

Selective Noise Cancelling Headphones

Thomas Scarsbrook
Supervisor: Steve Gunn

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There are often many sounds around you that you do not require. Some of these can even be disturbing due to their volume, or perhaps just the type of sound that they are. These "nuisance" sounds can often interfere with your hearing of other, desired sounds, for example causing you to miss what people are saying. This project aims to provide a solution for this whereby you can remove those unwanted sounds from what you hear.

This project will take in an unwanted sound source and cancel it out from the sounds being heard. This will be achieved through the use of a Digital Signal Processor (DSP) with multiple sound inputs, and a single sound output capable of driving a set of headphones. There will be a hardware component as well as a software component. The hardware component will be a DSP capable of completing the required analysis. This will be surrounded by circuitry capable of supporting the power requirements of the DSP, and the ability to interface suitable sound sources with the DSP. The software component will do the actual cancelling. Both the heard sound and the nuisance sound will be compared in order to filter out the nuisance source. It will have to account for varying intensities of sound between the nuisance source and when it reaches the ears of the user, also the impulse response of the room will have to be taken into account, so that the multipath nature of sound waves will not cause unwanted distortion. This software component will have to be capable of running fast enough so that the DSP actually cancels, rather than applying the change after the sound has already been heard.

This project can be extended through the use of additions of varying complexity. At the simpler end it could account for multiple nuisance sources, or to allow you to select the nuisance source as a required source, and to cancel everything else. Increasing in complexity to it trying to detect nuisance sounds autonomously, based on them being cyclic or of an annoying pitch, or through the use of Independent Component Analysis.