Can you hear me now?

Solving the Headphone Problem

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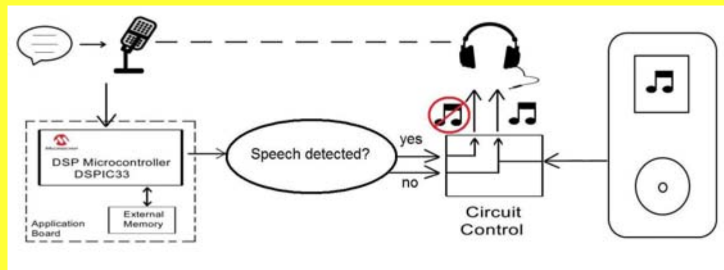
Introduction

Problem How to communicate with headphone wearers

Goal Automatic dynamic headphone control to mute output of sound when human is speech detected

Impact Improved user safety, increased social harmony

Operational Diagram



Hardware

•Small external microphones attached to headphones

•dsPIC 33 microprocessor

•Control circuitry

Software

•Input signal

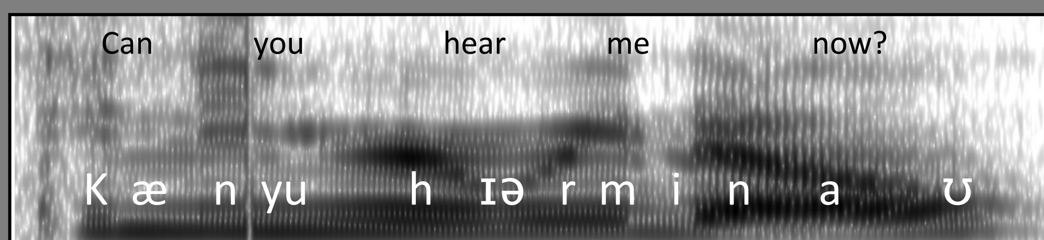
•Fast Fourier Transform (FFT) obtains correct frequency range

•Analyze FFT to determine characteristics of sound

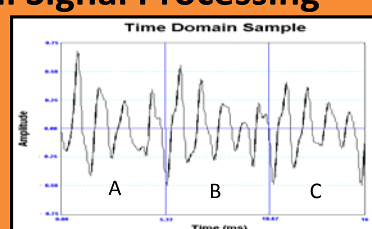
•Decision to mute sound

Spectrograph

The spectrograph shows all frequencies present in a sound, with the darkest markings representing the strongest sounds:



Digital Signal Processing



1. The Time Domain Sample shows the amplitudes of the sound waves.
2. The sound wave signal is divided into time segments, and the dominant frequencies of each segment are shown in the FFT plot.
3. If the frequencies fit the criteria for speech, a signal is sent to the control circuitry to turn off the music.