Learning by Demonstration applied to NAO Robot  –  2015-2016

# Movement Generalization and Classification

## Kinesthetic Learning

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## Abstract

This report explains the three approaches that i took in order to generalize NAO movements. I based my approaches on the article [1] from S. Calinon and F. Guenter and A. Billard . The dataset used consisted on Data collected the data from the 12 joints from NAO arms (6 joints corresponding to the left arm and 6 joints corresponding to the right arm). Me and my colleague Rui Almeida collected Data reproducing the same movement on a total of 6 repetitions of the movement, 3 from each one. On the first approach i applied Principal Component Analysis (PCA) to the Dataset, after i aligned the data using the Dynamic Time Warping (DTW), this are two pre-processing steps used to improve the Gaussian Mixture Model (GMM) algorithm that was applied to the resulting data, next and finally after this classification we obtain a "signature" using the Gaussian Mixture Regression(GMR). In a second approach (GMM) and (GMR) were applied directly to the original data. In the third and last approach the first steps are equal to the first approach but instead of concatenating the data, "signatures" were created for each repetition of the movement and in the end it was generated a mean from all the signatures that was used.

Figure 1: Imagem original

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