

# Generating a Symbolic Task Model from Multiple Demonstrations

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Most of the approaches to "Learning from Observation" so far assume that a demonstration can be well understood from a single demonstration. But a single demonstration contains ambiguity, in that interactions which are essential to complete a task can't be discerned without prior task dependent knowledge, which should be obtained from observation. To address these issues, we propose a technique to integrate multiple observations of demonstrations and estimate essential interactions automatically. The demonstrations differ, but indicate virtually the same task. The shared interactions among all the demonstrations are considered to be essential and a task model is generated from them. Detected essential interactions are further clustered to form a set of primitive symbols and a symbolic task model is generated. Finally, the robot reproduces the same task based on the task model even in different environment.

## Publication

1. K. Ogawara, J. Takamatsu, H. Kimura and K. Ikeuchi: "Extraction of Essential Interactions Through Multiple Observations of Human Demonstrations," IEEE Trans. on Industrial Electronics, PP.667 - 675 vol. 50 No. 4, 2003
2. K. Ogawara, J. Takamatsu, H. Kimura and K. Ikeuchi: "Modeling Manipulation Interactions by Hidden Markov Models," IROS 02, pp 1096-1101, 2002.

