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Carol Strohecker, Adrienne H. Slaughter

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Zyklodeon is a highly visual, highly interactive software construction kit. Players create cartoon-like dancers and endow them with properties that influence emergence of cyclic timing and movement patterns. This paper describes interactions within the initial prototype.

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ABSTRACT

Zyklodeon is a software construction kit in which Players create colorful Dancers and set them into motion. Dancers' appearances are inspired by Picasso's post-Cubist works, and movements are inspired by Martha Graham's emphasis on the torso as life center. The figures breathe visibly and move gracefully as they encounter other Dancers. Zyklodeon Players construct the figures and set parameters for their movements, thus experimenting with time cycles and notions of emergence in dynamic systems. Our design challenge is to make such complex relationships accessible through coordination of image and sound. We illustrate Dancers' movements as well as measures for breathing and dancing cycles. Graphical communication of key moments in the cycles is augmented by triggering of sounds that combine to form lively music.

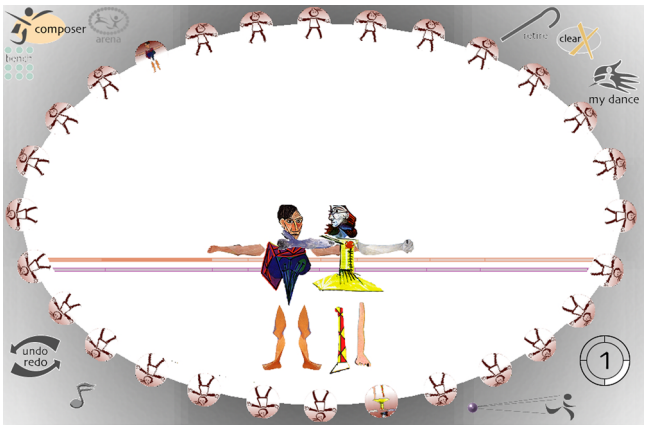
Keywords

construction kits, learning environments, conceptual development, dance

1. INTRODUCTION

Zyklodeon is the most recent entry in a genre of game-like kits based on constructivist learning theory [5, 6, 7, 8, 10, 12, 13]. The kits bear a family resemblance to Tinker Toys™, LEGOs™, and other building toys, but are dynamic and especially visual. Our designs offer a variety of ways of building, in an attempt to address multiple thinking and learning styles. We also emphasize visual and musical sensibilities, in the belief that pleasing aesthetics will attract a broader range of Players. Currently the kits are prototyped as highly interactive 2D graphical software, but we project development including augmentation with tangible input and output devices, and concurrent development of social contexts supporting the playful building activity.

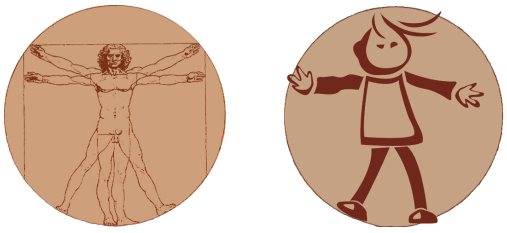
In Zyklodeon, Dancers' appearances are inspired by Picasso's post-Cubist works, and movements are inspired by Martha Graham's emphasis on the torso as life center [1, 2, 3, 4, 9, 11]. Dancers breathe visibly and move gracefully in response to other Dancers. Zyklodeon Players construct the colorful figures and set parameters for their movements, thus experimenting with time cycles and notions of emergence in dynamic systems. Our design challenge is to make such complex relationships accessible through coordination of image and sound.



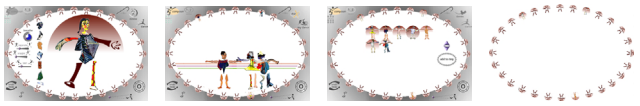
2. OPERATING THE APPLICATION

Players interact within four main structures, each with a particular screen presentation. The interaction design allows for flow between these structures, but here we describe the basic functionality.

2.1 Start-up and Overview



The kit opens with a movie-like sequence as an image of Leonardo's proportional man dissolves to a default figure presented in similar fashion. Four interactive structures then become available, constituting a variety of ways to play the kit:

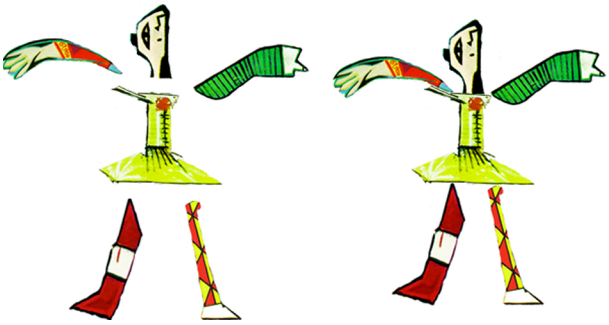


In the Composer, the Player can alter the default figure to create a new Dancer, whose composed behaviors emerge as movements in the dance area, or Arena. The Bench is a complete library of composed Dancers. The Player can place figures from the Bench into the Ring, an oval-shaped set of miniatures that surrounds the Bench, the Arena, and the Composer. Dancers can enter the Arena via the Ring or the Composer.

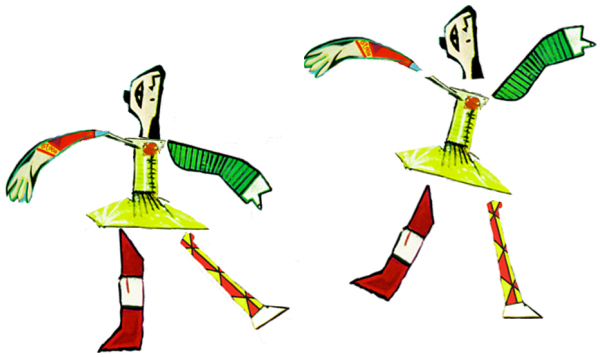
2.2 Composer

The Player creates a Dancer by replacing any or all of the body parts of the figure in the Composer. The Player can select a new head, torso, arms, and/or legs. As the Player rolls the mouse over a part of the figure, a column of alternate selections for that body part appears to the left. The Player clicks a selection to see it in the context of the figure.

When the Player selects a new torso, four widgets register its defaults for properties that characterize the Dancer's movements. The Breathe dial indicates the inhalation/exhalation ratio, which plays out as a separation of body parts from the torso followed by re-integration. One separation/integration cycle constitutes a single measure of breathing.



The Separate slider controls how far the body parts travel away from the torso during the separation phase of breathing. The Wiggle slider controls the degree of back-and-forth rotation that each body part effects as it separates from and returns to the torso. The Lean slider is associated with the Dancer's horizontal and vertical movements. The torso rotates slightly to the left or right as the Dancer moves horizontally. When the degree of rotation exceeds the value set by the Lean slider, the Dancer leaps.



The values associated with the Breathe, Separate, Wiggle, and Lean widgets combine to form a Drama Factor for the Dancer. Each time the Player adjusts one of these widgets, the Drama Factor recalculates accordingly. The gradient color of the circle surrounding the Dancer changes to reflect adjustments to the Drama Factor.

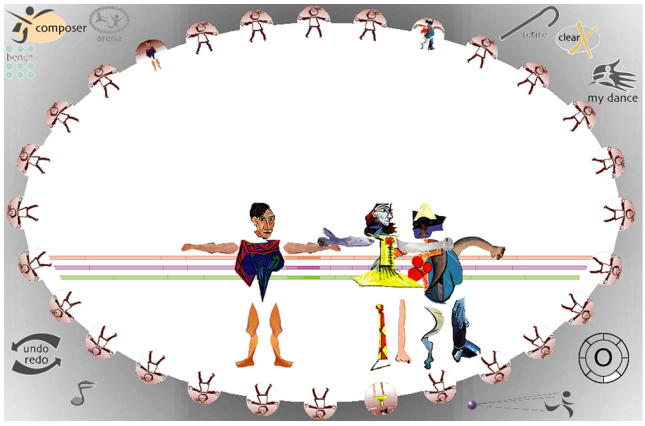
The Player clicks the Dance button to launch the figure into the Arena. A lone Dancer in the Arena breathes but doesn't otherwise move. When two or three Dancers are in the Arena, Drama Factors combine to form Partner Factors, which affect movements in the shared dance.

2.3 Arena

When a figure enters the Arena, its Breathe setting determines the number of measures for an activation cycle. This number is reflected in markings around the circumference of the Cycle Counter (the dial at the lower right of the screen). The number is also reflected in the structure of a horizontal bar, or Footlights, which spans the lower portion of the Arena.

When a second figure enters the Arena, a second set of Footlights appears beneath the first. Both sets of Footlights reflect a new number of measures, which is obtained by combining the Breathe

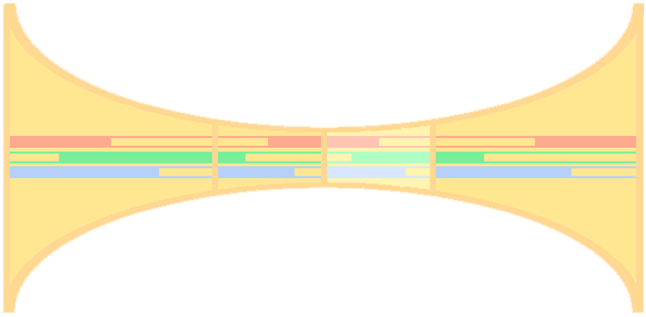
settings of the participating Dancers. The markings around the Cycle Counter also change to reflect this new number of measures. However, although the Dancers' Footlights share the same number of measures, the subdivisions of the measures differ. Each measure is subdivided to illustrate the individual breathing ratio of the associated Dancer.



Similarly, when a third Dancer enters the Arena, three sets of Footlights reflect a new shared number of measures. Subdivisions indicate each associated Dancer's individual breathing ratio. Three is the maximum number of Dancers that can be in the Arena at the same time.

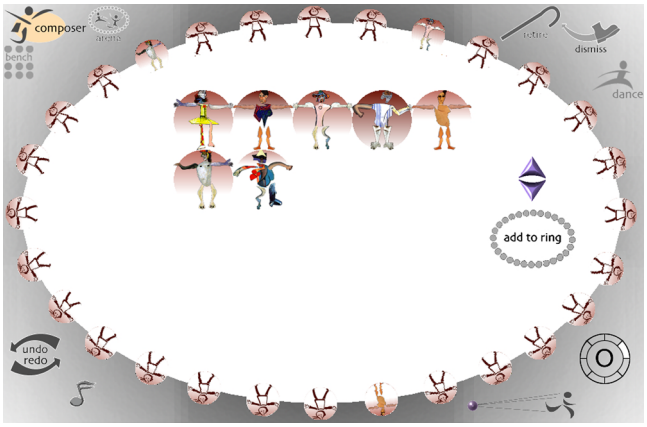
While the subdivisions of each measure in a given set of Footlights reflect a constant breathing ratio, the lengths of the measures vary. They get progressively shorter up to the middle of the activation cycle, and then they get progressively longer. This pattern is illustrated in horizontal fashion in the Footlights, and in circular fashion in the Cycle Counter.

A lone figure stands in place – it doesn't change location, but it does breathe. Its head, arms, and legs separate from the torso and return to it, according to the timing proportions of the Dancer's Breathe setting, the distance measure of its Separate setting, and the rotation degrees of its Wiggle setting. The body parts separate and integrate once during each measure in the activation cycle. Meanwhile the Footlights illustrate these separation and integration phases: as the cycle plays out, one half-measure after the next highlights, left to right, to show the passage of time as it corresponds to the Dancer's breathing. Meanwhile, one full measure after the next highlights clockwise around the Cycle Counter, to show the passage of time as it corresponds to measures within the dance cycle. At the end of the cycle, the number on the Cycle Counter increments and the Footlights return to screen left so the cycle can begin to play out again.



At any given moment, a Dancer partners with just one other figure, but Dancers change partners frequently as the activation cycle plays out. Two nearby Dancers' Drama Factors combine to form a Partner Factor. As these Dancers move horizontally with respect to one another, the Partner Factor affects the rotation of each torso. When a torso's lean value surpasses its lean limit, the Dancer leaps. After the leap, the torso returns to its default orientation as the current lean value is set back to 0 and the Dancer looks for a new partner.

2.4 Bench



Each time a Player creates and launches a new Dancer, a copy of the figure appears in the Bench as well as in the Arena and the Ring. The Player can arrange the Bench display in any order and can move figures back and forth between the Bench and the Ring, thus tailoring the kit for a rich variety of dances.

2.5 Ring

An oval Ring of miniature Dancers surrounds the Composer, the Arena, and the Bench. Each time a Player creates and launches a new Dancer, a miniature copy of the figure also appears in the Ring. Each Dancer is displayed within the gradient-filled circular area that indicates its Drama Factor.

If the Player clicks a Ring figure when the Composer is active, the selected figure appears within the Composer and can be modified. If the Player clicks a Ring figure when the Arena is active, the selected figure appears within the Arena and begins breathing (and dancing if any other figures are also in the Arena). The Player can

also rearrange figures in the Ring and can move the figures from the Ring back and forth to the Bench.

The Ring is a crucial aspect of play when the Arena is active. As Dancers move about, the Player can select new figures by clicking their miniatures in the Ring. A Dancer thus selected replaces the figure who has been in the Arena the longest, effecting a colorful swapping of places reminiscent of square dancing as the Player continues to shuffle figures in and out. An alternate mode effects this swapping automatically, allowing the Player to focus more on the emergent motion and timing effects.

3. FUTURE WORK

The process of arriving at this initial implementation was one of identifying the main interactive structures and affordances for detailed operations within them. Now we face a new challenge, of refining the presentations of images and sounds to communicate the coordination of breathing and dancing cycles.

4. ACKNOWLEDGMENTS

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