

Skill Transfer from Human to Robot by Direct Teaching and Task Sharing -A Case Study with Origami Folding Task- *

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Abstract: Manipulation skill, which is a sort of implicit knowledge, is very difficult to be transferred even among humans. Skill transfer from human to robot is even more difficult because humans and robots have dissimilar bodies. The authors already proposed a novel method to transfer manipulation skill from a human to a robot by direct teaching. A Hidden Markov Model (HMM) was employed to model the statistical characteristics of the teaching data demonstrated by a human. A nominal trajectory and sensory feedback control laws were extracted from the statistical characteristics of the trained HMM.

In this paper, a new method to extract sensory feedback control laws by direct teaching is proposed. The proposed method fully takes the statistical information of the teaching data from the canonical correlations between force (sensing) and velocity (action). Then, sensory feedback control laws, whose weighting factors have temporal continuity and directional dependency, are constructed without introducing any threshold values which had to be determined by trial and error in the previous method.

Like the previous study by the authors, the proposed method is applied to an origami-folding task and experimental results show that the success rate and the folding quality of 'Valley-fold' are improved. It is shown that task sharing by direct teaching is a key to successfully transferring manipulation skills between human and robot who have dissimilar bodies.

Keywords: skill transfer, direct teaching, robot hand, origami folding
