Utopia : A Borderless Digital Interactive Narrative

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"Utopia" is a depiction of an imaginary neighborhood, a place with no borders and boundaries, where all its residents are living in it happily and peacefully together. In this digital painting, visual indicators such as a character looking into a distance, etc. are designed to navigate the audience. The visual indicators encourage the audience to explore the painting. For the realization of the borderless digital painting, we developed an application for PC using Unity, an eye tracking camera and speakers. The application uses a camera in Unity and a square or rectangular two-dimensional image designed for our purpose (such as the mentioned painting of the neighborhood). When a user watches the painting freely, the image is scrolled without interruption depending on the viewer's eye direction. Each character in the painting has short animated moves, along with the sound effects which broadcast as the user's eye approaches.

1. Concept and Background

Utopia (/juːˈtəʊpɪə/):" An imagined place or state of things in which everything is perfect".

This artwork is a depiction of an imaginary neighborhood, a place with no borders and boundaries, where all its residents are living in it together happily and peacefully. Here no individual is superior to another and the land is free of hunters and hunts. All the residents depicted in this digital painting which is shown in a thin monitor are living the best moment of their life eternally, and the place is showing off its most beautiful state to the audience with faint sounds of everyday life. The idea of a world free of boundaries and discrimination was one of the main motivations for the artist of this work as an immigrant.

Although Negar Kaghazchi tries to portray a universal image of a neighborhood and its residents, the obvious utilization of oriental motifs and applying the perspectives similar to what can be observed in Persian paintings in the composition is prominent. While the old-style buildings with geometric shapes are staying strong in multiple parts of the layout, people, animals, and objects are flowing with organic shapes and depicting an apparent contemporary environment.

Furthermore, the structure of the system for a borderless experience is inspired by Japanese handscroll paintings ("Emakimono"). Emakimono is a horizontal handscroll painting, which is read by opening it to arm's length from right to left. It is composed of a series of scenes in which the artists had used visual cues in illustrating the scenes for storytelling purpose. Emakimono is created by joining together several sheets of paper and varies in size, with an average size of 30 centimeters in width and 9 ~12 meters in length.

2. System for *Utopia*

For the realization of the borderless digital interactive narrative, we implemented an Eye-tracking technology using Tobii Eye Tracker 4C camera, attached to a PC monitor. The application was developed with Unity.

The application uses a camera in Unity and two-dimensional images designed for our purpose. Using the interfaces, when the user looks to the screen, the image will continue to be shown without interruption depending on the viewer's eye direction. The required operation for the interfaces is moving, zoom-up, zoom-out.

For the PC with the Tobii eye-tracking camera, the movement on the screen image is implemented by tracking the user's eye movements. Zoom-in operation is implemented by gazing at any point in the screen and the zoom-out is by averting from the gaze point.

The navigation on the content is achieved through following the natural visual and audial references. To avoid any inconvenient edge or borderline while appreciating the content, we realized a natural loop that the viewer's gaze can move to any angles and can return to the point where it was originally seen in the painting without facing any borderline. All characters in the painting have short animated moves, along with the sound effects which broadcast as the user approaches.

Sound output is controlled according to the distance of camera and the zoom state. First, the system calculates the distances between the camera origin and the point at which the volume of each sounds are maximized (sound coordinate). Considering the looping nature of our content, we calculated distances in 9 directions for each sound coordinate (figure 1). And set the distances as the parameters to control volume of each sounds.

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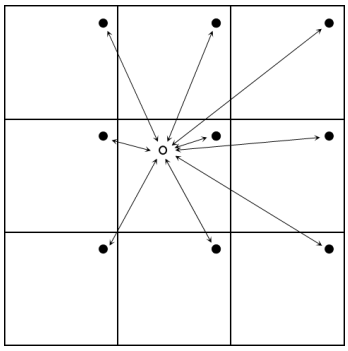

Figure 1：Calculating the distances（white circle: camera origin, black circle: sound source coordinates.）

The volumes of each sound source are controlled by the distances and zoom state. In addition, using eye tracking as an interface, the volumes are also controlled by the gaze of the viewer. The fluctuation of volume obeys Gaussian function. Maximum volumes, minimum volumes, diffusions are set for each sound. These diffusions are controlled by zoom state too.

We used a low-pass filter for all sounds. The cutoff frequencies are controlled by the distances and zoom state.

Our method for “borderless” painting was developed using a single two-dimensional image and a fixed-position camera in Unity instead of a method of laying out the same images in tiles and moving the camera in parallel to the image surface. This method controls the camera angle using matrixes and realizes a natural loop that a user can return to the point where it was originally seen.

3. *Utopia* : A Borderless Digital Interactive Narrative

Our system’s capability of providing a borderless environment allows the audience to experience personally the concept of a borderless digital interactive narrative of *Utopia*.

Figure 2：Detail of *Utopia* (Illustration by N.Kaghazchi)

The digital painting was created using the Procreate app, Apple Pencil and Adobe Creative Suites. The technique is a digital equivalent of colored pencils and the colors selected for the work are earthy and mostly in warm tones. The ambiance and lights and shadows are depicting a pleasant afternoon at the beginning of autumn.

Figure 3：Experiment of *Utopia* using an eye tracking camera and speakers

References:

[1] Kaghazchi N., Yoshii A., Kodama S., Kaneko M. (2017), Development and Evaluation of an Digital picture book System Using Multi-Directional Scrolling and Illustrations with Gaze-guidance, HCI International, Posters’ Extended Abstracts Proceedings Part II, pp.561-568, Springer International Publishing.