Making Character Animations by Utilizing Motion Capture Data

Masaki Oshita
Faculty of Computer Science and Systems Engineering, Kyushu Institute of Technology, Iizuka, Fukuoka, Japan

Email: oshita@ces.kyutech.ac.jp

Abstract

Making realistic character animation is a challenging problem. Our research group have been developing various technologies to solve this problem and to provide easy-to-use animation systems for users. In this paper, we describe these techniques for making character animations by utilizing motion capture data.

1. Introduction

Recently, computer animation has been widely used in movies, video games, TV programs, web graphics, etc. Because computer animation is a very powerful tool to present a story, drama, or instruction, there are demands from non-professional people to create computer animation. By using a motion capture device, an actor's motion can be recorded. However, utilizing motion capture data is still difficult problem. To make a character animation, a number of motion capture clips must be edited and combined by using an animation authoring system which requires training and is difficult to use for non-professional users.

2. Interactive Motion Synthesis Method

We developed an interactive motion synthesis technique that synthesizes a continuous motion sequence from given elementary motions and their execution timings [1]. Our method generates smooth transitions between the given motions to generate a continuous motion sequence. By using this method, a long animation can be easily created by combining a number of short motion capture clips as shown in Figure 1. Our method is based on a previous approach in [2], which determined the appropriate synthesis method and blending range for each pair of sequential motions, considering the constraints between the foot and the ground to prevent foot sliding. However, determining the blending range using only foot-ground constraints may generate unnatural motions such as non-smooth, too fast, or too slow transitions. Moreover, simple motion blending with a regular weight function can also generate unnatural motions. To solve these problems, we have introduced an optimal blending range and a weight function, which are determined for each blending segment for the upper or lower body. We propose new criteria and methods for determining these values.

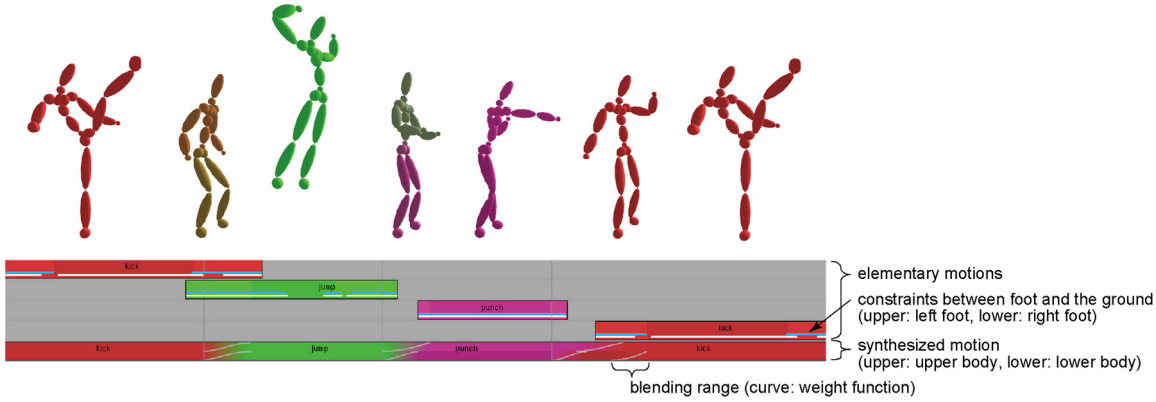

Fig. 1 Interactive synthesis method. In this example, a long animation is synthesized by combining four short motion clips which were placed on the timeline by the user.

3. Animation Authoring System for Dance Animations

As an application of the motion synthesis method above, we developed an animation authoring system for dance animations [3] (see Figure 2). We focused on Japanese traditional Noh dance in collaboration with

researches in Noh dances. We captured about 100 of motion capture clips of Noh dance motion units called *Shosa*. Noh dances are described based on a traditional notation called *Katatsuke*. By composing a series of motion units based on a *Katatsuke*, a Noh dance animation can be reproduced. Even novice users can easily use our system for practicing Noh dances or researching *Katatsuke*.

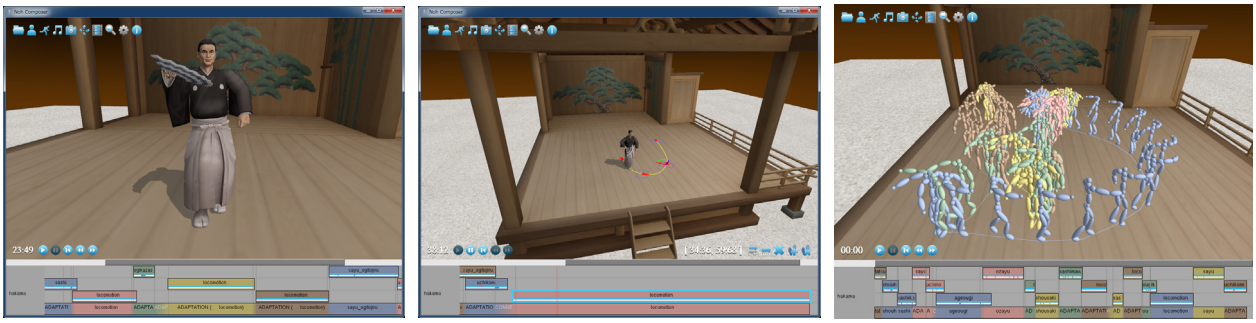

Fig. 2 Animation authoring system for Japanese traditional Noh dance. Noh dance animations are created by combining the motion capture clips of Noh dance motion units.

4. Generating Animation from Natural Language Texts

We developed an animation system that generates an animation from natural language texts such as movie scripts or stories [4] (see Figure 3). We also proposed a framework for a motion database that stores numerous motion clips for various characters. We developed semantic analysis methods to extract information for motion search and scheduling from script-like input texts. Given an input text, the system searches for an appropriate motion clip in the database for each verb in the input text. Temporal constraints between verbs are also extracted from the input text and are used to schedule the motion clips found. In addition, when necessary, certain automatic motions such as locomotion, taking an instrument, changing posture, and cooperative motions are searched for in the database. An animation is then generated using the motion synthesis system [1][2]. With our system, users can make use of existing motion clips. Even novice users can use our system.

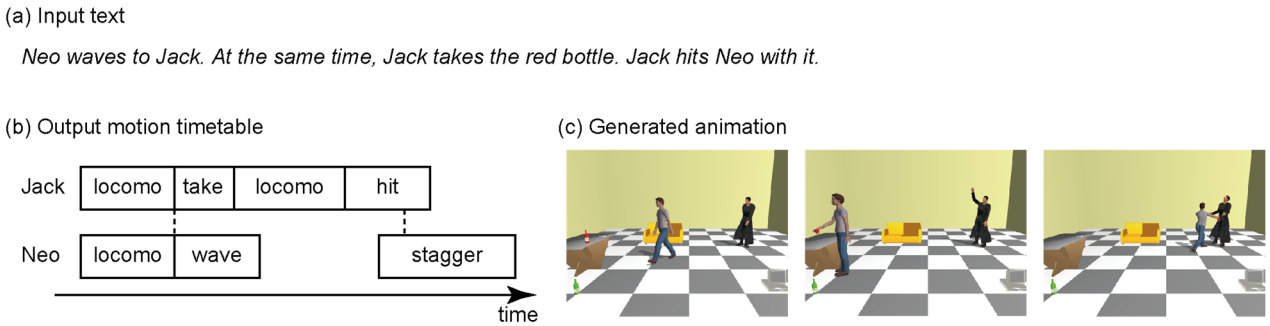

Fig. 3 Example of animation generation from natural language texts. (a) Input text. (b) Searched motion clips and their execution timings. (c) Generated animation.

5. Conclusion

In this paper, we described various technologies that we have developed. By extending these technologies we believe that even novice users will be able to create character animations easily in the near future.

References

[1] Oshita M., "Interactive Motion Synthesis with Optimal Blending", Computer Animation and Virtual Worlds, vol. 25, issues 3-4, pp. 313-321, 2014.

[2] Oshita M., "Smart Motion Synthesis", Computer Graphics Forum, vol. 27, no 7, pp. 1909-1918, 2008.

[3] Oshita M., Seki T., Yamanaka R., Nakatsuka Y., Iwatsuki M., "Easy-To-Use Authoring System for Noh (Japanese Traditional) Dance Animation and its Evaluation", The Visual Computer, vol. 29, issue 10, pp. 1077-1091, 2013.

[4] Oshita M., "Generating Animation from Natural Language Texts and Semantic Analysis for Motion Search and Scheduling", The Visual Computer, vol. 26, no. 5, pp. 339-352, 2010.