

Project Proposal (P0) - David Deschamps and Joseph Chouinard  
Active Sound-Cancelling Headphones Using The NLMS Algorithm

For this project we will attempt to create active noise-cancelling headphones. The general principle behind active noise cancellation is to generate a signal identical to incoming noise from the environment, but with opposite phase. This signal destructively interferes with the noise, reducing the volume of noise experienced by the listener. We plan to accomplish this using the following set-up as described in Michael Jezierny, Brenton Keller and Kyung Yul Lee's project [1]:

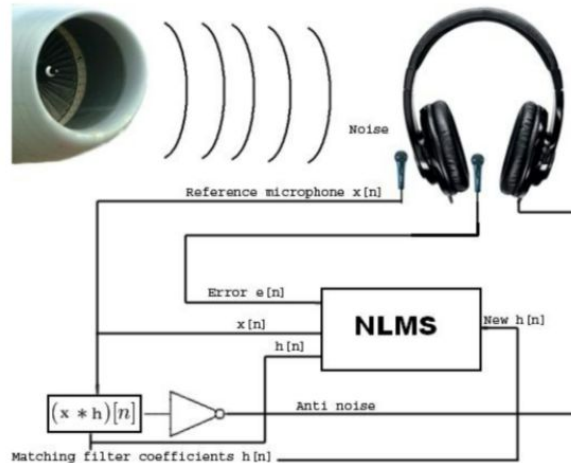


Figure 5: Block diagram of noise cancelling headphones.

We will write a C++ program that uses PortAudio[2] to gather inputs from two microphones and one set of headphones. This program will implement the Normalized Least Mean Squares (NLMS)[3] algorithm to match the incoming noise and generate an anti-noise signal, which is played through the headphones. The result of this anti-noise interfering with the noise is then fed back into the algorithm to calculate error and adjust the anti-noise signal.

Once we have a working prototype of this system, we will measure the sound level in decibels outside and inside the headphones in different noise environments (constant/changing noise levels/patterns), as well as the latency of our adaptive filter in adjusting to changing conditions. This will give us a quantitative measurement of the success of our noise cancellation.

References:

[1][http://ese.wustl.edu/ContentFiles/Research/UndergraduateResearch/CompletedProjects/WebPages/sp10/Keller/Senior\\_Project\\_Report.pdf](http://ese.wustl.edu/ContentFiles/Research/UndergraduateResearch/CompletedProjects/WebPages/sp10/Keller/Senior_Project_Report.pdf)

[2]<http://www.portaudio.com/>

[3][http://zone.ni.com/reference/en-XX/help/372357A-01/lvaftconcepts/aft\\_lms\\_algorithms/](http://zone.ni.com/reference/en-XX/help/372357A-01/lvaftconcepts/aft_lms_algorithms/)