**Kenny K. N. Chow**

*Paper:* **Embodying Generative Visual Renku: An Approach to Generating Metaphors through Interactions**

***Topic: Generative and Interactive Visual Art***

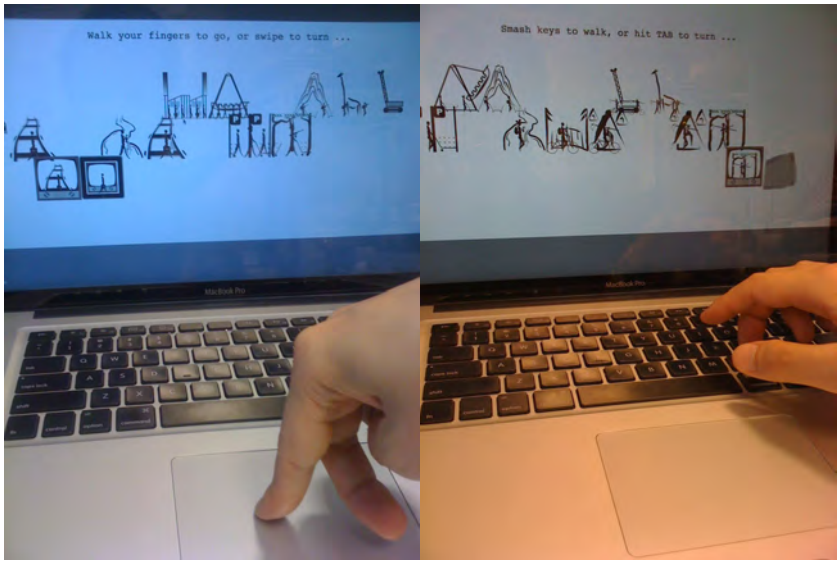
***Authors:***
***Kenny K. N. Chow***
The Hong Kong Polytechnic University, School of Design
Hong Kong
www.sd.polyu.edu.hk

***D. Fox Harrell***
MIT,
Comparative Media Studies Program / Computer Science and Artificial Intelligence Lab
USA

***Abstract:***
Generative Visual Renku is a new genre of digital visual art form, initiated by the authors, inspired by the linked discourse structure in Japanese renku poetry, iconicity of Chinese character forms, and conceptual metaphor and blending theories from cognitive science. GVR works generate evocative compositions of modular graphical images dynamically through interaction between the user and the system [1]. When the system accepts motor input from the user and generates animated feedback, the user makes metaphorical meanings through very automatic conceptual blending of motor action and generative animation [2]. This paper focuses on this embodied meaning-making process of a particular work of GVR*: Coding Landscapes, Crossing Metaphors*.

We newly introduce three different interaction mechanisms for this particular GVR work in order to compare the embodiment of metaphors in the user with the generative system. They include the conventional point-and-click mechanism, the emergent gesture-based touch-sensitive input, and a nostalgic keyboard input method featuring the classical command-line completion.

Through this study, we found that integrating embodied interaction ideas with cognitive semantics-based generative models can inform artists or designers promising ways of imbuing generative and interactive artworks with evocative and affective meanings, achieving a harmonic interplay of form and content.




*Screenshots of an embodied GVR work*

***References:***
[1] D. Fox Harrell and Kenny K. N. Chow, “Generative Visual Renku: Poetic Multimedia Semantics with the GRIOT System,” Hyperrhiz: New Media Cultures, Special Issue: Visionary Landscapes, 2009
[2] Kenny K. N. Chow and D. Fox Harrell, “Material-Based Imagination: Embodied Cognition in Animated Images,” Proceedings of the Digital Art and Culture 2009 Conference, 2009

***Contact:***
sdknchow@polyu.edu.hk

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# Embodying Generative Visual Renku: An Approach to Generating Metaphors through Interactions

**Kenny K. N. Chow, Ph.D.**
*School of Design, The Hong Kong Polytechnic University, Hong Kong, China*
*www.sd.polyu.edu.hk*
*e-mail: sdknchow @polyu.edu.hk*

**D. Fox Harrell, Ph.D.**
*Comparative Media Studies Program / Program in Writing and Humanistic Studies / Computer Science and Artificial Intelligence Lab, MIT, USA*

## Abstract

Generative Visual Renku (GVR) is a new form of computational visual art created by the authors. Inspired by linked verses in Japanese renku (renga) poetry, linguistic study of form and content of Chinese characters, and conceptual metaphor and blending theories from cognitive science, GVR works generate evocative compositions of graphical images through interaction between users and a computational art system. In our system, the user makes sense of interacting with animated images through conceptually blending motor input (e.g., walking fingers on a touchpad) with the animated image itself (e.g., a walking character on the screen). This paper focuses on the embodied meaning-making process regarding a particular work of GVR: *Coding Landscapes, Crossing Metaphors*.

We introduce three different interaction mechanisms for this particular GVR work. They include a conventional mouse-based point-and-click mechanism, gesture-based multi-touchpad input, and a keyboard input method featuring command-line completion. We have found that integrating embodied interaction with cognitive science-based models of concept generation can result in effective new ways for artists/designers to imbue traditionally formal generative and interactive artworks with evocative content-oriented and emotional meanings.

## 1. Introduction

The Generative Visual Renku (GVR) project, co-developed by the authors, presents a new form of generative and interactive visual art inspired by multiple areas of knowledge. The GVR concept and example works have been introduced elsewhere [1-3]. This paper describes the latest major extension of the project, namely new embodied user interaction mechanisms meant to support metaphorical meaning construction.

Traditional renku, or renga, is a type of Japanese linked poetry consisting of a series of links between topics from multiple poets [4, 5]. *Visual* renku, introduced by the GVR project, uses graphical images in place of written text and generates animated compositions dynamically as the user interacts with the system. It is interactive, accepting users' input (via the mouse, touchpad, or keyboard) and allowing users to

determine linking of subsequent imagery. It is also generative in that the subsequent imagery is dynamically and meaningfully composed using an analogical matching algorithm, which compute matches between graphical images based on both visual and conceptual similarity or difference. The algorithm was inherited from Harrell's earlier projects exploring semantics-based interaction for interactive narrative and discourse [6]. Semantics-based interaction here means that the meanings of content elements are represented formally and explicitly in the system using metadata, and user actions produce dynamic outcomes constrained by system designer-created rules. The GVR project consists of new code that extends this architecture to implement semantic-based interaction to guide visual composition of animated images.

The example work described in this paper, *Coding Landscapes, Crossing Metaphors*, demonstrates the visual-conceptual interplay described above. It displays iconic images representing two primary concepts, namely organic versus industrial/modular images, and allows users to traverse back and forth in rudimentary human figure forms. By selecting graphical images (we call them "topographic tiles" or just "tiles"), a user can see animated human figures walking across factories, parking lots, train stations, and occasional amusement parks as well as rivers, mountains, forests, and villages. Along the selected path, the human figures transform in response to places they visit, and the user may be reminded of personal experiences in cityscapes with repetitions of modular, industrial settings or of organic countryside environments, and hopefully of the way the two intertwine. The work marks the prevalence of modularity in our everyday lives, meanwhile reflecting our intermittent hopes for getaway. It provokes a broader metaphor that the landscape of contemporary life is a journey back and forth between rhythmic repetitions and surprising alternations.

Our system itself is built on a cognitive science foundation. The embodied cognition tradition in cognitive science states that human understanding of concepts is primarily built upon bodily experiences [7, 8]. Moreover, in the field of human-computer interaction (HCI) the embodied cognition perspective suggests that interactive systems should enable people to make meaning through engaged motor-based exchanges [9]. We have argued elsewhere that many interactive multimedia systems invoke imaginative meaning-making processes that involve both sensory perception and motor action. Interactions with these generative animation systems form motor-sensory loops that blend with everyday life experiences, engendering metaphorical understanding [10].

Exemplifying the idea above, we have designed and implemented three different interaction mechanisms for the GVR project. By comparing the respective metaphorical projections from user actions and percepts to concepts, we investigate how the coupling of system-generated animations and users' bodily actions helps users make rich emotional meanings through bodily engagement. This paper, after describing the artistic and theoretical framework of the project, focuses on describing and analyzing recent new interface mechanisms added to the system.

## 2. Artistic and Theoretical Framework

The GVR project draws upon an interdisciplinary artistic and theoretical framework, including traditions of collaborative (linked) poetry, the idea of embodied cognition from cognitive science, linguistic study of metaphorical meanings of Chinese character forms, and an embodied interaction approach to HCI.

### 2.1 The Art of Link and Shift

#### 2.1.1 Linked poetry

One of the defining characteristics of GVR is the linked structure inherited from traditional renku. Renku, a form of haiku with linked verses, is a type of collaborative literary work. It requires two or more poets to alternate in the creation of verses to form a complete poem. To compose a poem, renku poets have to create "links" between successive verses through describing similar objects, meanings, sounds, or even "scents," which means a consistency between mood or emotion. Meanwhile, "shifts" are used to avoid too much repetition of ideas or themes. The key is to balance between continuity and diversity. The poets' choices of words depend not only on individual aesthetic senses, but also the interaction with the words of other poets.

#### 2.1.2 Literary art

This kind of linked structures can be seen in other literary works. An illustrative example is Margaret Wise Brown's short bedtime story *The Runaway Bunny* (1942) [11]. The piece recounts an alternating conversation between a mother rabbit and her child bunny who wants to run away by imagining himself turning into a series of different creatures or objects. His mother cleverly deals his every twist by changing into another thing from which he cannot escape – reassuring the young bunny that she will always be there. For example, when the bunny escapes into the water as a fish, his mother changes into a fisherman. When the bunny jumps from water becoming a mountain, the mother transforms into a climber. In other words, every on of the bunny's twists is a shift and his mother's tactic is to construct a link.

#### 2.1.3 Animation

Similar approaches have also been employed by artists in other art forms like animation. The renowned animator Chuck Jones's experimental work *Duck Amuck* (1953) features linking-and-shifting. The cartoon character Daffy Duck is humiliated by the animator (i.e., the animated hand of Jones) who keeps changing the background imagery to render Daffy's outfits into mismatches with his environment. When Daffy dresses like a knight, Jones changes the background from castle to farmhouse. After Daffy changes into farmer garb, the panning background subtly transforms into an icy environment. Every time Daffy adapts to the setting Jones recreates a contrary setting, playing out as a succession of links and shifts.

These examples demonstrate a variety of link-and-shift traditions in both literary and visual arts. We find that such traditions are powerfully informative for generative approaches to interactive art, because they involve multiple participants in contributing to developing works that could continue forever if the rules strike a nuanced balance between similarity and contrast.

## 2.2 Cognitive Semantics

### 2.2.1 Metaphor, blending, and analogy

An influential theory in cognitive science, influenced by the embodied cognition perspective, is conceptual metaphor theory. George Lakoff, Mark Johnson, Mark Turner, and others have studied metaphors as mappings between domains and have shown that many basic metaphors are based on everyday motor-sensory life experiences [7, 12]. Gilles Fauconnier and Mark Turner have extended this framework in their conceptual blending theory, which describes how concepts are integrated both unconsciously in everyday life and in more complex thought such as in art and literature [13, 14]. Quite related to metaphor is the concept of analogy, in which the concept of one mental space is understood in terms of another. What allows for analogical inferences to be effectively made, it has been argued, is the structural similarity between the two spaces [15]. These approaches to imaginative association based on structural similarity constitute the theoretical grounding for algorithmically implementing the link and shift designs, as well as discourse structures, in the GVR project.

### 2.2.2 Metaphor-Icon link in Chinese characters

In [16], Masako Hiraga describes a significant relationship between C. S. Peirce's notion of iconicity from the field of semiotics and conceptual blending theory. She first reviews Peirce's well-known categorization of signs as icons, indexes, and symbols, and his further division of icons into images, diagrams, and metaphors, a trajectory moving from concrete perception to abstract conception. Imagic icons hinge on perceptual resemblance (e.g., the Chinese character "火", which means fire), and diagrammatic icons hinge upon other types of relationships between form and content (e.g., "木" means wood, two such characters arranged side by side "林" means forest). Metaphorical icons, one of most interest to Hiraga, involves image content and structural relationship to represent analogical meanings (e.g., "隻" single, depicting a hand holding one bird, an "雙" double, a hand holding two birds). Hiraga argues that the meaning-making process involved in understanding metaphorical icons can be explained by adding mappings of visual structure to conceptual blending.

Peirce's tripartitie notion of icon provides us with a powerful model for formalization of visual semantics of the graphic images in GVR. Moreover, the construction of metaphorical meanings based on both imagic and diagrammatic components has also proved inspirational for the graphical composition framework in the GVR project.

## 2.3 Embodied Interaction Approach to HCI

In interactive artworks, we believe metaphorical meaning can arise not only through verbal conceptualization or visual perception, but also through bodily interaction. This observation builds on Paul Dourish's notion of embodied interaction in HCI which in turn draws upon Martin Heidegger's idea of "being-in-the-world" from phenomenology. Dourish suggests creating interactive systems that make use of our "familiarity" with the everyday world, including practical experiences with physical objects and communication skills in social communities.

Dourish tends to concentrate on tools and practices, perhaps due to his grounding in Heidegger's ideas. In contrast, phenomenologist Maurice Merleau-Ponty emphasizes how our bodies become involved in everyday practices and turn abstract bodily actions like pointing or other gestures into habits. In the context of interacting with computers, users perform habitual actions such as double-clicking and automatically understand the corresponding meanings. We believe this notion can be extended from automatic conventional input to richer interaction mechanisms in expressive works.

### 2.4 Material-Based Imagination

Building on cognitive science and neuroscience hypotheses regarding embodied cognition, we have analyzed an array of interactive multimedia artifacts and argued elsewhere that cognitive coupling perception animated works and motor action in using interactive systems can provoke what we call "material-based imagination." This notion stands in stark contrast to the general notion of imagination as purely a mental activity without bodily experience [10]. When the system accepts motor input from the user and generates animated feedback, the user makes metaphorical meanings through very automatic conceptual blending of motor action and generative animation. We see this new development as a demonstration that centralizes bodily interaction in metaphorical meaning generation with respect to digital artworks and multimedia systems at large.

## 3. An Example of GVR: *Coding Landscapes, Crossing Metaphors*

The example work, *Coding Landscapes, Crossing Metaphors*, presents a type of GVR in which a poetic landscape is interactively co-created by the (author-designed) system and the user. The landscape is always composed of a series of modular graphic images depicting mundane locations. The arrangement of the tiles is meaningfully constrained by the structural (i.e., diagrammatic) properties along the edges. User input indicates where to add an adjacent to the map and the system adds subsequent tiles that are linked perceptually (i.e., imagically) or conceptually (i.e., metaphorically). The overall results is a map depicting the particular user's inclination toward either organic objects (natural or handcrafted) or industrial/modular artifacts (mass-produced or consumerist) that saturate much of everyday contemporary life in post-industrial societies. Animated human figures traverse the map and accumulate adaptations to the locations that they have journeyed through. Figure 1 below shows a screenshot of an instance of output of the work that has been co-created by a user with the system.

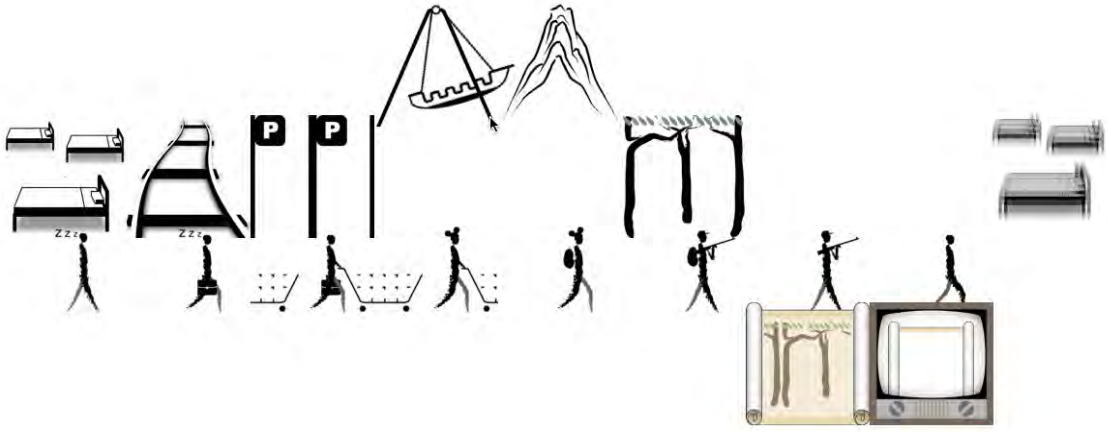

*Figure 1: A screenshot of* Coding Landscapes, Crossing Metaphors (a user has selected a number of tiles moving from left to right, the blurred tile at the far right indicates the next prospective tile to be added)

### 3.1 Coding Poetic Landscapes

This section describes the generative algorithms implemented in this work for autonomous and reactive animation phenomena, the rules applied in producing enduringly transformative personas, and the design of interaction mechanisms to enhance metaphorical understanding.

#### 3.1.1 Semantic annotation

The set of tiles (which keeps expanding) currently consists of sixteen tiles. Each tile is semantically annotated with metadata (in xml) indicating perceptual, conceptual, and structural qualities, following the Hiraga's (and thus Peirce's) theory mentioned above.

Perceptual Qualities of Tiles

Perceptual qualities include some basic visual attributes, including shape and pattern. For example, the forest tile "looks like" the parking lot tile because they both have a vertically-striped pattern (see Figure 2).

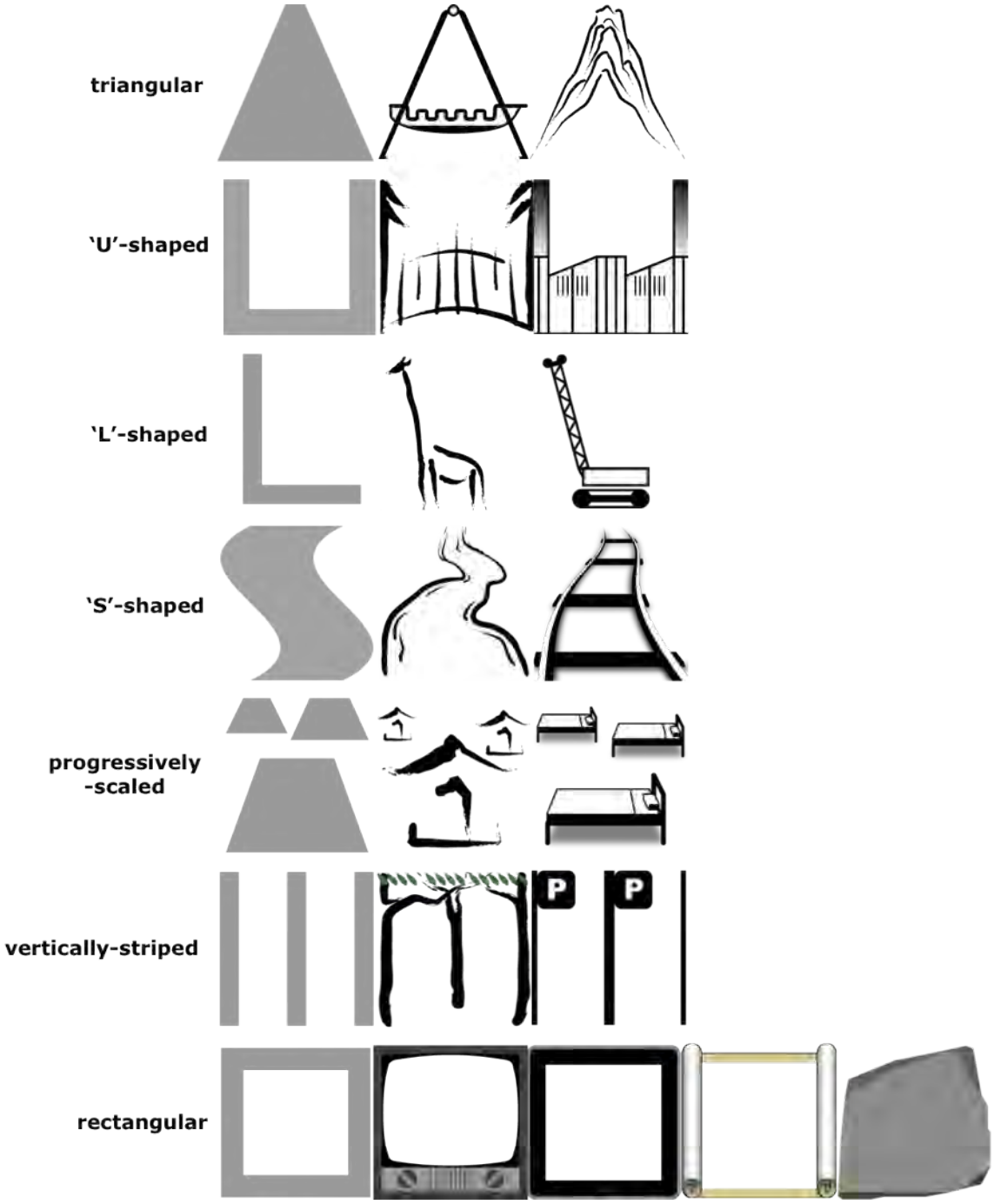


*Figure 2: A diagram showing visual attributes, including shape and pattern, of 16 topographical tiles*

Structural Qualities of Tiles

Structural qualities determine how tiles may or may not be composed. They implement a combination of cinematic and graphic design conventions. These conventions include shot distance and angle, figure/ground relationships, closed/open edges, and the like (see Figure 3). Composing tiles using these conventions helps to keep make sure that the resulting map is visually coherent.

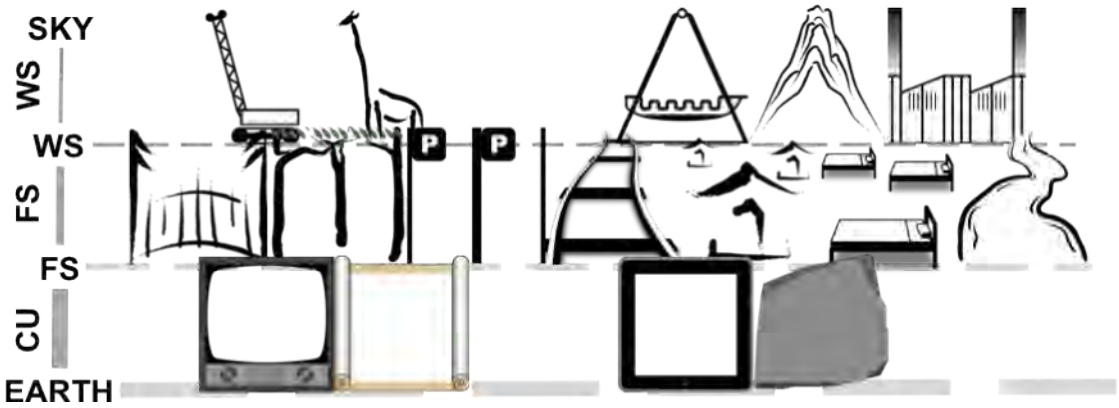


*Figure 3: A graph showing the edge qualities of the tiles in cinematographic convention: close-up (CU), full shot (FS), wide shot (WS), etc.*

Conceptual Qualities of Tiles

At the conceptual level, tiles are divided into two groups representing the dichotomy between organic (natural, handcrafted, and/or locally developed) and industrial/modular (mass-produced and/or standardized) objects described above. Tiles may also have finer-grained conceptual relations (see Figure 4 and 5). For instance, mountain, river, and forest all are related to the concept of nature. The handscroll painting and Rosetta stone are both historical artifacts. Such additional relations are secondary to the organic/modular dichotomy and provide a logical basis linking tiles as a user interacts with the system. Each tile has at least one counterpart featuring similar perceptual qualities, but different conceptual qualities, in order for them to have the potential to form visual links, but conceptual shifts in meaning (further discussed in the section on the "matching algorithm" below).

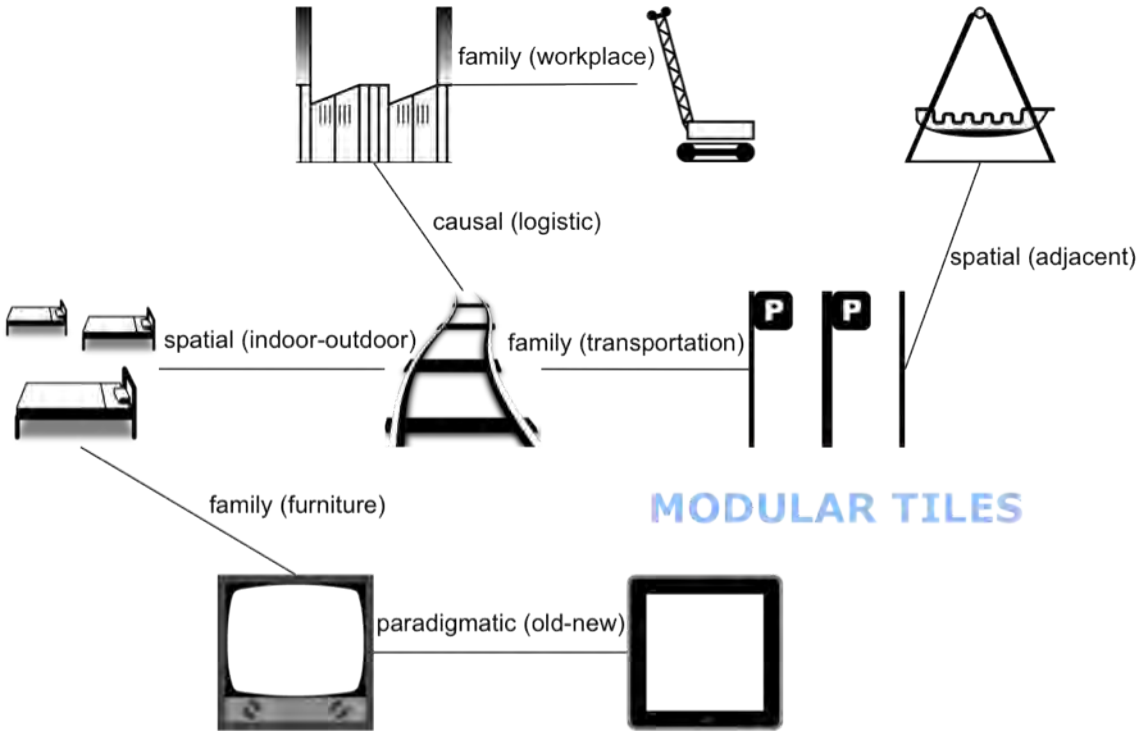

*Figure 4: A graph showing conceptual relations between modular tiles*

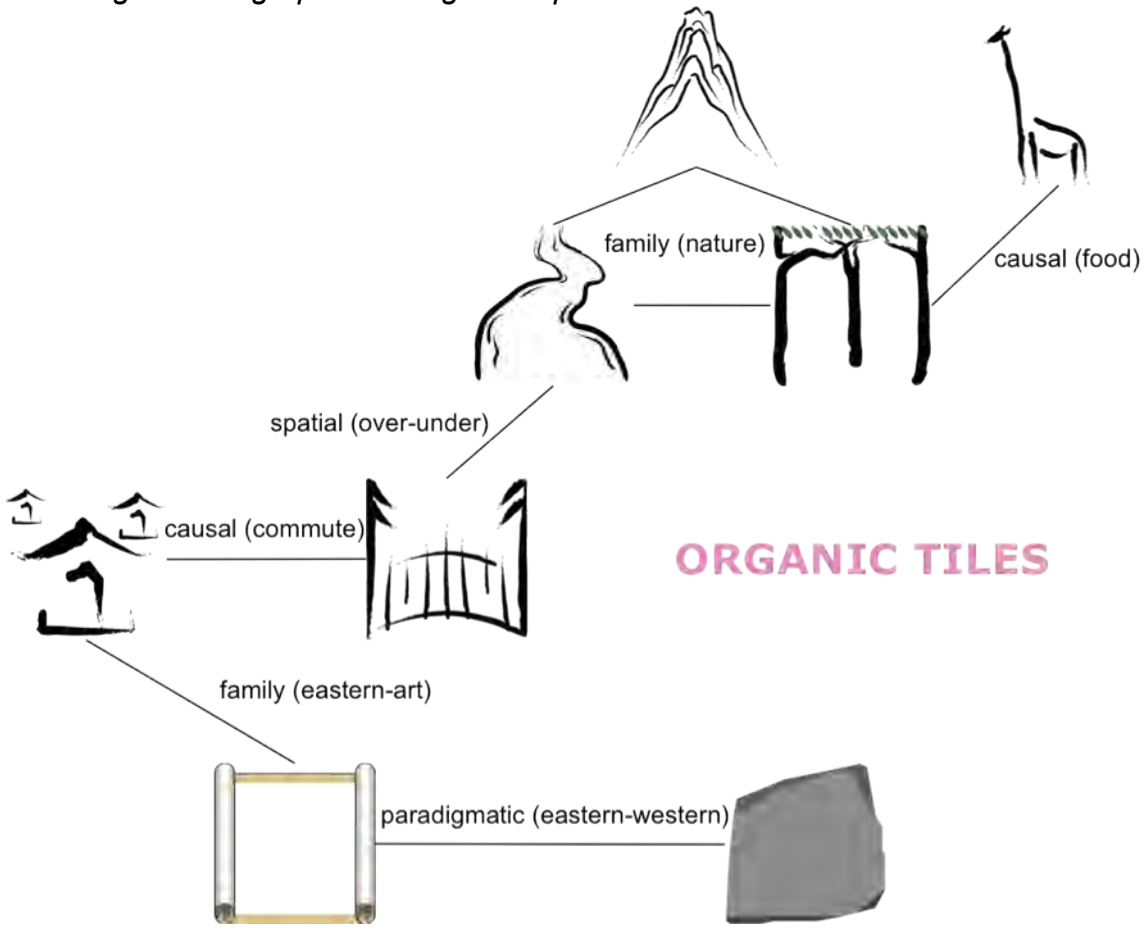


*Figure 5: A graph showing conceptual relations between organic tiles*

### 3.1.2 Matching algorithm and linked discourse

In conceptual metaphor, blending, and analogy theories cited above, concepts are projected from one mental space onto another. Building on these theories, and using Joseph Goguen's theory of algebraic semiotics to provide a method for formalization [17], Harrell first developed an algorithm for blending [18]. Extending insights gained from that project, Harrell further developed for the GVR project another algorithm to find analogous, or "matching," tiles based upon structural similarity between metadata descriptions of multimedia assets. A general description of the approach follows.

Tiles are put together consecutively. For each pasted tile, the set of possible subsequent tiles is determined using the matching algorithm, which first shortlists possible images based on the weighted structural qualities, and then computes how well each candidate matches the previous tile (based on a mathematical property called homomorphism). The degree of a match depends on some combination of the three qualities. The author can specify the relative weightings of the perceptual, structural, and conceptual aspects of images in computing a match. This enables authors to determine their own notions of what comprises a match.

In order to achieve the type of linking invoked in our example GVR work, we set the weightings of the perceptual to be negative, the conceptual to be positive, and the

structural to be zero. Hence, a link is a positive-degree match in which the two tiles belong to the same conceptual group (either modular or organic), but differ in shape and pattern. In contrast, a shift is a negative-degree match where the two tiles are contrasting conceptually, but similar perceptually. When a user has made too many links in selection, the system would forcefully suggest shifts by prioritizing negative weights. This rule ensures the balance of links and shifts in the interactive discourse of the work. In short, the juxtaposition (either linking or shifting) of tiles is always constrained by the structural qualities, which ensure a coherent composition, and perceptual and conceptual qualities, which are used to determine whether the juxtaposition is a link or a shift (see examples in Figure 6 and 7).

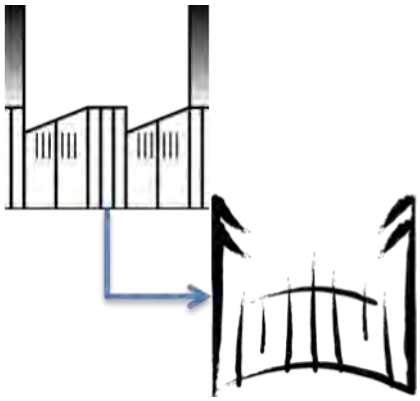

*Figure 6: A perceptual link (also conceptual shift) from factory to walkway, with a structural constraint from wide shot (WS) to full shot (FS)*

*Figure 7: A conceptual link (also perceptual shift) from mountain to river, with a structural constraint from wide shot (WS) to full shot (FS)*

### 3.2 Populating the Landscape

#### 3.2.1 Transformational rules

The generated landscape is also populated with context-sensitive human figures. These figures charge the output with more evocative metaphors as in traditional renku poetry. A figure walks across the landscape and transforms according to how one is naturalized in each environment based on appropriate, context-specific use or possession of artifacts. For example, a figure walking in the forest might pick up a shotgun. When entering the parking lot, the shotgun-man would be pick up a shopping cart, becoming a shopping-cart-shotgun-man. In other words, the figure

builds up a history represented by its artifacts. This type of transformation is combinatorial, because the artifacts are non-overlapping and can be combined with any image of the human figure carrying other artifacts. Transformation can occur in other ways, however. A special type of combinatorial relationship is a recursive one. In this type of relationship a graphical element may be nested inside of another one. Finally, we can also transform characters using procedural techniques such as distorting the image using a visual filter, altering the color, or performing a scaling, shearing, or rotating mathematical transformation. Figure 8 below depicts a chart of transformational rules for personas inhabiting the poetic landscape.

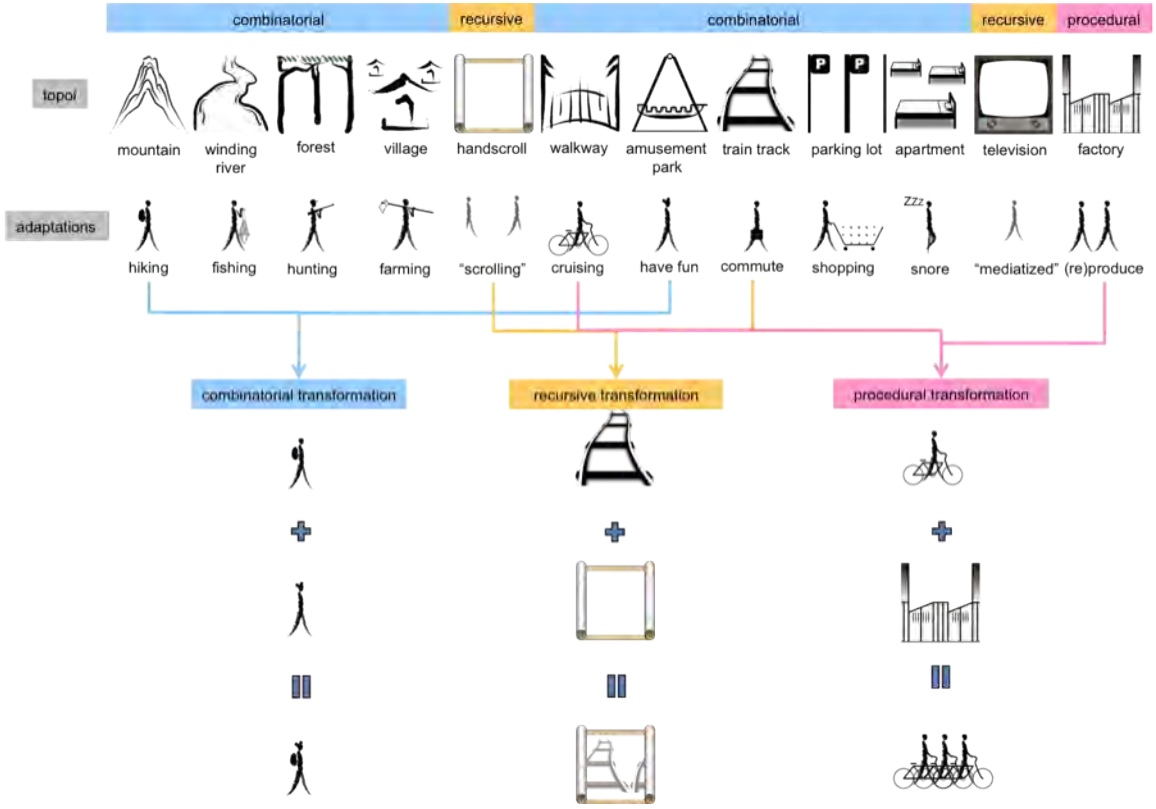


*Figure 8: Rules for transforming personas and some examples*

### 3.3 Crossing Metaphors through Interactions

#### 3.3.1 Interaction mechanisms

The earliest implementation of this example work accepts only simple mouse clicks as user interaction. When the mouse cursor moves to empty spaces adjacent to the tiles, the user is provided with possible subsequent tiles in different direction (left, right, up, or down) suggested by the system. The system waits for the user's click confirming which tiles is selected and that tile is added to the map.

The following subsections describe recent types of interaction added to the system. First, we added a shift-focus effect to the conventional point-and-click input mechanism to indicate which potential next tile the user is currently focusing on. Second, we implemented a gesture-based motion-sensitive input method using the touchpad. Third, we implemented a keyboard input method featuring command-line input. In the following discussion, we provide analyses of these different input mechanisms.

Shift-Focus Effect

As a step toward more embodied interaction, we added additional dimensions of motion-based input, namely feedback based upon relative mouse position instead of absolute position-based input. For example, potential next tiles are blurred with respect to how far the mouse pointer “moves” away from them. When the pointer moves closer to a particular potential tile, the tile would become sharper, imitating the shift-focus effect in cinematography. This simple interactive visual effect is motion sensitive because the degree of blurriness depends on the relative position of the pointer to the tile at any moment.

This motion-sensitive input-feedback mechanism demonstrates metaphorical meaning generation through bodily interaction at two levels. At the immediate level, the shift-focus visual effect automatically maps to the user’s sensorimotor experience of saccadic eye movement over the image. At a more abstract metaphorical level, further imaginative elaboration is inteneded to result in the idea of “decision-making in everyday life.” When the mouse pointer rests on a tile, the tile will be clearer than others, but still subtly floating until it is selected and settles into place. This mechanism is meant to invoke a sense of uncertainty because of a conventional experientially based metaphor: “unknown is up; known is down” [7]. Once the user clicks on a floating tile, it will be pinned down and confirmed, telling that the decision is irreversible.

Finger-Walking Input

Although the shift-focus effect provokes the imagination, the simple mouse click only means “confirm!” to the user. In contrast, the touchpad affords an array of finger movements that may replace the click. We can implement gesture recognition engines to accept various finger actions such as circling, rubbing, pinching, and more. Finger action is often natural, immediate, and automatic. People are used to various finger actions in everyday life. Here, we employ finger walking on the touchpad as a motor input (see Figure 9).

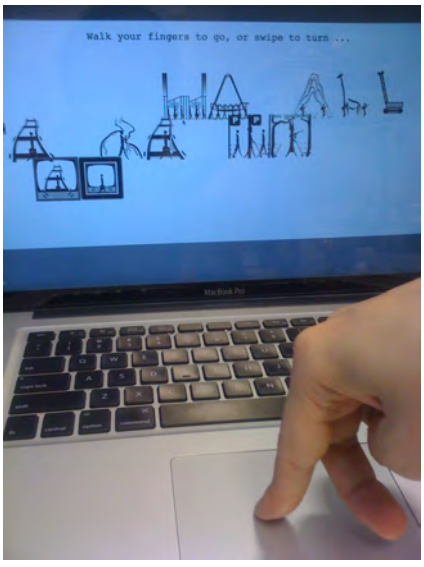


*Figure 9: A photograph showing a user walking fingers on the touchpad while interacting with the system*

Finger walking echoes the main theme, the basic “life is a journey” metaphor [7]. When a user walks her fingers on the touchpad, she sees human figures walking across the landscape. The specific motor input joins with the sensory output generated by the system to form a tight motor-sensory connection, which immediately embodies the user’s intention to traverse the landscape. One can control the finger-walking pace to affect the transforming figures’ traversing speeds. The human figures become the user’s avatar. Optional tiles still look blurred and floating, but they become clearer and clearer when the user continues finger walking. This interactive effect is intended to recall the experience of stepping into a path and peeking forward in order to have a clearer picture of the environment ahead. Building on the mouse-driven shift-focus effect, an optional tile will eventually be confirmed and the choice becomes irreversible. Before that, however, the user can always retreat and examine other possible directions by swiping on the touchpad. Further elaboration of this traversal experience results in new imaginative metaphor: “a landscape of multiple paths is a life full of determining choices.”

Keyboard Input

The third input method is a return from devices as the mouse and touchpad to the venerable keyboard. Here the user only needs to keep hitting different keys alternately in order to make those human figures walk (see Figure 10). It does not matter which key are hit. The interaction mechanism is similar to that of old-fashioned videogames relying on “button mashing,” though in this case all keys are valid. In fact, the user’s fingers can walk (or even run or dance) across keyboard just as the figure walks across the landscape. Optional tiles still become clearer when the user keeps moving her fingers on the keyboard. If she wants to retreat, this time she needs to press the tab key. Hitting tab again results in another optional tile. When the user keeps typing and hitting tab intermittently, the whole interaction becomes an elaboration of traditional command-line completion in computer coding.

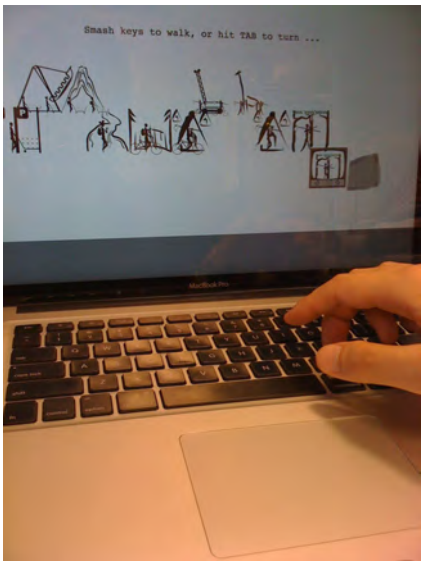


*Figure 10: A photograph showing a user’s “running” fingers on the keyboard while interacting with the system*

This design is intended to be evocative (perhaps even nostalgic) in two ways. First, textual input is still the prevalent input method for computer coding (visual

programming tools only exist in a limited scale). The keyboard input mechanism resonates with the first part of the work's title: "Coding Landscapes." When a user types on the keyboard and tiles pop up on the screen, she literally "codes" a landscape using our iconographic language. Second, command-line completion is a common feature of text-based user interfaces, which suggest relevant commands or filenames by automatically filling in partially typed texts. This feature has also been implemented in the integrated development environments (IDE) of many programming platforms. Often in such enironments, when a user/programmer hits the tab key, the system fills in another likely command name. Hitting tab consecutively results rotating between various command options. Our keyboard input mechanism resembles a coding environment and may provoke a user to consider nuanced relationships between computer coding and artistic creation.

## 4. Conclusion

In our GVR work, links and shifts across a poetic landscape, a metamorphosing human figure, and embodied interaction conjoin in a user's imagination. A figure with a shopping cart may walk across the boundary between a visually similar forest and parking lot. Fingers running across a keyboard or touchpad send that character into a sprint across amusement parks and rivers. It is our hope these experiences generatively reveal aspects of the landscape (intertwined natural and modular spaces, see Figure 11). The walking human figures are designed to evoke particular metaphors subjectively important to us as artists, critically evoking how human social identities transform with subtle traces of memories and artifacts from places traversed and left behind. We intend that the interaction mechanisms implemented might further engage users in an emotionally charged and enduring motor-sensory feedback loop mobilized by our generative visual poetry system.


*Figure 11: A screenshot showing a transformative persona crossing two topoi*

The GVR project attempts to extend form-dominant generative approaches in contemporary art to incorporate emotional meanings and evocative content. The sequentially connected structure and the multitude of emotion-laden topics in renku poetry make it a good candidate to serve as a departure point for our research inquiry. When designing generative rules and interaction mechanisms for this generative renku work, we found that integrating embodied interaction ideas with cognitive semantics-based generative models help tighten the connection between form and content. On one hand, contemplating the relationship between system-generated animation and user motor action directs our attention toward formal presentation and interaction. On the other hand, analyzing multiple levels of imaginative metaphorical understanding of our system points us toward a focus on

content. The two sides converge when we examine how the artifact enables a very tight loop between user motor input and imaginative elaboration. We believe our approach can inform system authors or designers seeking new ways to imbue interactive generative visual artworks with expressive metaphorical and emotional meanings. In this type of work (described by Harrell as “phantasmal media”) [19], content emerges from form, and form hinges on content.

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[2] Kenny K. N. Chow and D. Fox Harrell, “Material-Based Imagination: Embodied Cognition in Animated Images,” Proceedings of the Digital Art and Culture 2009 Conference, 2009