Estimation of Grasp envelope using a 3-Dimensional Kinematic Model of the Hand

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A 3-dimensional kinematic model of the hand was developed. The model predicts hand posture using a simple contact algorithm, which detects a contact between hand segments and the object. Using the 3-dimensional kinematic model of the hand, we estimated grasp envelopes because the space requirement for a specific task is an important aspect to be considered in the task’s design stage. For this purpose, two hose insertion methods – a straight method and a rotation method – were simulated. The simulation results were compared favorably with the experimental studies by previous research. The model can be used to estimate grasp envelopes for varying hand sizes, object sizes, object shapes, and grip types. The model gives useful and practical information about the grasp envelope to the engineers who design parts or work spaces.

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