Noise Canceling Headphones with Voice Pass-Through Technology

Overview
Harris presented our team with creating noise canceling headphones that utilizes voice pass-through technology. Noise canceling headphones on the market today attempt to cancel all outside noise, including voices. Harris wanted us to design a system that allowed voices to not be inhibited by any noise canceling technology. This gave us the challenge of selectively filtering the voice from the ambient noise and canceling all other surrounding noise.

Objectives
Our team’s objective was to produce a prototype of the noise canceling headphones that acts as a proof of concept for the combination of two technologies. We utilized a digital signal processing board to digitize the noise that the user is hearing and implemented our signal processing algorithms to extract the voice and cancel the noise.

Approach
- Determined customer needs and design specifications
- Reviewed noise canceling algorithms such as the Least Squares Algorithm and others
- Created high level block diagrams to determine the overall system flow
- Created a Gantt chart to implement a schedule to follow
- Used MATLAB to simulate filter designs and come up with the most accurate filters
- Created schematics of the audio codec and microphone set up
- Fabricated a prototype of the headphones
- Performed many weeks of testing and debugging
- Validating and analysing our results was accomplished just by listening to our headphones since our product is so user interactive.

Outcomes
- Proof of each concept was proven separately
- Noise canceling from inexpensive headphones provided proof of concept
- Filter design and demo provided proof of voice pass-through concept
- The combination of these two concepts will produce a new product for consumers as well as many businesses
- Created a filter training algorithm that can be trained for any type of noise that is desired
  - Practical for many different applications based on user need
  - Customizable