Interactive Motion Decomposition

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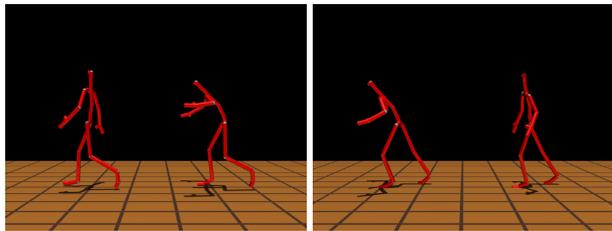University of California, Los Angeles

Figure 1: In the left image the original walk (left actor) has been modified with a "sneaky" style, yielding a sneaky walk (right actor). In the right image, the sneaking motion (left actor) is modified with a "walking" style, yielding a walk-like sneak that appears as a tiptoeing motion (right actor). Our visual decomposition works with any sort of motion data, including motion captured and key-framed data.

Exposition

We introduce a novel method for editing the style of motion data through motion decomposition. Our method extracts the style of a motion using linear decomposition based on Independent Component Analysis. The extracted style components are applied to other motions through a variety of editing operations. The resulting motions retain their original basic content while exhibiting the style of a different motion.

Unlike previous methods for stylizing motions, our method is interactive, visual and requires no knowledge of key-framing or statistical analysis. An important feature of our decomposition is that the resulting components are themselves motion data. Therefore, they are a familiar model for animators and can be subject to the growing number of techniques that work with motion data, such as retargeting. Our approach is the basis of a simple and intuitive interactive tool for analyzing and editing motion data.

Motion Decomposition. The decomposition is performed automatically through Independent Component Analysis (ICA). A user interactively selects one or more of the resulting components that best represent the style of the desired motion. These components can be combined together with a variety of visual editing functions to better represent the expressiveness and nuances of the motion. The chosen *style* components are then applied to the original motion yielding a new, stylized motion.

Interactive editing. Based on the proposed decomposition we have defined a set of editing operations that can change the style of an original motion. Of special interest is the ability of our approach to extract stylistic aspects from one motion and apply it to another. In addition, we can edit the components themselves to reduce or exaggerate their effect on the motion. For example, components may be combined together to yield better stylistic representations or to capture subtle nuances of motion. Using our interactive editing tool we are able to perform efficiently a series of examples that demonstrate the effectiveness of the method. Our approach is summarized in Figure 2.

Results. Figure 1 shows an example of style-transfer bewtween motions. We decompose motion capture data representing a person
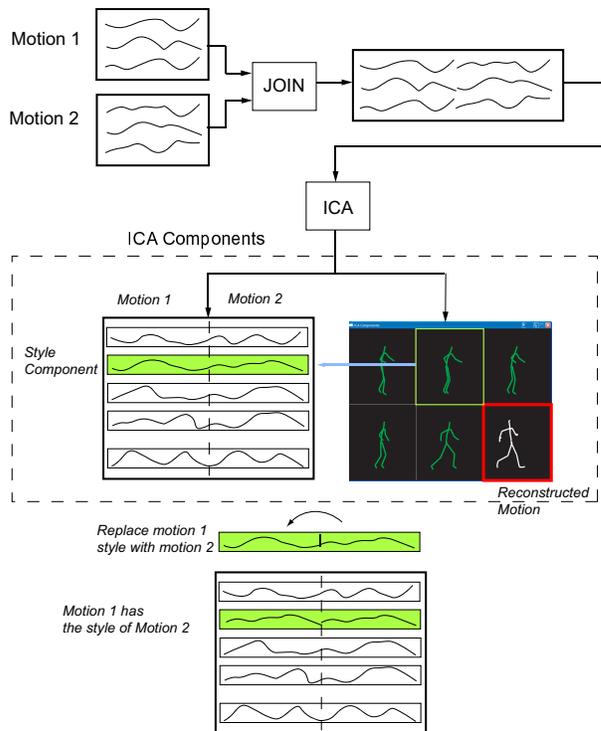

Figure 2: Overview of the ICA-based interactive editing system.

walking in a sneaky manner into independent components. We interactively identify the style components that capture the *sneakiness* of the motion. This *sneakiness* components are then be applied to a normal walk in order to create a sneaky-looking walk. Conversely, our method allows the reciprocal application of style to the above example. The characteristics of a walking motion can be extracted as an independent component and in turn added to a sneaky motion, yielding a walk-like sneaking motion. In addition, we can blend the style component and the target motion with varying weights so as to create a continuum of motions with varying amount of style. Thus, the original walk from the example above can be combined with a sneaky component in order to create a motion that is halfway between sneaking and walking. Thus, we can create transitions between the original motion and the new, stylized motion.

References

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