Improving Gesture Interface Using Bayesian Network Structure Learning and Non-parametric Modeling

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Abstract
In this paper, we present an attempt to improve the existing visual-based gesture interface using probabilistic algorithms, BayesDB and CrossCat. After calculating pairwise dependence probabilities between variables through Bayesian network structure learning and non-parametric modeling, BayesDB and CrossCat infer a user-input motion by comparing to the single variable datasets. Using probabilistic methods significantly reduced the number of samples needed while maintaining sufficient accuracy. Unlike the traditional Hidden Markov Modeling (HMM) interface or Dynamic Time Warping (DTW) recognition process, the suggested interface does not require 3D modeling or repetitive teachings. Out of the 1000 trials held in this experiment, the proposed algorithm always determined the user-input motion correctly with confidence level ranging from 71% to 99%.

Summary
The current gesture interfaces require a large database and a long time for the machine-learning process to make accurate gesture inferences. Here, we find an efficient and accurate way in which humans can communicate with a computer via gesture. This new interface significantly reduces the size of the required database, shortens the teaching iterations and infers user-input motions with higher accuracy and confidence.