A Suggestive Interface for Designing Dance Formations

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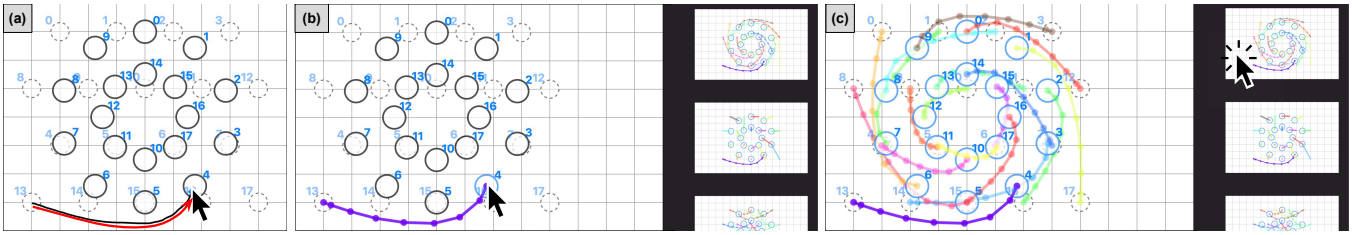

Figure 1: Procedure for creating paths with our system. (a) The user creates a path by dragging from a previous position (dotted circle) to a current position (open circle). A red arrow represents dragging. (b) The system generates multiple candidates and shows them on the right of the window. (c) The user completes the design by clicking one of the suggestions.

CCS CONCEPTS

• **Human-centered computing** → **User interface design**; *Graphical user interfaces.*

KEYWORDS

dance formation, suggestive interface, locomotion path

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1 INTRODUCTION

In group dance performances, formations and transitions between them are one of the important components to attract an audience. Choreographers often design such formations and transitions using a pen and paper, but static diagrams on paper are unsuitable for understanding when and how each dancer moves.

One possible approach to this problem is to make animations of the transitions. These animations are helpful in intuitively understanding the movements. Some applications and research have been undertaken to make such animations [Lee 2014; Schulz et al. 2013; Soga and Yoshida. 2012]. However, most of them only support straight paths and thus cannot create complex movements. DanceDesigner [Choreo Technology 2009] can freely design the locomotion of each dancer, but the user has to manually create each path one by one.

We propose a system that helps to design group dance formations and transitions. Inspired by Igarashi and Hughes [2001], our system is equipped with a suggestive interface. A user first draws some strokes that represent the paths of some dancers as input on the screen. Our system then predicts the other paths using predefined rules and generates multiple candidates. These suggestions are prioritized and listed as thumbnails. The user can complete the design by selecting one from these thumbnails.

2 SYSTEM OVERVIEW

Figure 2 shows the user interface of our system. Our system shows each formation as separate scenes that represent the top view of the stage. Open and dotted circles are dancer positions in the current and the previous scene, respectively. The user selects a scene from the scene list (Figure 2a), switches modes with the buttons (Figure 2b), and edits the selected scene on the main canvas (Figure 2c). The system has three modes: *Select*, *Drawing*, and *Path*.

The user first arranges dancer positions in the *Drawing* mode. The user can place dancer positions on the clicked position one by one. The user can also draw a line or a circle to place new dancer positions along them. Note that the positions in the current and previous scenes are independent of each other; the user does not specify the matching between these positions because this matching is automatically computed by the system later.

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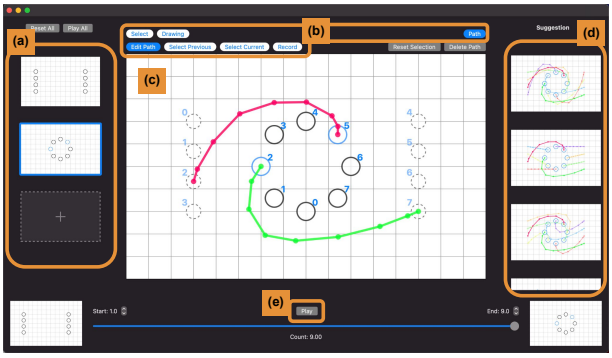

Figure 2: User interface of our system in the *Path* mode. Pink and green polylines on the main canvas show the paths of each dancer. (a) Scene list. (b) Mode buttons. (c) Main canvas. (d) Suggestion list. (e) *Play* button.

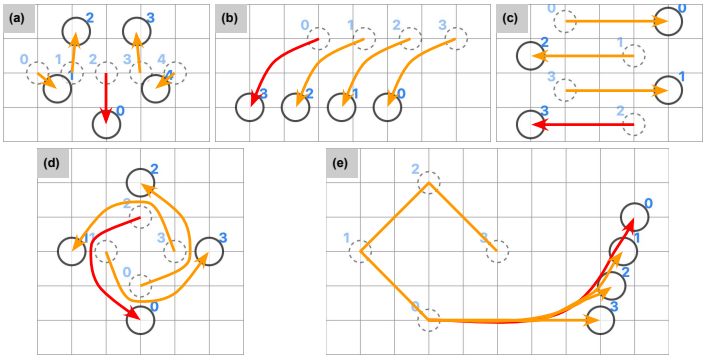

Figure 3: Path suggestion examples using each rule. Red arrows are the path drawn by the user, and orange arrows are suggested by the system. (a) Minimum distance. (b) Same direction. (c) Symmetry. (d) Rotation. (e) Locomotion in a line.

Once dancer positions are properly arranged on the canvas, the user can switch to *Path* mode, which is for locomotion editing. In this mode, the user can edit the temporal movement of each dancer from the previous position to the current position. First, the user selects an equal number of previous dancer positions and current dancer positions. Each of the selected positions is assigned an index in order of selection. Note that the user does not always have to pay attention to the indices. The system computes the matching between the previous and the current positions using five heuristic rules, and except for the fifth one, it does not use indices for matching. After that, the user creates paths for one or more dancers. When the user drags from a previous position to a current position in the *Record* sub-mode (Figure 1a), the system records the stroke and creates a path (Figure 1b).

The system then predicts locomotion paths for each of the selected dancer positions in two steps: the first is the prediction of the matching between the previous and the current dancer positions, and the second is that of the trajectory of the dancers from the previous position to the corresponding current position. This prediction is computed based on five independent heuristic rules (Figure 3). Each of the five rules assumes different transitions often used in group dance performances: minimum distance, the same direction, axial symmetry, rotation, and locomotion in a line. Only the fifth rule predicts the transition in which each dancer moves from the previous position to the current position with the same index. The system generates multiple candidates by using each rule independently. The system then shows these candidates to the user as suggestions (Figure 1b). The candidates are shown as small thumbnails, and the user can thus explore the paths in each candidate. Finally, by clicking one of the candidates, the user can apply it to the main canvas (Figure 1c). The user can also see animation of the transition by clicking the *Play* button (Figure 2e).

3 USER STUDY

We conducted a user study with four participants who had experience with dance and choreography. The participants were asked to reproduce shown target formation transitions and to design their original transitions with our system. Table 1 shows the number of drawn, modified, and suggested paths in all the target and the original transitions created by the participants. The drawn path is created by the user without suggestions. The modified path means that the user edited the suggested path, while suggested means without modification. In total, the suggested paths accounted for more than 63% of all the paths. This result implies that our system can suggest the desired paths.

Table 1: Sum of drawn, modified, and suggested paths in all the transitions designed by the participants.

	Drawn	Modified	Suggested	Total
Number of paths	71	14	149	234
Percentage	30.34%	5.98%	63.68%	100%

In the subjective feedback, all the participants answered that our system was helpful in creating dance performances because the animated formations were easy to understand. They also mentioned that our suggestion function saved time because it enabled them to design paths just by drawing a few of them and selecting a generated suggestion.

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