

Augmented Reality (AR) Headset for Brain Computer Interface (BCI) Development for Amyotrophic and Primary Lateral Sclerosis (ALS/PLS) Patients

Members: Michael Mathews, Ramon Estevez, Ryan Huang, Gerrod Segear
 Advisors: Dr. Hasan Ayaz, PhD¹ & Dr. Terry Heiman-Patterson, MD²

¹Drexel University School of Biomedical Engineering, Science, and Health Systems ²Temple MDA/ALS Center of Hope

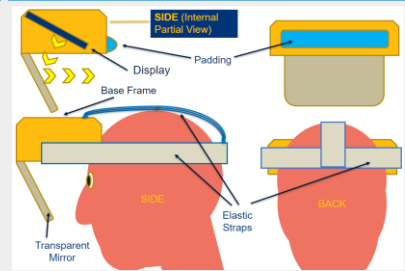
1. Problem

Need: ALS/PLS patients, whose loss of muscle function limits their ability to physically communicate and operate independently and efficiently in everyday life

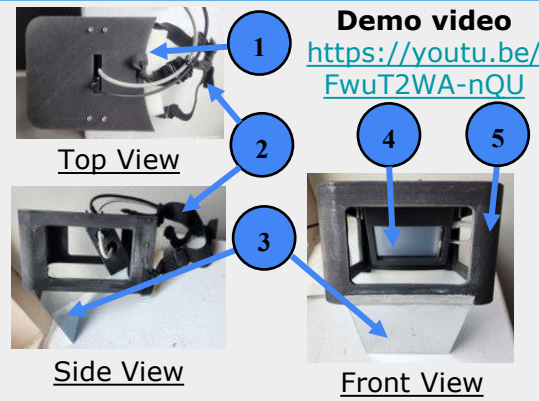
Objective:
 Develop a lightweight (R2) and cost-effective AR headset providing an improved visual interface method for BCI application (R1 & C6) and enhancing overall user independence

Design Inputs:
System Accuracy (R1)
 BCI system integrated with the design should yield $\geq 70\%$ icon selection accuracy [12]
Weight (R2)
 ≤ 1.5 lbs [13]
BCI System Compatibility (C6)
 Integration with current BCI system through HDMI cable

2. Solution



- 1) Padding
- 2) Elastic Straps
- 3) Transparent Mirror
- 4) Display
- 5) Base Frame



Build cost - \$80

3. Verification

Verification Test	Target Design Input Data	Observed Data	Pass / Fail
System Weight Test (V1)	Weight (R2) ≤ 1.5 lbs	0.83 lbs	Pass
System Integration Test (V4)	System Accuracy (R1) $\geq 70\%$ & BCI System Compatibility (C6) via HDMI cable connection	80% & HDMI connection established	Pass

4. Future

Revisions: Modifying design's size and reselecting build components to reduce weight, adding display brightness requirement, incorporating aesthetic design, and readjusting elastic strap configuration for maximum comfort

Impact: Improved daily communication and independence for those physically and verbally limited by ALS/PLS and paving the technological landscape of BCI for the future