Incorporation of Visual Feedback with Myoelectric Prosthesis Training

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BACKGROUND

Loss of a limb can be a traumatic experience for an individual. A variety of issues that are related to limb-loss include the financial burden of medical bills, difficulty of maintenance on complicated myoelectric devices, and frustration associated with an inability to properly use a prosthetic limb. In this work, we aim to address the frustration associated with improper training on how to effectively use a prosthetic limb. We propose to create a virtual reality game where users utilize electrical signals from flexing muscles in their residual arm in order to control a virtual limb. Through this training with a myoelectric system, a user can learn to effectively control a prosthetic as an extension of themselves in an engaging virtual reality environment.

Using a combination of open source platforms like Unity and Oculus Go we can facilitate major improvements to the training mechanisms used by myoelectric devices. We have generated a proof of concept, whereby a user can flex their muscles and observe a virtual hand on a computer screen reacting to this flexion. We will map multiple hand functions to multiple muscle poses through integration of a variety of flexion and extension signals from myoelectric detection. By linking successful flexion and extension to realistic virtual hand motions and corresponding point values in a gamified virtual environment, we hope to make the experience of myoelectric device training fun for both adults and children. Through the combination of an open source developed training tool with a 3D printed, highly available myoelectric arm device, expenses for more functional electronic prosthetics would decrease significantly making the technology available to people all over the world.

Conclusions

-Combination of Unity and a Myoelectric arm band are possible and can allow the user to see a virtual arm on the screen.
-Future research could allow for this Unity program to move onto a mobile platform like a phone application or Oculus VR.
-This would possibly decrease rehabilitation time and allow the user to enjoy the training through VR/AR games.