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Computing Human Arm Stiffness for the Purpose of Robotic Simulation

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Abstract

To replace a human during experiments, we've calculated the endpoint stiffness of a human arm to be simulated on a robot. The model used to calculate arm stiffness includes gravitational, short-range muscle, and muscle force-moment arm stiffnesses. The parameters of this model were estimated using data from the open source musculoskeletal MATLAB model, Dynamic Arm Simulator. The model will be used by a Barrett Proficio robot to simulate the stiffness of a human arm. The purpose of this human arm simulation is for experimentation during the development of a force sensing feedback system for functional electrical stimulation (FES). A robot that moves and produces similar stiffness to a human arm will be used in place of a human during experiments, for reproducibility and convenience. This requires the stiffness an arm produces under FES control to be computed and then replicated on the robot. Having an accurate representation of the stiffness an arm produces will create a better lab environment for the promotion of FES research.

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