Time Warping Under Dynamic Constraints With Application to Non-Stationary Action Alignment and Classification

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Abstract

Action and event recognition from video require comparing temporal sequences of images, or of intermediate representations derived from them. Such a comparison should be insensitive to intrinsic temporal variations within the same class -- for instance the speed of execution of a particular gesture -- and at the same time retain the discriminative power that enable classifying different actions. In this paper we propose a technique to compare temporal sequences that accounts for dynamic constraints implicit in the data generation process. Our technique is more flexible than those previously used for quasi-periodic actions such as walking gaits, but more discriminative than others based on dynamic time warping that do not satisfy dynamic constraints. We illustrate our approach on public datasets including stationary and non-stationary actions, using both motion-capture and image data. In all the experiments we have conducted our approach outperforms competing ones, although we highlight experiments where it exhibits limitations.