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A Gesture follower for performing arts

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1 Introduction

Our aim is to develop a gesture follower for performing arts, which indicates in real-time the time correspondences between an observed gesture sequence and a fixed reference gesture sequence (or in other words to time warp in real-time the observed sequence to the learned sequence). Applications concern for example choreography or (composed) music. The possibility to continuously establish correspondences between observed and reference gestures has important potentials. For example, this will enable the quantitative comparison of gesture data, at similar moments, between live and previously recorded performances. Particularly, this should facilitate the computation of parameters related to interpretation and expression. Moreover, this will also provide new tools to control and dynamically change mapping settings between gesture and digital media.

The demo is organized as follows. After a presentation of related works, we describe the architecture of the follower and its current implementation. Third, we show results obtained with dance and an "augmented" violin. Finally we conclude by a discussion of our approach.

2 Method

Intense research in the field of human machine interfaces has been conducted in recent years for the development of gesture recognition systems, and several methods and implementation have been reported [1]. The method described here is based on a Hidden Markov Models (HMM), and is similar to methods developed to perform score-following [2]. However, unlike standard score-following, the HMM structure is not based on an *a priori* given symbolic representation (i.e. the score), but directly on the measured continuous parameters of the learning sequence.

The learning process corresponds to model the learning example with a left-to-right HMM architecture. The self-transition probability is set in order to model the average time between two states. The gesture follower, determines in real-time the most probable state at time t, after a series or observation $O_1O_2\ldots O_t$, based on the forward procedure [3].

3 Implementation examples

A series of 20 short dance sequences (of approximately 30 s) have been video recorded. Each sequence is performed by two different dancers: the first one is used for learning, and the second is used to test the follower.

Posture data are obtained using EyesWeb, using the mocap analysis library [4]. Principal Component Analysis was performed on the dataset built by the 20 learning examples to reduce the dimensionality of the observed data. The projections on the first eigenvector are shown in Fig 1 for one pair of leaning (line) and observed sequences (dotted line). The output of the follower corresponds to the dashed line. This shows that the follower time warped the test sequence (dancer B) to the learning sequence (dancer A).

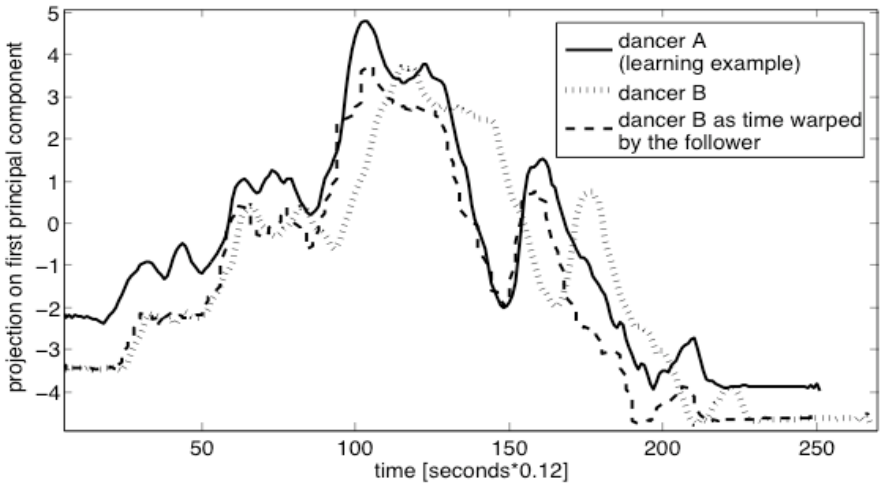

Fig.1. Results example on a dance sequence.

Globally, the results obtained with the 20 sequences performances of the gesture follower are promising; especially considering that sub-optimal posture features have been used. Various posture parameters and more complex HMM structures are under evaluation.

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