

Zyklodeon Interaction Design

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Abstract

This paper describes screen designs, control mechanisms, and system states for "Zyklodeon," a game-like, graphical software construction kit. Players create cartoon-like dancers and endow them with motion characteristics that combine to influence emergence of cyclic timing and movement patterns.

Zyklodeon Interaction Design



(These images are merely suggestive of the basic components and layouts.)

Start-up

The kit opens with a blank (white) screen. the Output Panel (OP) says, “Welcome to the cycle machine!” as the screen displays a movie-like sequence of 3-to-4-second dissolves:

The Leonardo image fades up, centered vertically and right-of-center horizontally.

Gradually this image dissolves to the encircled, sepia Marti figure (in the same screen location).

The sepia-toned Marti dissolves to a grayscale Marti.

The background fades up around Marti, defining areas for the Arena in which figures dance, the Ring of miniature figures surrounding it, and the Composer in which Players create dance figures.

The Composer widgets fade up to the left of Marti.

OP: “Create a new Dancer or launch this one”

Control mechanisms

Certain buttons and widgets are always present on the screen:

“Composer” button (click-button, disabled when the Composer is active)

“Arena” button (click-button, disabled when the Arena is active)

“Bench” button (click-button, disabled when the Bench is active)

“Retire” button (wand-button, always active for pruning the Ring. need a cursor image – cane?)

“Clear / Rest / Renew / Dismiss” button (Clear click-button enabled when Arena is active; Rest click-button enabled when Arena figure is selected; Renew click-button enabled when Composer is active; Dismiss wand-button enabled when Bench is active (need cursor image – boot?))

“Dance!” button (click-button: enabled only when the Composer is active; in same location as AutoDance / MyDance toggle)

“AutoDance / MyDance” toggle (enabled only when the Arena is active; in same location as Dance! button)

cycle counter (non-interactive widget, enabled only when the Arena is active. iterates number display as a dance proceeds through cycle after cycle)

cycle speed (slider, enabled only when the Arena is active)

“Undo” button (click-button, always enabled for multiple levels of undo)

“Redo” button (click-button, enabled only just after an Undo is performed)

“Sound” on / off toggle (toggle-button, always enabled)

Other buttons and widgets are present only under certain circumstances:

Bench – scroll widgets enabled when the number of entries is too large for everyone to fit on the screen; “Add to Ring” wand button (3 side-by-side Marti’s holding hands? include cursor image)

Composer – Breathe dial and Separate, Wiggle, and Lean sliders (see below)

Buttons and widgets have particular patterns of states and behaviors, as follows.

Control mechanism states and behaviors

Click-button:

Enabled (the Player can click the button)

MouseOver (triggers inverse highlighting)

Clicked (calls in a new button image and plays a sound to signal register of click, triggers the associated functionality, and announces the new state in the Output Panel)

Disabled (the Player cannot click the button; a filter grays out the image)

Toggle-button:

Enabled (the Player can click the button)

MouseOver (triggers inverse highlighting)

Clicked (calls in the button image associated with the alternate state of the toggle, plays a sound to signal register of click, triggers the associated functionality, and announces the new state in the Output Panel)

Alternate state available (the Player can click it)

Disabled (the Player cannot click the button; a filter grays out the image)

Wand-toggle:

Enabled (the Player can click the button)

MouseOver (triggers inverse highlighting)

Clicked (disables all other functionality; calls in the button image associated with the alternate state of the toggle, plays a sound to signal register of the click, changes the cursor to indicate the pending functionality, and announces the mouse-dependent pending functionality in the Output Panel)

When the cursor touches an object, the associated functionality is applied, a sound plays, the object is transformed accordingly, and the Output Panel announces the object's new state)

Alternate state available (the Player can click it to return the cursor and the button to their normal states)

Disabled (the Player cannot click the button; a filter grays out the image)

Slider:

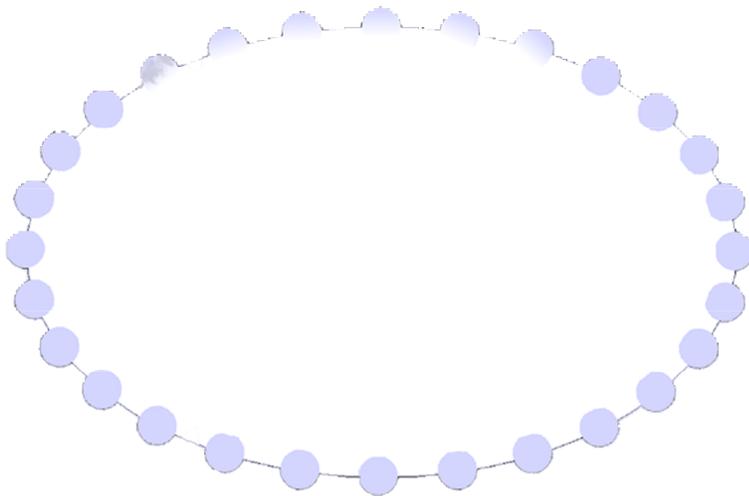
Enabled (the Player can operate the slider)

MouseOver (triggers inverse highlighting)

Moved (plays a sound, triggers the associated functionality, and announces the new state in the Output Panel)

Disabled (the Player cannot operate the slider; a filter grays out the image)

Ring



The Ring of miniature figures is always active.

Each figure is displayed within a circular area that indicates its dramaFactor (see below).

When the kit first starts up, the Ring is populated entirely by miniature Marti figures. New dance figures created in the Composer and launched into the Arena also enter the Ring, replacing Marti's randomly. When there are no Marti's left, new figures replace Player-composed figures, in first-in/first-out order. Each time a figure leaves the Ring (which means also each time a

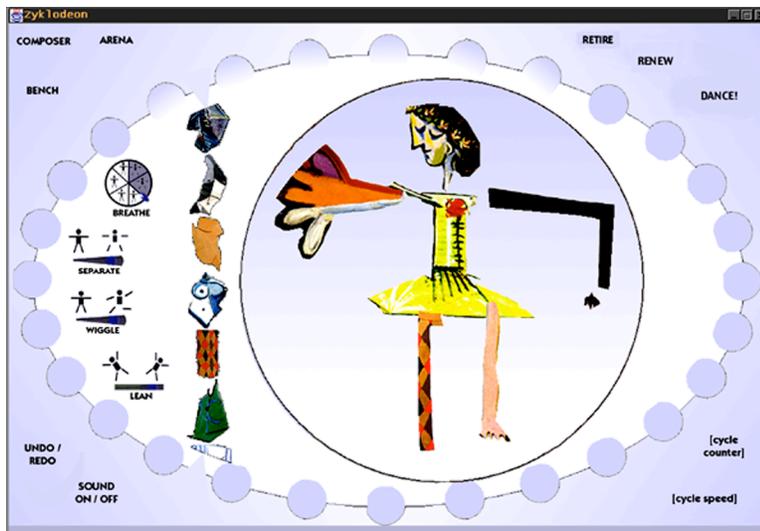
figure enters the Ring), the Output Panel reads, “Welcome new Dancer, bench old Dancer.” If the figure is not already in the Bench, it is added (see below).

The Player can rearrange figures in the Ring. When the Player click-drag a figure to another figure’s position, the two figures trade places. OP: “Dancers traded places”

The Player clicks the Retire wand-button. (OP: “Touch Ring figure to retire the Dancer to the Bench”) Then the Player touches a figure to remove it from the Ring. The figure disappears from the Ring and is replaced by a Marti miniature. However, the figure remains in the Bench (see below). (OP: “Dancer retired to Bench”)

The Ring state persists when the Player closes down the kit: when the kit is restarted, the Ring appears just as it had been left.

Composer



The Composer is the circle containing a dance figure, as well as associated widgets and body parts.

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 of the circle. Moving the mouse around the figure causes the selections for each part to come and go at left. (OP: “Click torso/head/etc. to choose another option”) Clicking part of the figure anchors the associated column of selections and plays a sound. Then the Player can roll the mouse along the column to temporarily view each part in the context of the entire figure. At this point a superimposed part does not replace whatever part is already in the figure; the part simply overpaints the proper area of the figure. (OP: “Click another torso/head/etc. option to choose it”) Releasing the mouse on a selection causes that part to stay in the figure, replacing whatever part had been there previously. A sound emphasizes this change. The menu stays anchored until the mouse leaves the selection column. Then the menu begins its floating behavior again, coming and going according to whatever body part the mouse rolls over.

To the left of the column of body part selections are four widgets associated with motions that the figure will display when dancing in the Arena:

The “Breathe” widget is a six-part circle that indicates the setting for the ratio of separation to integration, as a figure’s body parts move away from and toward the torso during a single measure of breathing. The circle displays marks at the 12 o’clock, 2 o’clock, 4 o’clock, 6 o’clock, 8 o’clock, and 10 o’clock positions. The area to the right of 12 o’clock corresponds to the separation factor, and the area to the left of 12 o’clock corresponds to the integration factor.

Each torso has a default ratio which is reflected in the widget. For example, Marti’s breathing ratio is 3:3, so his Breathe default value is 3 (representing the separation factor).

As a new torso appears in the Composer, the Breathe widget adjusts to display the default number of sections in a dark color. This number corresponds to the separation factor. The rest of the sections are displayed in a light color; these correspond to the integration factor. An immobile notch indicates the o’clock position of this starting point, and a movable knob rests at the same point. The Player can change the breathing ratio by pulling the knob clockwise around the circumference of the circle. (OP: “Pull knob to adjust breathing ratio”) The notch is unaffected by the move; it remains where it is. As the knob passes another of the six positions, the separation factor increases and the area behind the knob darkens accordingly. When the Player is finished pulling the knob and the new Breathe setting is established, a sound plays.

The “Separate” slider controls how far the body parts travel away from the torso during the separation phase of breathing. The slider values are not displayed, but within the code range from 1 to 5. The default for the torso that currently appears in the Composer is indicated by an immobile notch along the slider. A movable knob also appears at this location. The Player can change the separation distance by moving this knob. (OP: “Slide knob to adjust separation distance”) The notch is unaffected by the move; it stays where it is as long as that torso remains in the Composer figure. When the knob move is completed and the new setting is established, a sound plays. It has an upward sound if the separation distance is increased, and a downward sound if the separation distance is decreased. (OP: “Separation distance adjusted; drama factor increased/decreased”) Marti’s Separate default is 3.

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 slider values are not displayed, but within the code range from 0 to 5. The default for the torso that currently appears in the Composer is indicated by an immobile notch along the slider. A movable knob also appears at this location. The Player can change the degree of wiggle by moving this knob. (OP: “Slide knob to adjust degree of wiggle”) The notch is unaffected by the move; it stays where it is as long as that torso remains in the Composer figure. When the knob move is completed and the new setting is established, a sound plays. It has an upward sound if the degree of wiggle is increased, and a downward sound if the degree of wiggle is decreased. (OP: “Degree of wiggle adjusted; drama factor increased/decreased”) Marti’s Wiggle default is 0.

The “Lean” slider controls the maximum angle that a torso can rotate back or forth. This angle is the leap threshold for that torso. The slider values are not displayed, but within the code range from 1 to 5, values which are mapped to a range of 15 degrees to 75 degrees (or some such numbers). The default for the torso that currently appears in the Composer is indicated by an immobile notch along the slider. A movable knob also appears at this location. The Player can change the lean limit by moving this knob. (OP: “Slide knob to adjust lean limit”) The notch is unaffected by the move; it stays where it is as long as that torso remains in the Composer figure. When the knob move is completed and the new setting is established, a sound plays. It has an

upward sound if the lean limit is increased, and a downward sound if the lean limit is decreased. (OP: “Lean limit adjusted; drama factor increased/decreased”) Marti’s Lean default is 3.

As the Player adjusts the Breathe, Separate, Wiggle, and Lean widgets, the dramaFactor recalculates accordingly. The dramaFactor is the sum of the four settings; thus its possible values range from 3 to 20. A given dramaFactor’s proportional relationship to the range of all possible dramaFactors is illustrated by the grayscale color and fill level of the gradient circle surrounding the figure in the Composer. As the Player adjusts the Breathe, Separate, Wiggle, and Lean widgets and the dramaFactor recalculates, the level and color of the gradient also adjust accordingly.

The fill level of the gradient circle surrounding the figure grows downward: it is darkest at the top of the circle, and lightest at the bottom. The upper tip of the circle establishes the starting point for the gradient, and the dramaFactor establishes the second point. Color is also a function of the dramaFactor: the grays range from R85 G85 B85 to R170 G170 B170.

If the Player clicks the Renew button, the figure in the Composer is replaced by Marti.

Figures can enter the Composer via the Ring. When the Composer is active, clicking on a Ring figure enters it into the Composer. If a figure is already there, the system first checks whether it should discard or save the current figure. A YesNo window asks, “Do you want to keep this Dancer?” Following this question in the YesNo window are a “Keep Dancer” button and a “Don’t keep” button. If the Player says “Keep Dancer,” the currently composed Dancer is stored in the Bench and the Ring, and the selected Ring figure becomes the new figure in the Composer. If the Player says a “Don’t keep,” the Ring figure enters the Composer and the other figure is discarded. Sounds play appropriately.

If the Player clicks the “Bench” button while the Composer is active, the current figure remains in the Composer while the Bench overlays it. However, only the Bench is operable at this point. Then, clicking the “Composer” button while the Bench is still active returns the Player to the Composer, in the same state as before the Bench was called. If the Player clicks the “Arena” button while the Bench is active, the Bench disappears but the figure in the Composer is not launched; the Arena appears in whatever state it had most recently been.

While the Composer is active, if the Player clicks the “Dance!” button, the currently composed figure is launched. This means that a copy is stored in the Bench (see below), a miniature copy appears in the Ring (see above), and another copy enters the Arena (see below). (OP: “Dancer entering Arena, Ring, and Bench”) The figure also remains in the Composer.

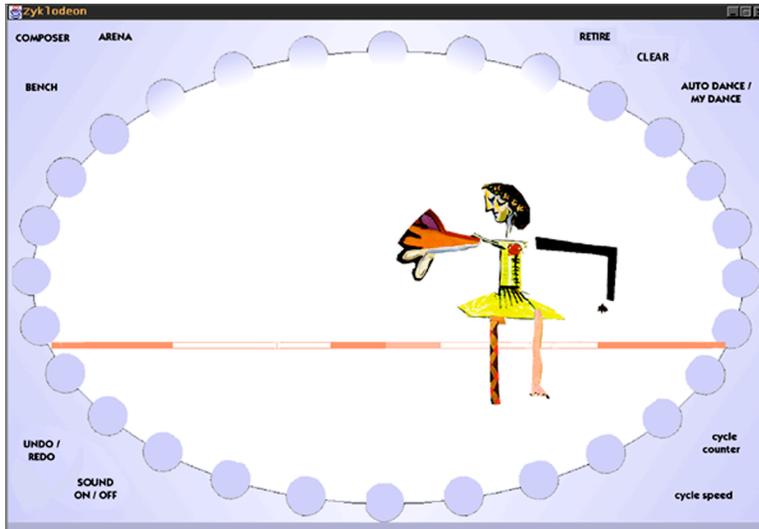
If instead the Player clicks the “Arena” button, the figure is not launched, and the Arena appears in whatever state it had most recently been.

If the Player closes down the kit while the Composer is active, the system displays the YesNo window saying, “Do you want to keep this Dancer?” If the Player says “Keep Dancer,” the Dancer is stored in the Bench and the Ring, and the kit closes. If the Player says a “Don’t keep,” the figure discarded is and the kit closes.

If the Player closes down the kit and no changes have been made to the figure in the Composer, no copies of the figure are made for the Ring or Bench.

A good-bye sound plays when the kit closes; it is an “inverse” of the kit opening flourish.

Arena



The Arena opens in MyDance mode, so the AutoDance toggle is enabled (replacing the Dance! button). The cycleCounter widget and cycleSpeed slider become active. (OP: “Click figure in Ring to join Dance”)

When a figure is launched from the Composer, a copy is stored in the Bench (see below), a miniature copy appears in the Ring (see above), and another copy enters the Arena. This copy is slightly smaller than the figure that appeared in the Composer. The Arena figure appears at a random screen position.

Figures can also enter the Arena via the Ring. If the Arena is active and the Player clicks a Ring figure, its larger counterpart appears in the Arena, at a random screen position.

One, two, or three figures can simultaneously occupy the Arena. If there are already three figures in the Arena and another one is entered, it replaces the figure that has been in the Arena the longest. The Player can work around this default by clicking a figure to stop its movement and select it. The torso color of a selected figure inverse highlights to indicate that it is the one that will be replaced by the next entry.

The Player can manually reposition a selected figure. Also, when a figure is selected, the Clear button changes to the Rest button, and clicking it removes just that Dancer from the Arena; then the button becomes the Clear button again. If a Dancer is selected and the Composer button is clicked, the selected Dancer appears in the Composer. Otherwise, if no Dancer is selected, the Composer appears in its most recent state.

When a figure enters the Arena, the circle surrounding its Ring miniature maintains its gradient quality but takes on a color other than gray (see below). Additionally, the Dancer’s Breathe setting determines the number of measures for an activation cycle. This number is reflected in markings around the circumference of the cycleCounter. The number is also reflected in the structure of a horizontal bar that spans the lower portion of the Arena. These “Footlights” are the same color as the new fill around the Ring miniature.

The Footlights illustrate the number of breath measures within a cycle by displaying a division between each measure. They also display divisions between the separation and integration portions of each measure. This ratio is the same from measure to measure, though the lengths of

the measures vary. They get progressively shorter up to the middle of the cycle, and then they get progressively longer. This pattern is illustrated in horizontal fashion in the Footlights, and in circular fashion in the cycleCounter.

The 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 its Breathe setting and the distance measure of its Separate setting. The body parts separate and integrate once for each measure in the cycle, while 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. Meanwhile, one full measure after the next highlights clockwise around the cycleCounter, to show the passage in another way. At the end of the cycle, the number display on the cycleCounter increments and the Footlights return to screen left so the cycle can begin to play out again.

In the Footlights, two degrees of highlighting signal the double-importance of the measures and the half-measures: as the cycle enters a new measure, both of its half-measures appear lighter than the rest of the measures, and as the cycle enters a particular half-measure, its color appears even lighter.

As the cycle plays out, the dramaFactor increases and then decreases (see below) . Sounds based on the root of a chord play accordingly.

When a second figure enters the Arena, the fill in its surrounding circle changes to another new color. A second set of Footlights appears beneath the first, in this same new color. Each measure in the new Footlights reflects the new Dancer's separation-to-integration breathing ratio. The Footlights also reflect a new number of measures, which is obtained by combining the Breathe settings of the participating Dancers. The first Dancer's Footlights remain where they were, but repaint to illustrate the new configuration. The markings around the cycleCounter also change to reflect the new number of measures.

As the cycle plays out and the dramaFactor increases and then decreases, sounds based on the root and third positions of a chord play accordingly.

When a third figure enters the Arena, its Breathe setting combines with the others' to yield a new number of measures for the cycle. The existing Footlights repaint accordingly, and a third set is added. Its color matches that of the fill in the circle surrounding the Ring miniature of the new Dancer.

As the cycle plays out and the dramaFactor increases and then decreases, sounds based on the root, third, and fifth positions of a chord play accordingly.

Footlights build in a particular color sequence: an optimal set for screen visibility would seem to be red-orange first, then green below it, then red-purple below that. Lighter variations of these colors constitute the two levels of highlighting.

Similarly, there are three gentle breathing sounds that play in association with each of the figures in the Arena. As figures shuffle in and out, new Dancers assume whatever breathing sound is next in sequence or associated with whatever Dancer is being displaced by the new entry.

At any given moment, a Dancer partners with just one other figure, but Dancers change partners frequently as the cycle plays out. Two partnered Dancers' dramaFactors combine to form a partnerFactor. The Dancers move horizontally with respect to one another, and the partnerFactor

affects the lean of each torso. When a torso's lean value surpasses its lean limit, the Dancer leaps. After the leap, the current lean value is set back to 0. The only way to change the lean limit is through the slider in the Composer.

In summary (and in more detail), when a Dancer enters the Arena, several events constitute its activation:

- if a Dancer already in the Arena is displaced, it waves before disappearing (a randomly chosen arm rotates up and down according to the dramaFactor)
- the gradient circle around the displaced Dancer's Ring figure returns to grayscale
- the gradient circle around the new Dancer's Ring figure takes on a color to match the Footlights (the next color in sequence or the color that had been associated with the displaced Dancer)
- an entry flourish plays as the new Dancer appears in the Arena
- a breathing sound plays continuously (the next in sequence or the one that had been associated with the displaced Dancer)
- the new Dancer's Breathe setting is summed with any other Dancers' in the Arena, to get a new number of measures for the cycle
- the Footlights and cycleCounter repaint accordingly and progress as the cycle plays out
- sound chord parts associated with each dancer play according to the changing measures
- the new Dancer partners with the nearest figure
- the two partners' dramaFactors sum to form the new Dancer's partnerFactor
- the Dancer flips its head toward its partner
- the Dancer flips its torso toward its partner
- the Footlights and cycleCounter progress
- the Dancers breathe (the body parts separate from the torsos and return, according to the Breathe settings)
- each Dancer moves horizontally toward its partner
- when a Dancer arrives at the opposite end of the Arena, it reverses direction and the torso flips (so that it always faces the direction of movement)
- when a Dancer passes its partner, it skips horizontally a little, a heartbeat sound plays, and the Dancer's head flips (so it is always facing the partner)
- at the end of each breath, the torso leans a little (it rotates in the direction of movement, according to the partnerFactor)
- if the new lean value is less than the lean limit, keep breathing and keep moving
- if the new lean value equals or exceeds the lean limit, leap (a flourish plays; the Dancer moves vertically and rotates arms and legs, all according to the dramaFactor)
- if the leap is very high, some part of the top of the Dancer may be occluded by the background
- the Dancer descends by the same y-value as the ascent
- the Dancer breathes twice
- the Dancer looks for a new partner

The Player can adjust the timing of the playout with the speed slider. None of the measure conditions change, but progress through the cycle can be slower or faster.

At any time, the Player can click the AutoDance toggle. MyDance then becomes the enabled state of the toggle, and the figures move according to the AutoDance algorithm. (OP:” Watch the Dancers leap or click MyDance to select new Dancers”) Whatever Dancers are in the Arena remain, as do the Footlights and the timing and leap calculations. The Dancer selection process is automatic though. Every other cycle, a randomly chosen Dancer enters the Arena, replacing the one that has been there the longest. If there are fewer than three Dancers in the Arena when the Player clicks the toggle, the randomly chosen Dancers do not replace the existing ones. Instead, the number of figures builds to three, and then the replacing begins.

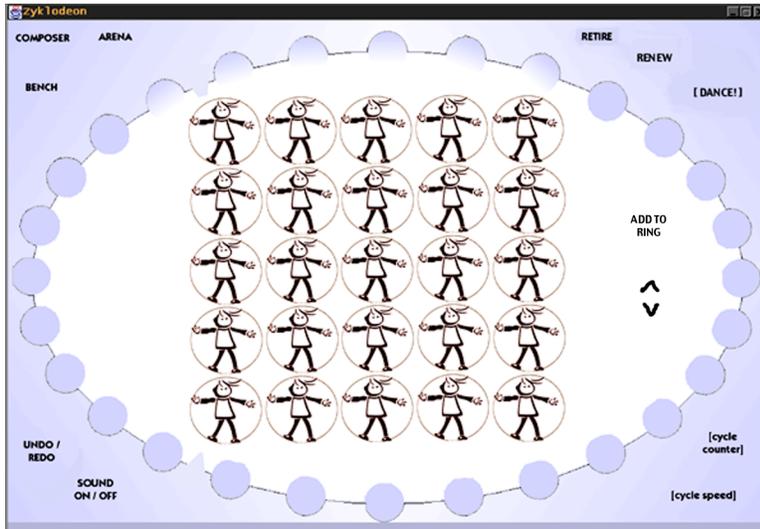
This process continues until the Player intervenes by changing mode. When the Player returns to the Arena, the Dancers will still be there, but the Arena will again be in MyDance mode, and the AutoDance toggle will be available again. While in AutoDance mode, if the Player intervenes by clicking a Dancer, it stops and inverse highlights, and the mode returns to MyDance, enabling the AutoDance state of the toggle.

If the Player clicks the Composer or Bench buttons, the current figures remain in the Arena. If no Dancers are selected when the Composer button is clicked, the Composer appears in its most recent state. If instead a Dancer is selected when Composer button is clicked, the Composer appears with that Dancer in place.

If the Player clicks the Clear button, all the figures in the Arena disappear, and all the gradient circles around the Ring figures return to grayscale.

If the Player closes down the kit while the Arena is active, the system displays a YesNo window saying, “Do you really want to stop this dance?” Following this question in the YesNo window are a “Stop dance” button and a “Continue” button.

Bench



The Bench is stocked with a default Marti figure who can be repositioned but never deleted.

Each time a Player creates and launches a new Dancer, a copy appears in the Bench as well as in the Arena and the Ring. The Bench displays the newest entry first; older figures move to the bottom of the display (next to Marti, who is last).

However, the Player can rearrange figures in the Bench. When the Player click-drag a figure to another figure's position, the two figures trade places. The system then maintains this order but subsequently adds new Bench entries to the beginning of the display.

The Player can click the Dismiss wand-button and then touch a Dancer to remove it from the Bench. The system displays a YesNo window saying, "Do you really want to dismiss this Dancer? You won't be able to get it back." Following this question in the YesNo window are a "Dismiss" button and a "Don't dismiss" button.

If the Player affirms "Dismiss" and the indicated Bench figure does not exist in the Ring, the system deletes the figure. If a representation of that Dancer does exist in the Ring, another YesNo window appears. It says, "This figure is also in the Ring, waiting to Dance. Do you want to dismiss the Dancer from here and the Ring? You won't be able to get it back." Following this question in the YesNo window are a "Dismiss from the Bench and the Ring" button and a "Don't dismiss" button.

The Bench includes Up and Down buttons that enable browsing when the number of Dancers exceeds what fits within the portion of the Bench display delineated by the Ring.

The Bench also includes an "Add to Ring" wand-button. To use it, the Player clicks the button and then touches a figure in the Bench. The Bench selection replaces Marti's in the Ring randomly or, when there are no Marti's left, replaces the oldest Player-composed figure in the Ring. The Output Panel reads, "Welcome new Dancer," and a sound plays.

When the Player clicks the Arena or Composer buttons or closes down the kit, changes to the Bench are saved automatically.