversing. Finally, I created a threshold to balance true positives and false alarms.

Results
I understood what sound kitchen appliances make: 4.0 kHz. Stove Alert! had a 100% sensitivity, specificity and negative predictive value. It also had a 91% positive predictive value.

Conclusions/Discussion
Over a testing period of 36 hours, or five-million one-hundred and eighty-thousand time samples, the Stove Alert! worked well. Since the purpose was to have hearing disabled people always hear their stove alarm, the 100% sensitivity was the most important feature. The project met the objective.

Summary Statement
The Stove Alert! is a programmed device that assists hearing disabled people with hearing stove timers.

Help Received
Mom and Dad reviewed poster slides and helped teach me about sounds and filters and Dad fixed the sound drivers on the BeagleBone Black.