Quantification of Spastic Ankle Joint Based on Parameter Optimization Algorithm

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Spasticity is a symptom of an upper motor neuron syndrome, which is shown by the change of resistance as the passive stretch differs, especially by joint velocity and position. In the practical field, patients state is evaluated using qualitative index depending on the subjective sense and criterions. The quantified index based on the concrete biomechanical model is highly needed to characterize the spastic joint for accurate diagnosis. In this research, we developed own manual spasticity evaluator and suggest the mechanical model of the ankle joint to characterize the spasticity. This model is composed of parameters of the intrinsic moment of inertia, viscosity, and elasticity, which are estimated passively The reliability of this model was verified through the variance in estimated torque value using it. The VAF value was over 80%, which infers to the fact that our model is reasonable. Based on this result, we can provide a model and an algorithm for parameter estimation which can be used as a basic criterion of quantitative diagnosis. We expect this model to be used for the ankle rehabilitation of the patients, and also use it for generation of the assistance ankle joint force of the wearable supporting robot.