In Between: Media Artwork that Uses Stroboscopic Effects

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Abstract

This study reinterprets the experimental and formative expression of futurism using stereoscopic images with stroboscopic effects. In general, a variety of technologies are used for Media art in the production stage and the exhibition stage. Through stereoscopic technology, three-dimensional images are taken by two cameras and the video is displayed using a 3D projector. The stroboscopic effect is generated by calculating the mean of RGB values for the front and back images using image processing technology. Our artwork expresses the meaning of time by visualizing the lifetime of flowers on video and explores the ambiguity between reality and illusion through a painting of real flowers.

Keywords: Media Art, Futurism, Stereoscopic Technology, Stroboscopic Effect.

1. Introduction

Futurism, which pursued a scientific worldview, attempted the visual expression of common phenomena within an industrial-social context. Paintings or sculptures prior to futurism described scenes in the “moment”, but works possessing temporality began to appear through the influence of futurism, which considered the expression of motion an important formative element.

This relationship between motion, time and space is explored in Bergson’s concept of ‘duration’, which outlines in sharp detail the ambiguity caused by gaps that emerge in the human experience of the real and the illusory [1][2].

Etienne Jules Marey created the instrument for recording multiple photographic exposures on a single image as shown in Figure 1(a). He traced the relationship between time and space, capturing the fact that this is the essence of motion [3]. As shown in Figure 1(b), Eadweard Muybridge created a series of motion photographs to display a horse in motion using multiple cameras for observations of high-speed activity [4]. Futurist painters who were interested in the visual expression of motion naturally took interest in these photographic techniques.

Time-lapse photographs capture the movement of objects in a photograph by taking still photographs for a specific length of time at fixed intervals or through multiple exposures. This approach is an attempt to understand and express the movement of objects.

Figure 1. (a) Etienne Jules Marey’s ‘Gehen 1883’, (b) Eadweard Muybridge’s ‘The horse in motion’
Futurist painters observed the movements of objects and expressed their motion and speed on canvas. In his painting ‘Girl Running on a Balcony’, Giacoma Balla expressed the directional movement of a girl walking on a balcony using stroboscopic-like effect [5]. Balla's image is composed as if it were produced by a stationary camera. Marcel Duchamp’s ‘Nude Descending a Staircase, No.2’ combined photography and art in response to the dynamic works of futurist artists with scenes mimicking high-speed photography. The superposition of cubist figures evokes the perception of descent. Luigi Russolo produced a superimposition of six or seven blue images of a woman walking and turning in 'Plastic synthesis of Movements of a Woman' [6].

![Image of artworks](image)

**Figure 2.** (a) Giacoma Balla's 'Girl Running on a Balcony', (b) Marcel Ducham's 'Nude Descending a Staircase, No. 2', (c) Luigi Russolo's 'Plastic Synthesis of Movements of a Woman'

2. Stereoscopic photography

The basic principle of stereoscopic images is that viewers experience an illusion of perspective because of how the image uses binocular disparity. Visual systems infer depth from positional differences between the two retinal projections of a given point in space [7]. This positional difference results from the fact that two eyes are laterally separated, as shown in Figure 3(a).

In order to photograph stereoscopic images, cameras are fixed at positions corresponding, respectively, to the left and right eyes. As shown in Figure 3(b), two digital cameras mounted with lenses of same focal length were fixed on a parallel rig. A 3D projector of the DLP-Link type and shutter glasses are used. The left and right images were played using a stereoscopic player.

![Diagram of binocular projection](image)

**Figure 3.** (a) The geometry of binocular projection and definition of binocular disparity, (b) Stereoscopic photography with two cameras.
The method for photographing long exposure images is to adjust the camera’s specially designed aperture and exposure times. However, it is difficult to build special equipment and predict exposures to accurately capture the withering process of flowers. We performed time-lapsed photography at fixed time intervals and re-created the images using stroboscopic effects with existing images. Two cameras were connected to a PC to take stereoscopic images and the exposure settings and time-lapsed photography were controlled using a Nikon Camera Control Pro. This process occurred over many days. Continuous lighting was used for uniform exposure and the left and right photographic images were saved to the PC.

![Figure 4](image1.png)

**Figure 4.** (a) painting of wall, (b) real flowers, (c) painted flowers

These are real flowers, a vase, a table and the wall in a style that mimics brushwork in a traditional painting (Figure 4). The painted scene appears to be a flat painting, through the lenses of the cameras, and serial images are obtained through approximately one week's time lapse at a rate of one frame per 3 minutes using two cameras as shown in Figure 5.

![Figure 5](image2.png)

**Figure 5.** Serial images taken over about one week

3. Time Visualization

The images obtained were compressed into a photograph showing the effects of long exposure through post-processing using the Visual C++ program. The program obtains the values of RGB colors extracted from each of the serially photographed images, calculates the means of the values using equation (1), and then produces single images with the stroboscopic effect as shown in Figure 6. Various long exposure images were generated by changing the position and number of serially photographed source images [8][9].
To create a video with stroboscopic effects, the method described above was used. If a video has \( n \) frames, we calculated new images for each frame using the equation detailed here (2). A range of stroboscopic effects can be adjusted by setting the value of \( c \) and \( d \). The color image is slowly changing to gray, representing death.

\[
R_{\text{new}}(x,y) = \frac{1}{n} \sum_{i=1}^{n} R_i(x,y), \quad G_{\text{new}}(x,y) = \frac{1}{n} \sum_{i=1}^{n} G_i(x,y), \quad B_{\text{new}}(x,y) = \frac{1}{n} \sum_{i=1}^{n} B_i(x,y) \quad (n: \text{image number})
\]

(1)

\[
R_{\text{new}}(i)(x,y) = \frac{a}{c + d + 1}, \quad G_{\text{new}}(i)(x,y) = \frac{a}{c + d + 1}, \quad B_{\text{new}}(i)(x,y) = \frac{a}{c + d + 1} \quad (n: \text{image number})
\]

(2)

\[
\begin{align*}
& \text{if } i - t > 1: a = i - t, c = a \\
& \text{if } i - t < 1: a = 1, c = i - 1 \\
& \text{if } i + t > n: b = n, d = n - i \\
& \text{if } i + t < n: b = i + t, d = b
\end{align*}
\]

4. Conclusions

‘Between’ was created to reveal the flow of time by compressing multiple flower images into a single image and producing video by sequentially connecting post-processed images. The softness of stroboscopic images can be understood as a representation of the flow of time. This artwork is an analogy for the span of human lifetimes that contain both beautiful and troubled times, and which ultimately end in death. Physical time is always the same but time perceived by actual people is felt differently, according to differing situations. For example, a beautiful and joyful time seems to pass quickly, while a difficult time can seem to flow very slowly. Although time flows at the same speed,
consciousness experiences time as waves of differing “densities”. We attempted to express these waves with stroboscopic images using different intensities by changing the ranges of compressed images.

Audiences believe the flowers, and the afterimage of their withering, are realistic. However, they also believe the image is a painting because we have also painted living flowers. The process of flowers withering appears experientially as a single painting in the process of moving. It is one image, but an image which changes over time. It is not a video, however; it is a stable image which changes over time, representing the uniquely human experience of mortal life, which is the same time both one and stable and yet always in a state of motion and change.

Stereoscopic technology offers viewers the chance to reinterpret the world around them and opens the door to new expressions of self-conception, emotions and definitions of time and space.

Reality and illusion always have deeply-felt ambiguities, ultimately dependent upon what viewers think, see and feel. This work shows how time relates to human experience and, as characterized by Bergson, how this experience relates to memories and our many states of consciousness, and ultimately how this all helps to define our experience of the human condition.

Figure 8. Exhibition at the ‘Adios Media Art 2012’ exhibition at Geumnarae art hall.

5. References