Noise Cancellation

Introduction
Noise cancellation is a technology that utilizes adaptive filtering and can be found in many different applications. This technology is used to cancel out unwanted sound waves by producing a similar wave with an inverted phase. When done properly, the volume of the unwanted sound can be greatly reduced and sometimes entirely removed. This project analyzed how noise cancellation can be achieved through signal processing and attempts to show in the real world how this type of adaptive filtering works.

Software Flow Diagram

- Power On
- Generate Random Value for White Noise
- Get Sample Near Ear
- Update Filter
- Convolution
- Output to Speaker

How It Works
Sound travels from one speaker to a microphone where it is sampled. The system then learns the generated signal through adaptive filtering and produces a sound through the other speaker which cancels out the original sound. The Least Mean Squares adaptive filtering algorithm is used to reduce the error of the system, or the signal that is sampled by the microphone, to zero.

Example of the system learning the signal (left) and cancelling out the signal (right).

Conclusion
The implementation of a noise cancelling algorithm was successful in this project. The code written was tested on multiple pieces of hardware and performed as was expected. The graphs shown on this poster show the system learning a signal and cancelling it out. The difficulty in this project came from implementing the system in real time. There were many different issues that persisted in the attempts to design a functioning system. With more time and better hardware, this could be completed.