

WEARABLE UNOBTUSIVE NOISE CANCELING VEST

MOTIVATIONS

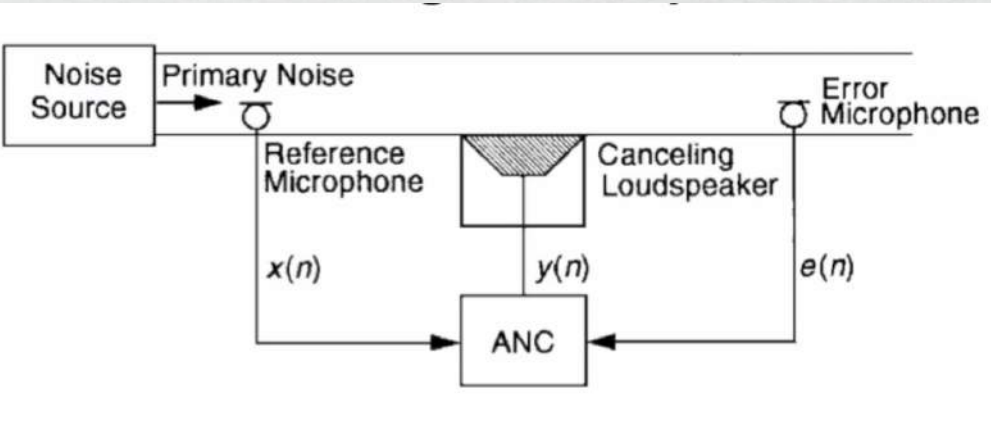
- International Space Station (ISS) has high amounts of ambient noise
- Potential to damage the hearing of astronauts if they do not have the proper protective equipment
- There is a need for a protective active noise canceling device that can actively mitigate sounds
- Must not interfere with the daily activities and motion of the astronaut

PROCESS AND TESTING

- A cost-effective test system using Max/MSP and a set of stereo desktop speakers
- Even with uncontrolled acoustic environments and simulated components, we were able to achieve drops in sound levels by over 10 dBA SPL
- We discovered the system’s ability to reduce noise levels was highly dependent on the environment and position of the user
- We relied on digital manipulation for the anti-noise processing because of the lack of fine control with purely analog systems



Testing the system with laptop and speakers



The block diagram for the system

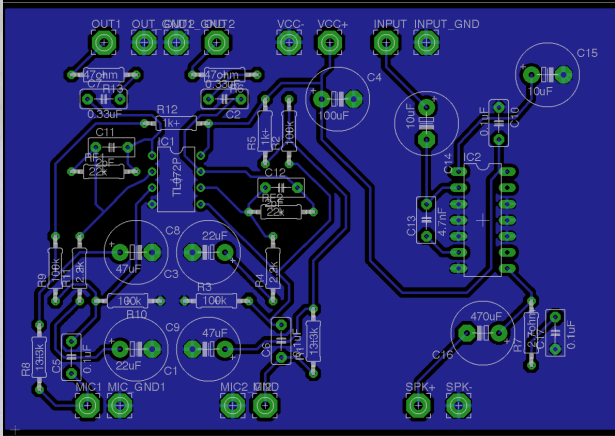
DESIGN

- The prototype vest is sized for 50th percentile men with large arm openings for easy movement and any type of shirt underneath
- 3D printed housing are mounted with thread and velcro, so the back harness can come off if necessary
- The collar that houses the speakers and mics is as close to the ears as possible without getting in the way of any head gear



SYSTEM

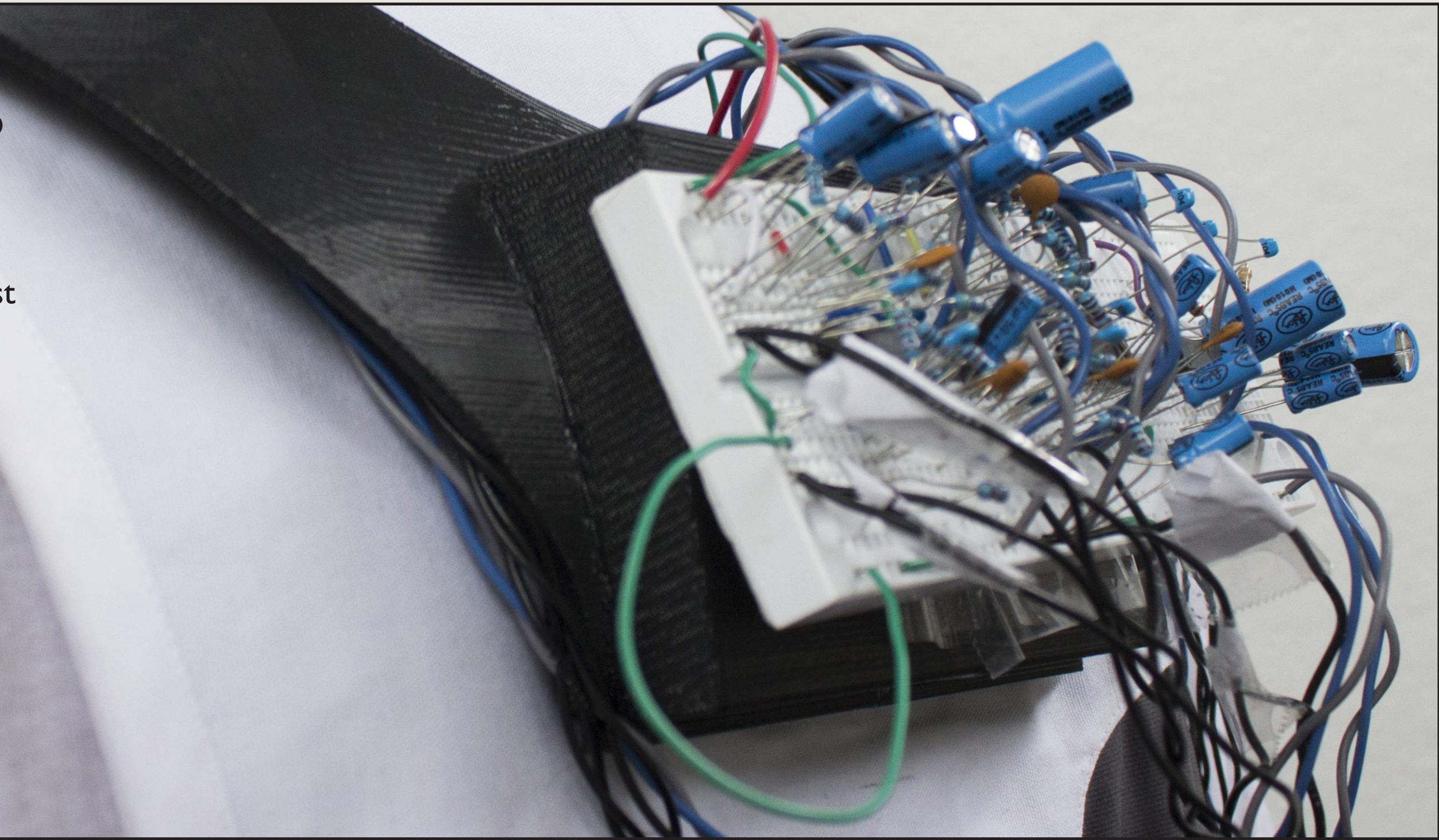
- Two mics and a speaker are mounted on either side of the neck in 3D printed housing
- The battery and circuitry are on the back of the vest in 3D printed housing
- The playback level is controlled by a potentiometer on the user’s chest



Circuit Board



Circuit Board Placed On Vest



RESULTS

- We achieved a 10dBA drop with sinusoidal signals, a 3dBA drop with pink noise, and a 2dBA drop with white noise
- User testing demonstrated the sensitivity of the system to motion and the slight tight feeling of the harness



Results of reducing 700hz sine wave



User Testing Set-up

FUTURE WORK

- The vest would be made in more sizes and the speakers could be adjustable
- Future testing will be done to determine the best placement for the speakers and system
- More advanced types of DSP are needed for crosstalk, feedback, and adaptive filtering. Additionally, the system would benefit from head and posture tracking to adjust the phase relationship as users tilt and move their heads

