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 Segar
Advisors: Dr. Hasan Ayaz, PhD & Dr. Terry Heiman-Patterson, MD

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 ≥ 70% icon selection accuracy [12]
- **Weight (R2):** ≤ 1.5 lbs [13]
- **BCI System Compatibility (C6):** Integration with current BCI system through HDMI cable connection.

2. Solution

![AR Headset Design](https://youtu.be/FwuT2WA-nQU)

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

**Build cost:** $80

3. Verification

<table>
<thead>
<tr>
<th>Verification Test</th>
<th>Target Design Input Data</th>
<th>Observed Data</th>
<th>Pass / Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Weight Test (V1)</td>
<td>Weight (R2) ≤ 1.5 lbs</td>
<td>0.83 lbs</td>
<td>Pass</td>
</tr>
<tr>
<td>System Integration Test (V4)</td>
<td>System Accuracy (R1) ≥ 70% &amp; BCI System Compatibility (C6) via HDMI cable connection</td>
<td>80% &amp; HDMI connection established</td>
<td>Pass</td>
</tr>
</tbody>
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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.