Capturing the Perceived Phantom Limb through Virtual Reality

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Phantom limb is the sensation amputees may feel where the missing limb (occasionally an organ) is still attached to the body and is still moving as it would if it were there. Between 50-80% amputees report neuropathic pain, also known as phantom limb pain (PLP). Recent studies suggest that providing sensory input to the stump or amputation area may modulate how PLP can be related to neuroplastic changes in the cortex. However, there is still little understanding of why PLP occurs and there are no fully effective, long-term treatments available. Part of the problem is the difficulty for amputees to describe the sensations of their phantom limbs due to the lack of a physical limb as well as phantom limbs that are in positions that are impossible to attain. This project aims to develop an effective 3D tool with the Maya 3D animation software and the Unity game engine. The tool will then be used for those with phantom limb syndrome to communicate the sensations accurately and easily through various hand positions using a model arm with a user friendly interface. The 3D model arm will be able to mimic the phantom sensation, being able to go beyond normal joint extensions of a regular arm. This way we can have a true 3D visual of how the amputee with phantom limb feels if it is abnormal. Testing the effectiveness of the tool will involve a pilot study with able-bodied volunteers. The non-dominant limb of the volunteers will be hidden behind a blind. After putting their limb in a random position, they will attempt to capture the limb on the 3D model. The actual position and captured position will be compared to determine the reproducibility and accuracy of the virtual limb. By taking advantage of computer graphics, virtual reality and computerized image capture technologies we are hoping to achieve a far less challenging way to quickly and accurately capture the position and striking feelings of the phantom limb sensation.

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