Abstract

Globally, stroke is one of the leading causes of disability. Almost 80% of the stroke survivors suffer from upper limb movement disorders. However, studies suggest that 20% of post-stroke patients attain some functional recovery in initial 6 months through targeted exercises. Though the conventional physiotherapy and occupational therapy techniques that require repetitive one-to-one sittings with therapists are powerful, yet, given the low doctor-to-patient ratio particularly in developing countries like India, getting access to these settings might be difficult. Alternative technology-assisted platforms e.g., Virtual Reality (VR)-based systems are gaining popularity. To make the VR-based systems interactive, the VR platform is augmented with specialized peripherals e.g., Data-glove. In the present research, I have developed a VR-based upper limb exercise platform that presents Gross Motor and Fine Motor tasks to the user. The platform is augmented with a cost-effective inertial sensor based full-arm Data-glove to track the Gross Motor and Fine Motor actions of the user while offering tactile feedback. Additionally, I designed a usability study in which 12 healthy and 12 post-stroke hemiplegic participants volunteered. Results indicate the potential of my system to quantify the Gross Motor and Fine Motor capability of post-stroke hemiplegic patients while they interacted with my system. Also, the results show the feasibility of my system to offer a comparative estimate of the range of motion between the dominant/non-dominant hands of healthy and unaffected/affected hands of post-stroke individuals.

Keywords: dataglove, inertial measurement unit, rehabilitation, serious games, tactile feedback, upper limb, virtual reality.