Multi-task and Multi-kernel Gaussian Process Dynamical Systems

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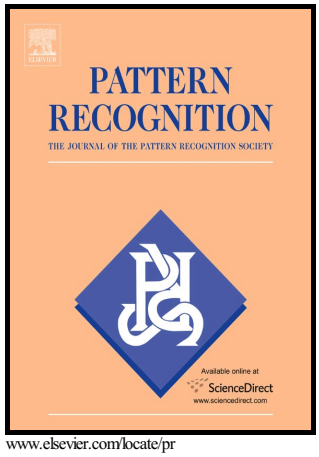

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Abstract

In this work, we propose a novel method for rectifying damaged motion sequences in an unsupervised manner. In order to achieve maximal accuracy, the proposed model takes advantage of three key properties of the data: their sequential nature, the redundancy that manifests itself among repetitions of the same task, and the potential of knowledge transfer across different tasks. In order to do so, we formulate a factor model consisting of Gaussian Process Dynamical Systems (GPDS), where each factor corresponds to a single basic pattern in time and is able to represent their sequential nature. Factors collectively form a dictionary of fundamental trajectories shared among all sequences, thus able to capture recurrent patterns within the same or across different tasks. We employ variational inference to learn directly from incomplete sequences and perform maximum a-posteriori (MAP) estimates of the missing values. We have evaluated our model with a number of motion datasets, including robotic and human motion capture data. We have compared our approach to well-established methods in the literature in terms of their reconstruction error and our results indicate significant accuracy improvement across different datasets and missing data ratios. Concluding, we investigate the performance benefits of

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