Body-part Motion Synthesis System for Contemporary Dance Creation

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Abstract

We developed a body-part motion synthesis system (BMSS) that allows users to create short choreographies by synthesizing body-part motions and to simulate them in 3D animation. This system automatically provides various short choreographies. First, users select a base motion and body-part categories. Then the system automatically selects and synthesizes body-part motions to the base motion. The system randomly determined the synthesis timings of the selected motions. Users can use the composed sequences as references for dance creation, learning, and training. We experimentally evaluated our system's effectiveness for supporting dance creation with four professional choreographers of contemporary dance. From our experiment results, we basically verified the usability of BMSS for choreographic creation.

Keywords: motion synthesis, contemporary dance, choreography, creation

Concepts: •**Computing methodologies** → **Motion processing;** •**Applied computing** → *Performing arts;*

1 Introduction

We are developing systems that support contemporary dance creation and education. We developed a body-part motion synthesis system (BMSS) that allows users to create short choreographies by synthesizing body-part motions and to simulate them in 3D animation [Soga et al. 2016]. This paper describes our latest BMSS and its evaluation by professional choreographers. Since creating complex choreographies is very time-consuming, the latest BMSS supports the automatic synthesis of choreographies to reduce the time needed to create them. We experimentally verified its usability for choreographic education with contemporary dance majors [Yazaki et al. 2015]. In this study we probe its usability for professional creation by dance choreographers.

Previous studies, which automatically synthesized motions using motion data [Shiratori and Ikeuchi 2008], generated natural motions by connecting or synthesizing multiple motions based on rules. However, we support creation that targets contemporary dance without style or traditional manner restrictions. Rather than natural motions, our proposed system generates unexpected motions that are helpful for dances.

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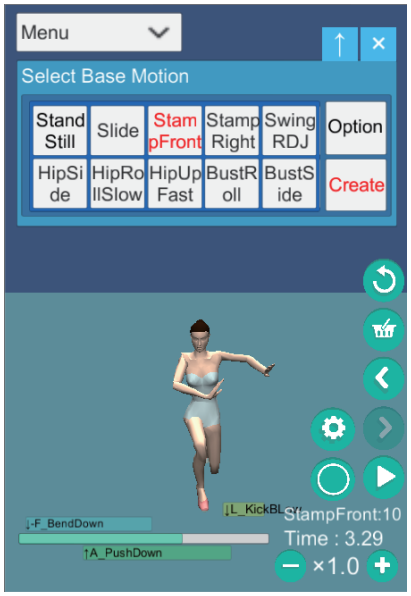

Figure 1: *GUI of BMSS4.*

2 Body-part Motion Synthesis System

This system automatically provides various short choreographies. First, users select a base motion and body-part categories. Then the system automatically selects and synthesizes body-part motions to the base motion. The system randomly determined the synthesis timings of the selected motions. This feature allows many variations of choreographies to be generated each time. Figure 1 shows the GUI of BMSS version 4.

Motions are provided as short motion clips that were captured by motion capture from performances by professional dancers. The short generated choreographies can be displayed as animation using 3DCG characters. Favorite choreographies can be saved, composed, and played as dance sequences on timelines. A smooth transition to/from the synthesized motion, with the base motion's corresponding body-part, is achieved at the start and end timings of the synthesis to display them naturally. Perhaps impossible or unnatural motions are generated if the synthesis timing is simply determined by a random number. To reduce the chance of generating such motions, we adjusted the synthesis timing by the constraints of body parts making contact with the floor.

Users can use the composed sequences as references for dance creation, learning, and training. Since the application runs on tablets, users can use it freely anywhere when they are creating dance choreographies. This provides an opportunity to develop new ideas for choreography creation. Occasionally, impossible and/or unnatural motions are created, but users do not have to completely reproduce actual motions in the 3DCG characters. They can incorporate various arrangements and ideas in their generated motions without our application by adopting such techniques as horizontal inversion and devising motions for the hands and feet to simplify balance.

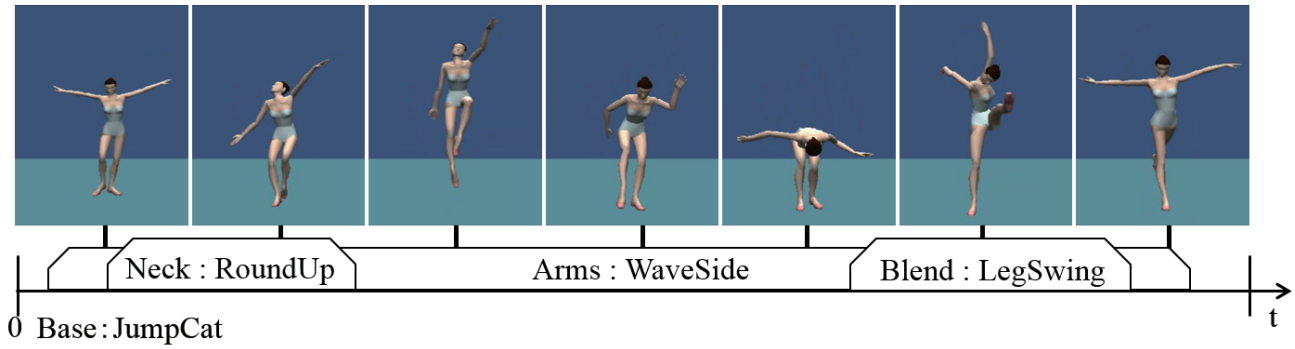

Figure 2: *Example of motion sequence created by choreographer.*

3 Evaluation by Choreographers

We experimentally evaluated our system's effectiveness for supporting dance creation with four professional choreographers of contemporary dance: two working in Tokyo (JP) and two in London (UK).

First, they became accustomed to BMSS by operating it for a few days. Next they composed short dance motions and saved them as potential seeds or hints for their own choreographies. Then they created their own short dance sequences using the software. Figure 2 illustrates an example of a short choreographic motion created by a choreographer in our experiment. Finally, they answered questions about dance creation using BMSS.

From our experiment results, we basically verified the usability of BMSS for choreographic creation. In their questionnaire answers, all four professional choreographers admitted that they discovered new dance movements for themselves. They also praised the software's general usefulness for choreographic works.

Here are typical responses about the usefulness.

– "The software is very helpful for a person who wants to begin contemporary dance choreography. It can also be used as a teaching material." (JP)

– "I think it is very useful in allowing a choreographer to explore and prepare movement ideas outside of a dance studio, which is often a practical and financial barrier to people choreographing." (UK)

Such feedback suggests that our system effectively supports professional dance creation. However the choreographers described that they were not so positive to use BMSS for their own professional works. Here are typical responses.

– "Because the software is based on movements which are recognized as standard dance methods, I feel it is difficult to ajust for real requests of choreography I have received." (JP)

– "I don't feel as though this particular version of the software would be useful for my choreography largely because of the stylistic issues." (UK)

The choreographers expressed reluctance to use BMSS for their own professional works because they had already established their own methods of choreography. They also suggested points for improvement. We plan to improve BMSS to make it more useful for choreographic works based on the suggestions from the professional choreographers.

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