Cultural Computing: ZENetic Computer

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Abstract

We offer Cultural Computing as a method for cultural translation that uses scientific methods to represent the essential aspects of culture. Including images that heretofore have not been the focus of computing, such as images of Eastern thought and Buddhism, and the sansui paintings, poetry and kimono that evoke these images, we projected the style of communication developed by Zen schools over hundreds of years into a world for the user to explore - a somewhat exotic Eastern sansui world. Through encounters with Zen koans and haiku poetry, the user is constantly and sharply forced to confirm the whereabouts of his or her self-consciousness. However, there is no "right answer" to be found anywhere.

Key words: cultural computing, emerging technology, education, Entertainment Computing, Art

1. Introduction

There are many different nations throughout the world, each with different customs and cultures. Normally, one can see and learn about these cultures through such media as books and museums. However, for example, do you think you would develop an interest in Japanese culture and be able to understand it simply by viewing a collection of Japanese paintings in a dim room at the Boston Museum of Fine Arts? How would it be if, with the guidance of an interactive computer system, a viewer were able to create his or her own Japanese ink painting, enter the painting and travel through it? Many people would be able to go beyond their age and nationality and have a truly meaningful experience.

Culture is not only about knowledge; its essence is the understanding gained through individual experience and education. The conventional relationship between culture and computers has been to record slowing decaying traditional culture, or to restore or recreate a culture via simulations in order to communicate it to future generations. So, watching the development of technology, we discovered the possibility of being able to compute the essential aspects of a culture. Similar research projects have involved proving the validity of traditional cultures scientifically, but with our “cultural computing,” we go beyond proofs to represent the various basic expressions of a culture via scientific methods, and offer an interactive system that allows one to enjoy learning and understanding a culture through personal experience.

As a first step toward that goal, we chose the sansui Zen culture of Japan, developed a system based on this theme and found opportunities to present this system at international conferences and the Zen temple Kodai-ji in Kyoto, Japan.

2. The Concept of ZENetic Computer

The user builds a three-dimensional sansui ink painting on the display using an intuitive and user-friendly interface, thus creating their own imaginary space. These images reflect the concepts of the natural and philosophical worlds, and they show us a dramatic scene completely different from our every-day life. These experiences send a wake-up call to our everyday consciousness and probe our unconscious imagination. While processing the user’s state of consciousness based on his or her sansui ink painting design, the system produces a story appropriate to the user and draws them into this new imaginary world. Furthermore, there are tricks set in the stories to shake the user’s state of mind. This story is not like the complete stories found in movies or novels, but rather it is a collection of short fragmental stories.

A user who experiences these disconnected fragmental stories, while perhaps experiencing a certain lack of balance, holds an unconscious desire to draw these fragments together into a complete story. With these fragmental stories, the system communicates with the user using Zen dialogues and haiku poetry in an allegorical sense. Through being asked questions to which there are no answers, a user may feel some sense of anger, but on some subconscious level he or she is trying hard to answer these questions.

Based on these kinds of unconscious workings, users connect the separate stories and try to develop a complete story on their own. In response to the various images and questions posed by the system, users respond with a virtual brush, the rake of a rock garden, the images on the screen, or by clapping their hands. Through a combination of the unconscious desire to connect the story fragments and the user interface, the distance between our everyday self and our true, inner self is shortened. In the process of bringing these two selves together, “ma” interaction plays an important role.

"Ma" is a Japanese concept that assigns a very high value to the moment and place in which a personal experience occurs. In the final scene, users meet with a bull, which is used in Zen as a metaphor for expressing one's true self. Through this conversation, users can experience the birth of self-awareness brought about through the unification of one's everyday self and one's unconscious self.

Figure 1: ZENetic Computer @ SIGGRAPH Emerging Technologies

3. Technology Used in the System

The key technologies used in implementing this system are as follows:

(1) The three-dimensional sansui ink painting engine allows users to create an imaginary sansui world that they themselves can enter and explore.

(2) The neural network engine recognizes the user's hidden self through the process of building a sansui ink painting. The engine then divides the user's personality into one of five categories based on Buddhist "goun" thought.

(3) The dynamic chaos engine, using the above personality category output and the user's actions as a base, generates contents and a story suited to each user.

3.1 Process of Interaction

The system processes the interaction with the user in the following manner:

(1) The user places icons based on symbolic images and builds a three-dimensional virtual world using sansui ink painting.

(2) The system recognizes the user's hidden personality and places it into one of the five goun categories.

(3) The user enters into the sansui world and the story begins. The haiku poetry which the user meets in the sansui world guides the user toward the various fragmental stories.

(4) Within each interaction, the user's goun state changes based on the interaction between the chaos engine and the user's interaction result.

(5) Depending on the user's changing goun state from (4), the user experiences an appropriate Zen dialogue.

(6) The system expresses the user's goun history from (2) through (5) through kimono designs of the Yuzen brand. (The kimono designs change depending on the user's interaction history.)

(7) Finally, the user experiences an original version of the Ten Bulls Story and views a flashback of their goun interaction history.

3.2 Three-dimensional Sansui Painting System

We divided the main elements used in sansui ink painting into 12 symbols (rock, mountain, moon, traveler, bridge, bird, tree, house, flower, wise man, cloud and water), turned them into hieroglyphic icons and placed them in the upper area of the display as seen in Figure 2.

The perspective in our three dimensional sansui painting is based on the unique San-en system used in traditional sansui ink painting. (Kou-en is distant, as though one is looking up at the objects, Hei-en is a parallel, straight-on view, and Shin-en is closer, as though one is looking down at the objects.) We represent the San-en perspectives in three-dimensional coordinates, deciding the position within three-dimensional space based on where the user places the icons. The sansui painting space also shows the time of day, changing the scenery as the day passes from morning to evening.

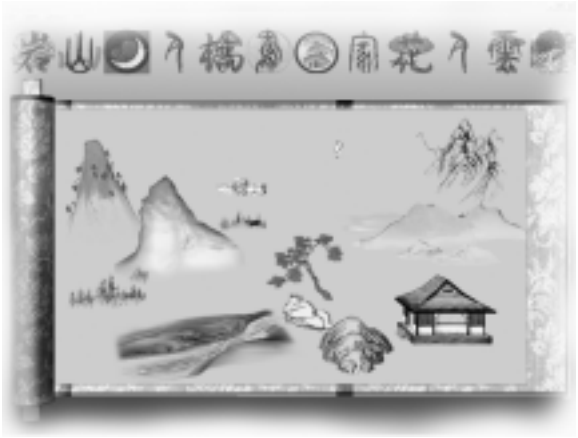

Figure 2: An example of a user's sansui painting

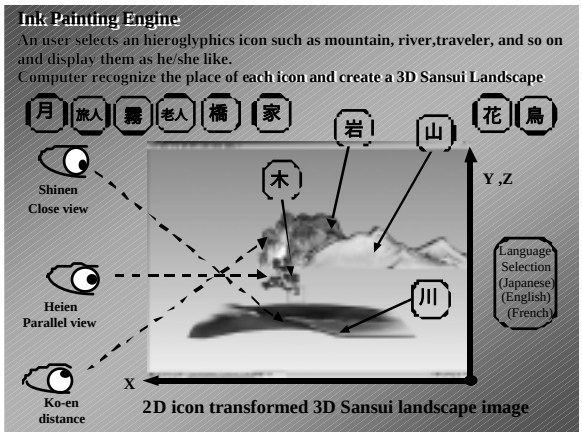

Figure 3: The San-en method of sansui painting

By watching the process by which the user builds his or her preferred sansui painting, the system uses a neural network to classify the users' individual personality. A user's personality then corresponds to a position within the goun space. Goun is a Buddist way of thought that says that the world is made up of five basic physical and mental elements. We use this system of thought as a basic for personality classification. The five personality categories that make up goun are as follows:

色 (Shiki) How nature and materials actually exist
受 (Jyu) Intuitive impression
想 (Sou) Perceived image
行 (Gyou) Process of mind that activates behavior
識 (Shiki) Deep mental process behind all of the above processes

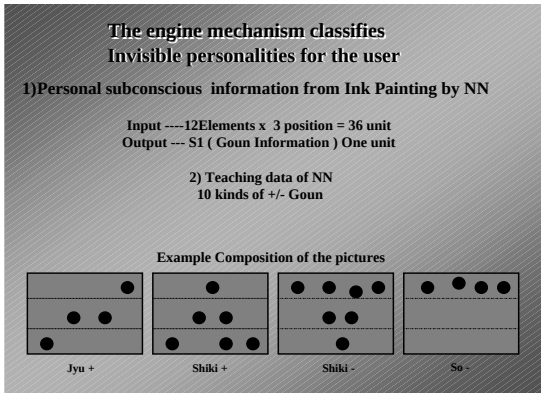

Figure 4: Determining a user's personality from the composition of their painting

In addition to the composition of the sansui ink painting, data related to the user is taken from the interaction between the user and the system and included in the calculation of the user's goun personality. Depending on the user's response to the various stories, the pseudo personality and the user's hidden personality may sometimes diverge. This difference is then reflected in the content of the story created by the chaos engine.

3.3 Story Context from Symbols and Allegories

The story's context is determined by the icons the user chooses. The user then enters the sansui space, which represents his or her inner state of mind, and, using the rock garden interface (Figure 5), travels through the Zen world. By approaching symbols contained within this space, the symbols framed by the display link together, and the story fragments are output as haiku or Zen dialogues. (See Figure 6)

Figure 5: Rock Garden Interface

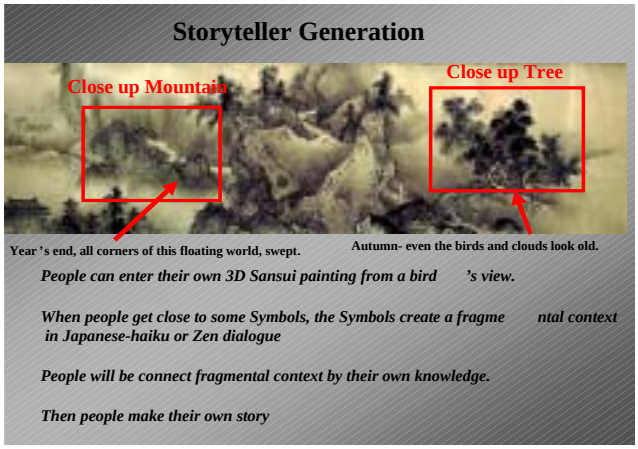

Figure 6: Framing for Haiku Generation

3.4 Story Generated by the Chaos Engine

A dynamic chaos engine, based on the difference between the user's pseudo personality and their hidden personality, has the role of generating a high-dimensional context and story.

The chaos engine consists of three dynamic components, which we call agents. The three agents are called User, Target and Master. The agents act based on internal chaotic dynamics and move around in goun space. Through the integration of the agents' motion within the goun space, interplay between the different agents is encouraged and a synchronization based on their internal dynamics develops. The three agents are coupled so that

there is an interplay between their motions in the goun space and the synchronization of their internal dynamics. The transient dynamics of the chaos engine are sampled and used to create the sounds and images experienced by the user, and also to control the evolution of the story. (See Figure 7)

Figure 7: Zen Dialogue "Daruma Anjin" Interaction

In the chaos engine used in the current implementation of ZENetic Computer, the User Agent corresponds to the user's pseudo personality (Personality 1) as determined from the previous fragmental stories. The Target Agent corresponds to the momentary view of the user's pseudo personality (Personality 2) obtained from the latest user interaction.

The User agent starts at the position of Personality 1 and tries to approach the position of Personality 2. The User agent is coupled to the Target via the Master in such away that if there is no interference from the Master, the User tends to synchronize to the Target and move toward the Target position, so that the User and Target become identical. On the other hand, if there is interference from the Master, it is more difficult for the User to synchronize with the Target, and so less likely that the User will reach the Target.

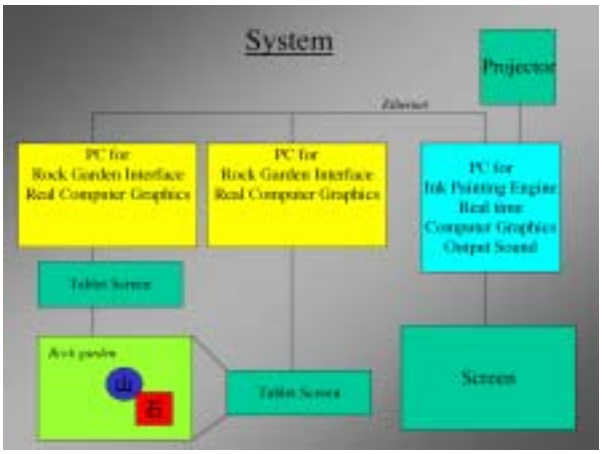

Figure 8: Hardware System

4. Conclusion

The realization of real-time interaction between individual users' conscious and unconscious and computers has long been a dream in the field of computer science. One can say that the field of interactive storytelling is at the forefront of research trying to bring about this dream. In adopting a chaotic engine, the system we built aims at realizing a dynamic interaction that brings together a user's conscious and unconscious aspects. In response to questions posed to the people who have experienced ZENetic Computer, most people say that it was a relaxing and mentally awakening experience unlike anything they had experienced. Future work will focus on scientific analysis based on the user's interaction history, such as looking at which point in the interaction a psychological change occurred or became more active, and analyzing the cultural differences as well as universal similarities in users' sansui ink paintings.

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