ACROSS-DISCIPLINE CREATIVITY BY INTEGRATING VISUAL TECHNOLOGY AND DANCE PERFORMANCES

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ABSTRACT

The aim of this study was to investigate the outcomes and benefits of integrating digital visual technology into the field of performing arts. In this study, an integration mechanism for dance and digital visual effect technology was proposed, which not only can enforce the performance effects, but can also decrease the cost of the performance. For technical parts, we demonstrated a mechanism for the compression of videos and special visual effects for smooth playing the visual screens. In addition, a solution was proposed to deal with the difficulties of creating a performance, such as including body movement and synchronization of the digital visualization on screen. By doing so, more ideas for creation can be delivered. In addition, some issues concerning bringing new experience to audiences were also been discussed in this paper.

Keywords: digital art, visual effect, performing art

Introduction

The use of visual art adds a new aspect to a piece of work, and not the final form of the creation (Wands, 2007). The final form of a modern, digital production could in fact be traditional. In other words, artists integrate it with a traditional art form to develop a new mode of creating art. Digital technology is used in the fields of photography, sculpture, installation, videos, film, music, games and art performance (Hsia, Huang, & Hwang, 2012; Hwang, Yang, & Wang, 2013; Reed, & Phillips, 2013). In this way, new techniques of digital painting, digital photography, digital sculpture, digital installation, digital animation, digital video, and digital music have been developed (Pérez & Sánchez, 2013). Because of the development and the
progression of the technology, people now have diverse ways to present their artworks. Many artists and researchers have discussed the technology which can be used in art performances. In addition to dance movements, artists also use the lights on the stage to create visual effects for art performances (Heitlinger & Bryan-Kinns, 2013; Seif El-Nasr & Vasilakos, 2006). One of the most popular ways is to project virtual images or animations on the backdrop of the stage (Crow & Csuri, 1985; Herbison-Evans, 1991). Thus, this study created a type of visual effect by synchronizing the music codes and the animation, developing a vivid art performance environment.

Through utilizing technology, artists can create better traditional artworks (Lin, Hsieh, Liu, & Chuang, 2012; Hsieh, Lin, & Wang, 2011). However, the technology used for artworks is not as convenient as one may think. There are many technical problems which must be solved when we integrate them into our artworks. If we focus on the recreational quality of the performance, we may ignore the skills or the study of the technology. This results in merely mediocre artworks (Meador, Rogers, O’Neal, Kurt, & Cunningham, 2004).

For this reason, our study explored the process of creating an artwork and the working experience of the artists from different fields, including the elements used by the choreographer to integrate visual effects with dance movements by employing the techniques of Post-video editing and Trapcode to create visual effects matching the music. In addition to introducing the adopted technologies and process of the performance, we discuss the framework of the performance and provide some suggestions for artworks in the future.

** Relevant Research**

A digital artwork is a kind of production that combines technology with artistry, so the composers should not only be adept in art but also be good at utilizing the digital technology. They also need to communicate with experts from different fields in order to exploit the new techniques (Fong, 2009). Many digital artists and composers cooperate to develop new looks for the performing arts. There are also many composers, choreographers, dancers, and researchers discussing the use of technology in dance and theatre (Yang, Yu, Wu, Diankov, & Bajscey, 2006; Latulipe & Huskey, 2008; Burg & Luttringhaus, 2006; Jung et al., 2011). We do not intend to describe all the work that has been done in the realms of academic research, installations, or interactive productions here. However, we would like to discuss some examples that have influenced our work. Discussing these examples will help situate our work, and uncover its uniqueness and its purpose in extending the current work and techniques.
In 1849, the German musician, Richard Wagner wrote the “Gesamtkunstwer,” translated as: “A total work of art,” provided a similar concept as that mentioned above. It indicated that by integrating performance with music, songs, poems, visual art, writing, and scenarios could break the limitation of art. Every artist or composer wants to make a perfect artwork that could inspire all kinds of sense of people (Koss, 2010).

The 2010 production, Mortal Engine, was created by Chunky Move, a group founded in 1995. Unlike in other performances, lights were shone on the dancers, but there were also shadows on the stage. We could see the dancers performing both under the bright light and in the darkness. This created a strong contrast for the audience. The lighting designer successfully created a chaotic atmosphere on the stage using the lighting equipment. The composer, Gideon Obarzanek, who was also the director of Mortal Engine, said that their main goal was to show how the technology could help them to match the spirit of the performance: human nature in society, but without emphasizing its cool effects (National Theater, 2010).

Compared to other large-scale interdisciplinary productions, the production “Zoé,” designed by Taiwanese students, Hu Jin Xiang and Xiao Si Ying, was a piece of artwork in microcosm (National Taiwan Arts Education Center, 2009). They used interactive technology wherein the dancers’ movements triggered the projection of line patterns on the dancers. This made the dancers look as if they were struggling for the freedom of their very souls. In the performance, the designers also used some kinds of noise to synchromesh the dancers’ movements, creating a scene in which it seemed that they were actually fighting bitterly against their bonds.

There are many foreign companies which have developed technology to integrate with dance, such as Troika Ranch. This company developed a custom-built motion-capture system, called MidiDancer. The system can be activated by the dancers’ movements to project some visual images or animation, which are detected by several lenses in the system. In this way, it can provide some visual effects for the dance performance (Troika Ranch, 2013). We hoped that we could achieve the same result in our production. Because of the limitations of cost and time, the production needed to be small-scale, just like “Zoé,” and we had to find another way other than interactive technology to create the visual effects we needed.

**Coordination of Visual Effects and Dance**

From the history of the evolution of music and dance, we have learned that we can generate body language for dance through the dance moves and the rhythm of the music (Brown &
Dancers’ movements bring about visual effects, and used with the right music at the right time, those movements can generate the right atmosphere for dancers’ positions.

Digital visual art has the same effect on dance performance, but in different ways. It creates various images such as spots, lines and vector graphs to match the music. In this way, the performances become more vivid.

Dance performance and digital visual art have different ways of operating. However, we tried to combine the advantages of these two strategies to provide a high quality, substantive production (Meador et al., 2004).

Our study conducted a step-by-step experiment on a new production. First, the digital visual artist integrated music with the animation by coding the music file, creating a flexible dance space. Then, the choreographer generated the movements to match the music and the animation, taking advantage of both. Combining sound effects and images with dance, we attempted to create a perfect look for the production.

The idea for the production was to represent the spirit of the performance in a graphical way, enhanced by technology. We not only put emphasis on the visual effects, but also introduced some digital artwork skills and some concepts of the choreographers, described below.

**Digital Visual Artwork**

The use of digital art in contemporary society has brought about new opportunities for developing new forms of performance. Instead of using digital technologies to imitate realistic scenes or objects (e.g., planets or spaceships in movies), artists have attempted to use digital technologies as a creative medium in recent years (Lin & Li, 2008); that is, digital composite images not only reflect the real world, but are also a way to present imaginary or creative scenes using digital technologies.

We produced two different performances: “The Love Song in Yue” and “The Ring.” The former is the story of the traditional “Yue” country love song, in which a woman expresses her feelings to an unrequited lover. The latter is about the weak side of the mind; that is, how people struggle and feel when facing loneliness and helplessness. The concepts of design were to use simple lines showing dynamic sense, sense of speed, and depth perception to present the dance performances. We used post-video editing software CS5 and Trapcode to complete the visual effects.
1. Creative Suite 5 (CS5)

Creative Suite 5 (CS5) is a powerful and widely used professional digital video effects editing software package produced by Adobe Systems Incorporated. Through this device, artists can create every kind of new stunning motion graphic and visual effects. It also provides several output formats and diverse editing functions with motion tracking particle systems, such as eliminating background and 2D/3D compositing, allowing users to add a rich variety of visual effects to the film, video, DVD or Flash (Christiansen, 2010).

2. Trapcode Suite

The Trapcode Suite was developed by Peder Norrby in 2001. Its main function is to control the graphics, audio creation and application. For digital visual artists, it is a very convenient device for creation. We can see that many films and TV programs implement this device, with a variety of plug-in software packages allowing users to create extraordinary visual effects (Trapcode AB, 2014).

3. Digital Visual Art Creative Skills

To develop performances with multimedia technologies, digital visual artists usually generate the visual images first. Based on the created images and the selected music, choreographers create the movements to match them.

In order to express the emotion and the meaning of the script, we used this system to fill the gap between visual technology and dance. The details of the use of the technology for the two productions are presented in the following paragraph.

3.1 The Love Song in Yue

We treated “The Love Song in Yue” as a music interactive factor. We changed the particle reaction, intensity and frequency in some ways. This song expresses the emotion of bitterness and the despair of love. The voice of the woman in the song stands for the emotion of unrequited love. By the use of visual effects, the audience can feel the inner feelings of the woman much more deeply. The bright image projected on the screen was the symbol of a warm heart. The spinning particles were just like the released emotion surrounding the woman. As the video progressed, she gradually left the image of particles, showing that she was afraid of losing her love. Before she was betrayed, she chose to leave her love first. We used red as the main color for the visual image. Implementing the form system, we could adjust the model, base form, size, color, transparency, quick maps, layer maps, audio react, disperse and twist, fractal and spherical...
field, kaleidospace, world transform, etc. Those are every kind of effect that can be used on the particles.

We adjusted the synchronization rate between the music and the particles in Audio React. There are five reactors in Audio React, two of which we used in our production. First, we selected the song, “The Love Song in Yue,” from the Audio Layer. Then we set the value of the intensity to 50.0. We mapped the value to “Disperse,” before we started to adjust at Reactor 2. We set the frequency value to 1,000, and turned up the intensity value of Reactor 2 to 125.0. Then we mapped the intensity of the music to “Fractal.” Before we used the functions of “Disperse” and “Fractal”, several settings were needed. We set the value of “Disperse” and Twist in “Disperse” to 10, and that of twist to 5. We selected the section: XYZ Individual of Displacement Mode in “Fractal” Field. The values of X Displace and Z Displace were 100. We set the value of Flow Evolution to 50. We selected abs (noise) in “Fractal” Sum for the interaction between the music and the particles.

In our production, the margin of the particles depended on the volume of the music. We used the optical virtual effects from “Optical Flares” to create a sense of layering for vision. By changing the angles of the camera, we could see the different types of particle movements on the screen. The operation list of Form and Audio React are represented as Figure 1, Figure 2, and Figure 3 is the setting of “Disperse” and “Fractal”. Figure 4 shows the dancer interacting with the visual effects.

![Image of the user interface for Form]

**Figure 1  Operation list of Form: setting the size, type, acting mode, shape, etc. of the particles**
Figure 2 Setting “The love song in Yue” as an interaction element, this influenced the Reaction mode, intensity and frequency of the particles.

Figure 3 Setting of “Disperse” and “Fractal”

Figure 4 The dancer interacting with the visual effects
3.2 The Ring

The idea of this production was that the dancer struggled to be strong even though she already felt hurt and frustrated. We formulated the initial particles in Trapcode, making it a circle. The circle stands for the idea: be strong yourself. However, as the intensity of the music changed, the shape became blurred, meaning that the dancer’s mind was actually weak. We used cool colors for the image to symbolize the dancer’s loneliness and helplessness.

The music of the production was “Minor Waltz” from Cinderella’s Sister’s original soundtrack. The main melody was a piano accompaniment. At first, we input the music file to the Audio Layer. We set the value of “Strength” in Reactor 1 to 350, and then mapped it to “Fractal” irregular changing mode in “Fractal.” The direction of change was from the left to the right on the x-axis. In order to have more animation forms, we set the value of “Strength” in Reactor 2 to 200. Then we mapped it to divergent movement mode in “Disperse”. The value of “Strength” in Reactor 3 was 120. It was mapped to the mode of changing the expansion and intensity of the sphere in Sphere 1 Strength.

Due to the use of two changing modes of “Disperse” and “Fractal” in Audio React, we had to set up the data in the “Disperse,” “Twist” and “Fractal” fields in order to ensure the particle had the two formations mentioned above. If we set the value in “Disperse” to 1, the particles would slightly diffuse. If the value of “Affect Size” was 1, the particles would move tightly together. If the value was higher, we could create an image like a cloud or fire. We set the “Displace” value to 50; the formation of the movement of the particles can be changed in a range. The Flow Y value was -50. This created a falling movement for the particles on the Y-axis. The Flow Evolution value was 25. This meant that the flow setting could be adjusted automatically. These settings were for the interaction between the music and the particles.

The backdrop of the screen was black, and the particles were blue. We used the function “Glow” from post-video editing to enhance the effect of the halo of the particles.

Figure 5 illustrates the interaction between the dancer and the visual effects, Figure 6 was the setting of Minor Waltz, and Figure 7 was the setting of the formation of the movement in “Disperse” and “Fractal”.
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Figure 5  The dancer interacting with the visual effects

Figure 6  Setting “Minor Waltz” as an interaction element, which influenced the Reaction mode, intensity, and frequency of the particles

Figure 7  Setting of “Disperse” and “Fractal”
Dance Design

Just like other types of art, the context of a dance and the form of representation are important. Due to the advancements in technology, we have various ways to present art. This time we chose a new way which was different from traditional approaches for our production.

In the past, we selected a theme for a dance, which would represent an emotion, a will, or a story. We selected music that matched the theme. After completing the design of the movements, we started to prepare the stage, costumes, and lighting effects. In this way, all the effects were completed after the dance movements were achieved. However, this time, we made the digital visual works after selecting the music. According to the effects and music we set up, we designed a series of dance moves. The following describes the elements we used in the two songs in our production.

1. The Ring

The ring shaped image on the screen was constructed out of projected particles. Sometimes the particles would spread out and sometimes they would move together. However, the ring-like shape was still on the screen. This created an emotion that the dancer wanted to leave, but it seemed she did not have enough ambition. The type of movements we used in the production was modern dance.

(1) Using the arms and body movements “swing” and “sway” to swing left and right, but without the fulcrum of the body ever changing.

(2) The dancer raised and lowered her limbs to match the movement of the particles, creating the sense that the dancer was trying to get rid of them.

(3) The main movements “curve,” “spiral,” “turn” matched the ring-like shape.

(4) In the middle phase, the movements stopped and waited for the next turning point. The dancer’s arms were placed in the center of the ring, implying that she could not let go. The dancer showed her back to the audience, also implying the emotion of escape (Figure 8 (a)-(c)).

![Figure 8](image.png)

Figure 8 A series of small images showing the middle phase of the performance
The dancer made a powerful move to get away from the ring. The circle of particles broke into pieces to match the dancer’s movement. The dancer changed her position from high to low, and touched the broken ring slowly to show the struggle in her mind (Figure 9 (a)-(f)). At the end of the music, the dancer laid down on the floor, showing her back to the audience. This implied that her emotions had finally been constrained.

![Figure 9 A series of movements in the production: The Ring](image)

2. The Love Song in Yue

We could learn about Yue’s emotions of love, desire, and negativity from the lyrics of the song. The spinning animation stood for the emotional struggle. The spinning animation extended to the whole stage, creating a new performing space. As the music began, the animation was shaking with the rhythm. The light spot in the right corner was treated as the person whom Yue loves. The spot would become big and small in relation to the intensity of the music, creating a sense of distance from Yue.

The form of dance in this production was Chinese folk:

1. At the beginning, Yue had extended her back to show her negative attitude towards love. Her hands pointed to the distant spot, showing her desire for her lover.

2. As the music began, Yue shrunk her body, pulling her arms into her chest. This showed her
emotional struggle. Yue desired a deeper relationship, yet she was also afraid (Figure 10 (a)-(d)).

Figure 10 A series of movements in the production: The love song in Yue

(3) The movements of Chinese folk dance ‘Three-dimensional rotation’ matched the spinning image (Figure 11 (a)-(b)).

Figure 11 A series of movements in the production: The love song in Yue

(4) The basic Chinese dance position “lean”: A leaning body position and the special gesture showed the dancer’s desire for dependence (Figure 12 (a)-(b)).

Figure 12 A series of movements in the production: The love song in Yue
When the dance matched with the visual effects, it showed Yue’s inner emotions. At the end of the music, the dancer slowly left the light spot through her little steps. The dancer turned her head back to see the spotlight again and again. The aim of this scene was to show the love in Yue’s mind, but she eventually refused to confess her emotions. This was not a happy ending (Figure 13 (a)-(c)).

![Figure 13](image)

Feedback from the Audience and the Experience of the Artist

Given the non-traditional format of the performance, it was important to elicit feedback from the audience and participants.

1. Feedback from the Audience

After performing in public, we selected three audience members from different fields. The first was a science teacher. He had very little experience with watching this kind of performance. The second audience member had graduated from an American school, and had a great deal of such experiences. The third audience member was a dancer, who had more knowledge of the performing arts. The following describes the feedback on the two performances from these audience members.

1.1 The Ring

An audience member who had more experience of watching dance performances said that
the visual effects and the dancer’s movements created a smooth atmosphere. As the whole performance was performed with a slow and soft rhythm, she felt that she had completely fused into the sense of the performance. She also indicated that the blue particle image made her associate the performance with water.

Another audience member who had less experience also admired the performance. He said when the dancer’s first step triggered the shaking of the animation, he was moved. However, he emphasized the main reason for his crying was the music. The music made him recall his sad memories.

An audience member who had dance experience had a different view from the other audience members. She felt that it expressed a joyful atmosphere when the animation changed from blue to white. However, the dancer showed pain and struggle in the performance. She felt that the visual effects had no relationship with the dancer’s movements. She felt that there were two different artworks performed on the stage, and that they did not fuse together.

On the other hand, the authors reviewed the negative feedback. In the performance, we used all kinds of ring positions to match the ring-like shape. To match the changing color of the shape, we used different intensities of movement. We did not consider that the changing of color might have also implied a joyful atmosphere. The dancer’s movement was always close to the animation to show the emotional struggle. However, the switching of the movement could not meet the anticipation of the audience. Although we always enjoy artwork from a subjective viewpoint, this was a clue for the choreographer: we should be more focused on the details of changing the visual image. The digital visual artist should define their work more clearly, and there needs to be more communication with the choreographer.

1.2 The Love Song in Yue

One audience member said the Chinese music and the stretches of the emotion impressed him. The spinning images were like a loosened spring. It only changed its direction. This way, the image created a sense of distance on the Z-axis. The Chinese music and dance integrated with the visual effects was the most impressive point for him.

An audience member who had a rich experience watching dance performances said that she did not like Chinese music. However, she appreciated the performance in that the Chinese music and the dance were integrated with the visual effects, which impressively expressed Yue’s emotion to the audience. She said the performance was just like a poem. A good performance would make the audience fuse in the atmosphere. Moreover, she indicated that this performance was the most successful one she had ever seen.

Another audience member who had less experience of watching performance said that
because the visual effects were similar to those used in the Ring, he was not very impressed with the visual component of the performance. However, he admired the emotion that the performance tried to express: one-way love. The audience member is a teacher, so he thought this kind of emotion was just like the love between a teacher and a student. They love each other but the restrictions of the relationship restrains their emotions. This audience member considered that the aim of the performance was successfully presented to everyone.

2. Experience of the Digital Visual Artist

In our works, the digital artist firstly created a new production. In this way, the artist would not be interrupted. The choreographer generated the dance movements according to the work of the artist, just like rewriting a work.

At the generating phase of the digital artwork, the artist should be adept in using the technical devices. It was found that Trapcode could create various kinds of movements of particles depending on the values we input to the system. After that, we used post-video editing to generate visual effects. We also had to consider the efficiency of the computer hardware. The more visual effects we used, the bigger the video file became. In order to maintain the definition quality, we also used an uncompressed AVI file at first. These reasons caused a lag when we output the video (2MB for a two-minute long video). To avoid this situation, we should compress the file twice.

Despite the powerful technology we have today, we must focus on the main goal of the artwork. Just like the designer Seymour Chwast said: When you are working, use your mind first, and then use your hands (Millman., 2007). When we decide to create a work, much preparation needs to be done. We should try to thoroughly understand the meaning a story is trying to express. Then we may start to create.

We were supported by people from foreign countries, who gave us some suggestions about operating post-video editing and Trapcode. Due to their enthusiasm for art, they did not ask for payment. We therefore decided to keep this faith and devote the results of this study to others as a reference.

3. Experience of the Choreographer

In our works, the choreographer not only had to consider the rhythm of the music but also the visual effects. Because we integrated the dance performance with technology, the choreographer got a new point of view for creation (Jung et al., 2011). The compilation of the dance was smooth as the choreographer first received digital artwork, despite this creating some
restrictions to the use of movements, positions, and space. We found that designing the dance according to the visual effects would make the dance match the theme more perfectly.

Many artists have faced problems using music when projecting onto a 2D or 3D stage (Seif El-Nasr & Vasilakos, 2006). We also faced this problem in our work. In a traditional performance, the changing of the movements depends on the beat of the music. In our works, although the visual effects changed with the music, it did not depend on the beat of the music but the volume. For instance, in a part of “The Love Song in Yue,” there was a sobbing voice for which it was hard to detect the regulation of the beat. In this situation, it was difficult for the choreographer to match the beat of the music. We suggest that the choreographer communicate with the digital artist frequently, and the beats of the music should be analyzed before designing the dance.

**Conclusions**

The productions were completed with the cooperation of the digital visual artist and the choreographer. They coded the music and created the effects to match the aims of the production. The technology not only brought us magnificent images but also expressed the deep emotions of the performance.

The choreographer generated the movements matching the music and the animation, taking advantage of both. Combining sound effects and images with dance, we tried to create a perfect performance for the audience.

The choreographer also suggested that the effects changed by the volume of the music made it hard for her to handle the dance movements. We should therefore analyze the beat of the music in the future.

We met some technical problems such as the number of particles we used causing the video file to become too large. Worst of all, the video lagged when we attempted projecting it on the screen. We suggest that the video file should be compressed before being used in performances.

To sum up, this study presents a new way of integrating dance with visual effects without using interaction technology. Its working scale was smaller and the cost was much lower. In this way performing artists can express the emotions of a performance to the audience by combining realism with visual arts. In the future, it is expected that more visual effects, such as contrast and alienation, and rendering techniques can be used to create the beauty of conflict to create different artworks for audiences. Moreover, it is expected that more interactive materials, such as the features of digital games can be introduced to the performances.
References


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視覺影像結合舞蹈之跨領域創作

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摘要

本文旨在探討舞蹈結合視覺科技，實踐於表演藝術領域的結果及優點。在這個研究中，提出一種結合舞蹈與視覺特效演出的方法，能有效減少整體的製作成本，並強化演出的效果。技術上，透過討論整個創作技術及表演的結構，指出一些科技使用技巧上的問題，如特效的添加與粒子的數量將會影響輸出影片的時間、品質與檔案的大小，為避免過大的影片在表演當下出現延遲，須將影片再行壓縮處理；展演出，針對編舞者在創作時面臨的問題，包括動作切換難以精準及視覺畫面同步轉換的困難，提出解決方案。最後，對未來演出計畫提出一些創作的建議與想法，希望帶領觀眾以更多元的角度與思維來看待作品。

關鍵字：數位藝術、視覺特效、表演藝術