ABSTRACT

In this thesis, the design, implementation and control of a 5-bar parallel manipulator for developing virtual force field capability in a 'Gait-trainer' setup is addressed. The 'Gait-trainer' setup which is already operational is a single-degree-of-freedom (DOF) device that is based on a 12 bar Theo-Jansen mechanism and is intended for physical rehabilitation of patients who lose gait function. While the single-degree-of-freedom device is ideal for imposing natural kinematics for the human gait, it is not ideally suited for developing a force field that is known to be helpful for gait rehabilitation. The parallel manipulator seeks to introduce additional degrees of freedom to the 'Gait-trainer' to introduce a virtual force field while still taking advantage of the low cost and simplicity of the single DOF mechanism of the 'Gait Trainer'. To test the feasibility of this concept, a standalone parallel manipulator is constructed and a series of validation experiments are performed on it. The desired force fields are successfully created and the errors have been quantified. A few alternative design choices have also been explored and recommendations for further improvements for final mounting on the Gait Trainer have been made.