Spatial visual music - the combination of visual music and physical space

Yang, Jing

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SPATIAL VISUAL MUSIC

— THE COMBINATION OF VISUAL MUSIC AND PHYSICAL SPACE

YANG JING

School of Art, Design and Media

College of Humanities, Arts, and Social Sciences

2020

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YANG JING

School of Art, Design and Media
College of Humanities, Arts, and Social Sciences

A thesis submitted to the Nanyang Technological University
in partial fulfilment of the requirement for the degree of
Doctor of Philosophy

2020

STATEMENT OF ORIGINALITY

I certify that all work submitted for this thesis is my original work. I declare that no other person's work has been used without due acknowledgement. Except where it is clearly stated that I have used some of this material elsewhere, this work has not been presented by me for assessment in any other institution or University. I certify that the data collected for this project are authentic and the investigations were conducted in accordance with the ethics policies and integrity standards of Nanyang Technological University and that the research data are presented honestly and without prejudice.

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Yang Jing

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19 December 2019

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Vibeke Sorensen

AUTHORSHIP ATTRIBUTION STATEMENT

This thesis contains material from a paper accepted at Understanding Visual Music 2015 Symposium and published in the Proceedings in which I am listed as the author.

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SUMMARY

The current study serves as an experiment of an artistic approach in which Visual Music is combined with the utilization of physical space to enhance emotional expression and evocation. Instead of treating the space as merely container of artworks, the current study considers the parameters of space as compositional elements, which can be composed musically according to the artistic emotion that needs to be conveyed. In the current thesis, the author proposes a concept called “Spatial Visual Music” as a sub-genre of Visual Music. With the emphasis on the qualifier “spatial”, this term refers to a particular type of Visual Music creation in which the artists compose not only the sounds and visuals, but also the space (spatial parameters). The term “Spatial Visual Music” is thus defined as a type of artistic expression, which requires the act of using spatial parameters as compositional elements to compose music-like spatial relationships, and construct a space as a three-dimensional visual score. A term called “entitative space”, which roots in the Chinese classical art aesthetics and Taoist ideology, is also proposed in the current thesis. With the incorporation of the concept of “entitative space”, spatial parameters are imported into Visual Music composition as compositional elements in addition to visual and auditory parameters. The enrichment of compositional materials has the potential of extending the flexibility of Visual Music creation process, providing additional

information, influencing audience's emotional response, and enriching interactive activities for Visual Music artworks. The main contents of this thesis consists of three parts: The first part is literature review, from Chapter 2 to Chapter 3, which involves the historic trace of Visual Music studies, the basic theory of physical space and the concept of perceptual space, and a review of the utilizations of space in different art forms. The second part is the theoretical proposition, where the author proposes a new term called "Spatial Visual Music", a structure of Spatial Visual Music, and two concepts called "Memoryscape" and "Digital-Cortex" which provide the theoretical foundation for artistic practice. The third part introduces the experimental artistic practices that designed under the instruction of the proposed theoretical framework of Spatial Visual Music.

Keywords: Visual Music, Physical Space, Spatial Visual Music

Thesis Supervisor: Vibeke Sorensen
Professor, Chair
School of Art Design & Media
Nanyang Technological University

Co-Supervisor: Miller Puckette
PhD, Professor
Department of Music
University of California San Diego

1. INTRODUCTION

Art is not a transcript nor a copy. Art is the expression of those beauties and emotions that stir the human soul.

— Howard Pyle

The current study serves as an experiment of an artistic approach in which Visual Music is combined with the utilization of physical space to enhance emotional expression and evocation. This thesis provides both the theoretical framework and the practical methods for combining space with Visual Music by proposing a concept called “Spatial Visual Music”¹. The diagram below (Figure-1) shows the research focus of the current study and its relationship with the relevant disciplines.

Figure 1 – Vision, Sound and Space

¹ New terms representing key concepts appear with quotation mark when initially introduced.

The combination of music and physical space produces spatial music, which refers to the form of music in which the major aspect of the composition of the work is the placement and movement of sound in space. The spatial relationship between musical components is the integral part of the performance.

The combination of visual art and physical space produces installation artworks (or sculptural / architectural installation), which is used to describe large-scale, mixed-media constructions, that are composed of sculptural visual elements in real space.

The author names the combination of Visual Music and physical space as Spatial Visual Music. The term is proposed as a sub-genre of Visual Music, which refers to the Visual Music creations that using space (spatial parameters) as compositional element and compose a space musically. The major aspect of the composition is the musical construction or reconstruction of a physical space, and the purpose of the creation is to present musicality through the composed space.

1.1 Thesis Structure

This thesis comprises six chapters, including this *Introduction*, which gives a brief description of the research topic and motivation.

Chapter 2 is *Visual Music*. This chapter introduces the basics of Visual Music. It gives a brief sketch of the history and the development of Visual Music studies, makes a review on the Visual Music practices from 2D to 3D, introduces representative three-dimensional Visual Music art works which were built concerning the virtual and physical space, and reviews the studies and practices of expanded cinema.

Chapter 3, *Space*, introduces the concept of space, explains the connections between visual and auditory space, the nature of spatial awareness / perception, and the establishment of indirect sense of spatial perception. This chapter gives a discussion on the role of both virtual and physical space in different art fields, which provides a general background of this thesis, and explains how the space serves as a symbolic object and conveys artistic emotion. This chapter contains four sections: (1) the first section explains “what is space” and “how do we ‘feel’ it”; (2) the second section illustrates different kinds of visual or auditory spaces that are utilized in various art fields, and the space’s abilities of influencing people’s feeling and emotional responses, and enriching interactive activities. The art fields discussed in this section include: pictorial art, motion picture, performing art, architectural art, and installation art; (3) the third section, *Space Consciousness in Chinese Classical Art Aesthetics and Taoist Ideology*, introduces the concept of multi-spot perspective, and a term called “entitative

space”, which is proposed based on the concept of “negative space” and “*liu-bai*”². This section explains in detail the space consciousness and the meaning of “empty space”³ in Chinese classical art aesthetics and Taoist ideology. This part illustrates the concept of space in Chinese classical art, aesthetics and ideology, by analysing the role of space in traditional Chinese art including landscape painting, screen painting, and architectural art such as garden and palace design; (4) in the fourth section, “*Space’s Ability of Reshaping the Timelines*”, a series of scientific studies related to “time” and physical space, gives the author great inspiration on the artistic utilization of physical space.

Chapter 4 is *Spatial Visual Music*, which introduces the author’s main proposition of “composing the space musically”, provides the theoretical framework of involving physical space in Visual Music creation, and proposes a concept called Spatial Visual Music. This chapter aims at providing the solution to the question: “how to combine physical space with Visual Music?”. In this chapter, the author introduces the proposition of involving space (spatial parameter) as a compositional element in Visual Music creation, explains the

² “*Liu-bai*”: a frequently used artistic expression technique in many fields of Chinese art (will be introduced in detail in section 3, Chapter 3).

³ The author uses quotation marks for “empty space” for the reason that in Chinese ideology the “empty space” (kōng) is not regarded as empty or nothingness.

necessity and benefits, explicates why this combination is possible, defines Spatial Visual Music and illustrates its structure, and indicates the interactive mechanism of Spatial Visual Music. To provide the theoretical basis for the practical approaches, the author also proposed two concepts called “Memoryscape” and “Digital-Cortex”. “Memoryscape” (the landscape of memory) is defined as an artistic abstraction and externalized expression of the artist’s personal memory or impression of a certain time period. “Digital-Cortex” refers to a dynamically communicating context. The author defined the “Digital-Cortex” as a combination of “Memoryscape” and the exploratory actions done by an individual audience member. There are three sections in this chapter, which will introduce: (1) the idea of “combining space with Visual Music”, (2) the concept of Spatial Visual Music and its definition, and (3) the interactive mechanism of Spatial Visual Music, which involves the contents of: (a) the general structure of the Spatial Visual Music, (b) the relationship between time and space in Spatial Visual Music, and the concepts of “mapping time to space” and “reshaping timelines in physical space”, and (c) two concepts called “Memoryscape” and “Digital-Cortex”.

Chapter 5 is *The Practical Method and Experimental Practice of Spatial Visual Music*. This chapter illustrates a series of experimental practices and conceptual design schemes which are designed and created based on the theoretical

framework that was introduced in Chapter 4. This part of studies serves as both practical methodology and examples for the Spatial Visual Music creation. (1) A work called “*Hutong Symphony*”, which is designed based on the concept of “entitative space”, is introduced as a practical example of one of the author’s theoretical approaches. It is a paper-cut flipbook which was designed and created based on the author’s personal impression of the neighbourhood (one of the typical *Siheyuan* and *Hutong* areas in Beijing, China) of her childhood. Based on the concept of “entitative space” from Chinese art aesthetics and Taoist ideology, the author extracts the negative space from the *Siheyuan* and *Hutong* area, and makes a paper-cut flipbook to show the musicality of the landscape of (old town) Beijing. (2) In addition to the major project, the conceptual design of two interactive Spatial Visual Music installations, the “*Hutong Impression*” (designed based on the concepts of “Memoryscape” and “Digital-Cortex”) and the “*Hutong Diary*” Series (designed based on the concept of “mapping time to physical space”), are introduced to elaborate further on the alternative practical utilization of the theoretical framework. (3) Two 3D visual scores, “*Tagu*” and “*The Butterfly Lovers*” (designed based on the concept of “warping the timeline in physical space”), which are created in three-dimensional physical space, are illustrated as examples of exploring the feasibility, applicability and benefits of combining physical space with Visual Music.

Chapter 6 is the conclusion with a reflection on the practical projects and their links to the identified theoretical framework, as well as a summarize of the benefits of involving physical space into Visual Music creation. An outlook of the future research directions is also provided.

1.2 Music, Visual Music and Spatial Visual Music

Music — The Language of Emotion

What is music? In a narrow sense, music is considered to be an aggregation of a series of vibrations in the air that are observed by listeners and interpreted as sounds (Samama & Clements, 2016). In a broader sense, philosophers tried to explicate music in the way that how sound is organized, which is composed with (1) “an appeal to ‘tonality’ or essentially musical features such as pitch and rhythm”, or (2) “an appeal to aesthetic properties or experience” (Hamilton, 2007, pp. 40-65). Andrew Kania (2011) adds further conditions to the characterization of music, and argues that music is “any event intentionally produced or organized to be heard, and either to have some basic musical feature, such as pitch or rhythm, or to be listened to for such features (Kania, 2011, p. 12)”. The sound of music usually consists of interplays of rhythm, melody and harmony, and these elements can be combined and made to interact. Music itself is not merely sound; silence also plays a significant role. When listening to music,

each individual audience experiences more than just a sequence of sounds. For some of the listeners, music reminds of a narrative, and for others, it calls up colours or images (Samama & Clements, 2016).

Frederick Delius said that “music is an outburst of the soul”, Aldous Huxley said that “after silence, that which comes nearest to expressing the inexpressible is music”, and Gustav Mahler said that “if a composer could say what he had to say in words he would not bother trying to say it in music”. What is the “inexpressible”? In terms more straightforward and less poetic, it is the intangible human emotions, which one has to experience and feel by oneself instead of reading from descriptions. The question of how music can express emotions and the secret of the listeners’ emotional responses to music has been researched widely by scholars (Budd, 2011). Although it is to this day still not fully clear why, it is obvious that music can evoke emotions (Changizi, 2009). Numerous studies from psychology, anthropology, philosophy, musicology and biology have investigated the music’s ability of conveying emotional information to listeners (Rodger, 2016; Juslin, 2013), and the musical elements and parameters such as musical notes, melody, rhythm, structures, and different tones of various musical instruments are the carrier of its emotional information. One of the most important criteria for the aesthetic value of music is its ability of making us feel (Juslin, 2013): its ability of using these musical elements to lead the listeners

getting into the atmosphere it creates, and feeling the mood and emotion it expresses or evokes. These expressions and evocations are interpreted very differently across cultures, and dependent on different social context and individual experience. The author believes the core beauty of music lies precisely in emotional expression. In other words, music is not merely an assembly of musical notes, but a “language of the emotions”, said Deryck Cook (1959).

Visual Music — The Music in Visual Form

Among a variety of art forms, a genre that focuses particularly on the musicality of visual composition is Visual Music, which can be regarded as another form of music. Research in Visual Music explores the synthetic experience of vision and sound, and attempts to emulate musical forms in visual arts (Brougher, Strick, Wiseman, Zilczer, & Mattis, 2005). Therefore, Visual Music can be literally understood as “visible music”, or the music in visual forms (Chapter 2 will introduce the definitions of Visual Music in detail). From this perspective, as a visual emulation of music, the core of a Visual Music artwork is the musicality it presents, the musicality that hosted by visual compositions. But what is the core of musicality? This question leads us back to the idea proposed in previous section: it is the music’s ability of making us feel. Hence, the author claims that if music is “a language of emotions”, then Visual Music should be “a visual language of emotions”.

The existing Visual Music artworks indicate the beauty of music in a variety of ways. Some of them use colours to show the rich range of musical tones, some use curves to show the fluent melodies. Regarding Visual Music as another form of music, the author believes that the greatest power of Visual Music artworks lies in the inheritance and development of the music's ability of affecting people's feeling and evoking emotional response. The studies on the concept of "seeing the music" should not only stay on the surface of making visual representations of the musical notes, tones, rhythms and melodies. More than that, we need to value the emotional expression and evocation that Visual Music can be on a par with music.

Along the history of Visual Music studies, artists and scholars have made efforts on exploring the emotional expression in Visual Music works from various aspects and with diverse approaches. In 1895, Alexander Wallace Rimington (2004) claimed that just like music, colour is capable of expressing artistic emotions⁴. Subsequent Visual Music studies not only lend support to Rimington's argument, but went further to show that not only colour, but many other visual attributes (e.g., shape, brightness, motion, path and etc.) are also capable of doing

⁴ Alexander Wallace Rimington wrote in his article *A New Art: Colour-Music*: "That colour, like sound, is capable of expressing artistic emotion there can, I think, be no question..." (2004, p. 47)

so. For example, Gyorgy Kepes (1944) linked musical melody with visual path by claiming that the function of the kinetic linear path in plastic organization may be compared with the function of melody in musical composition. Meanwhile, Wassily Kandinsky's work laid the foundation of abstractionism in painting. He claimed that in addition to colour, shapes could also be related to music (Kandinsky, 1947).

The motivation of the current research is to emphasize the Visual Music artwork's ability of influencing people's feeling and evoking emotional response, and explore further on the methods and approaches of enhancing the emotional expression and evocation for Visual Music creations.

Spatial Visual Music — Seeking for an Enhancement of Emotional Expression and Interaction

Space has been regarded as an effective tool to influence the emotional expression and evocation in a variety of areas. Architecture and landscape design are fields in which the space design is widely employed to affect people's experiences, feelings and emotions. Take one kind of space design which was extensively applied in the two Chinese imperial palaces of Ming and Qing

dynasty⁵ as an example: the designers of both palaces used different kinds of spatial comparisons and contrasts to intensify the visitor's feelings of grandness and awe-inspiring. A number of contrasts in size, scale, height, width and density make the perceived buildings and landscapes seem more spectacular than they really are (Chapter 3 will introduce this space design in detail). The designers used the space as an effective tool to create an atmosphere of regal majesty and splendour, and make the visitors deeply impressed by the supremacy of the feudal imperial power.

In performing arts, the design of space, including venue size and layout, is also an important consideration for artists because the factors of the physical space can “structure how people move through the venue space and therefore how their senses are engaged” (Rodger, 2016, p. 41).

Space has depth. Depth, as an important dimension, has the ability to provide additional information (Cooper, 2002). Because of the human brain's visual information processing capability, the depth of space could be perceived in either

⁵ The two imperial palaces refer to the Forbidden City (the Palace Museum) in Beijing, and the Ming Palace (also known as the “Forbidden City of Nanjing”) in Nanjing. The Forbidden City started to be built in 1406, and had been the imperial palace for both Ming and Qing dynasties for some five centuries. The Ming Palace, which was built in 1366, was the imperial palace of the early Ming dynasty. In these two palace, space design was widely applied.

2D or 3D media, virtual or physical world (Branigan, 1981). To involve the concept of space into Visual Music creation will allow for the ability to stretch the depth and enlarge the feeling of layering, and thus, provide the possibility to provide richer visual and/or auditory information for an enriched audio-visual experience.

Along the history of Visual Music, numerous pioneering artworks have been created in 2D or virtual 3D form. In comparison, there has been limited attention on utilizing three-dimensional physical space as part of the Visual Music performance. Inspired by the utilization of space in other forms of art, and the traditional Chinese ideology and aesthetics on space, the current research would like to extend the previous Visual Music studies and propose that the physical space can be regarded as a compositional element for Visual Music composition, and therefore lead to a new genre of Visual Music, which can be understood as Spatial Visual Music.

The current thesis proposes a concept called “entitative space” (this concept will be explained in Chapter 3), and attempts to involve this space in Visual Music composition to enhance emotional expression of the works and influence the interactive response between the work and the audience. Instead of treating space as merely containers of the audio-visual objects, the current study considers the

features of physical space as compositional elements, which can be composed musically according to the artistic emotion that needs to be conveyed.

The involvement of space will help to enhance the emotional expression for Visual Music creations. In addition, the spatial attributes, such as depth, distance, size, volume, position and directions, will become new “musical attributes” to enlarge and enrich musical vocabulary.

The combination of Visual Music and physical space is possible as: (1) both visual and auditory sensory systems are capable of providing spatial information, and (2) space is “shapeable” and “composable”⁶ — it can be segmented, connected, enclosed, divided, constructed or reconstructed to have various shapes, patterns, looks and feels, and create a variety of different perspective views and diverse experiences in different spots.

In the current thesis, the author focuses on the relationship between visual and auditory space, and space’s ability of enhancing the emotional expression and interaction for Visual Music art creations. Usually the studies of spatial sound art and spatial visual art include both the physical and virtual three-dimensional

⁶ By “shapeable” and “composable”, the author means that space can be regarded as an object which can be shaped into different shapes, and the different shape of spaces can be composed together just like the different musical notes.

space. In the current study, the research focus will be put particularly on the utilization of physical space. The future studies of Spatial Visual Music can include all types of spaces and compose / recompose these different kinds of spaces together to create a three-dimensional visual-musical environment and form a blended reality.

2. VISUAL MUSIC

It all started with Aristotle's words "colours may mutually relate like musical concords, for their pleasantest arrangement, like those concords, mutually proportionate."

— Bainbridge Bishop

Our eyes and ears are effective channels of receiving information and transferring them into our brain to create sensations and perceptions. The connection between visual and auditory systems has always been an interesting question which attracted substantial scholarly attention from various disciplines including neuroscience, biology, philosophy, psychology, and art. From Pythagoras' concept of *The Harmony of Spheres*⁷, experiments of rainbow in the electromagnetic spectrum, Sir Isaac Newton's *Opticks*⁸, Louis Bertrand Castel's

⁷ It is a simple fact that each note has its own vibration, and it is the frequency of these vibrations that distinguishes one note from another. Pythagoras (570 BC – 495 BC) discovered the fact that the pitch of a musical note depends on the length of the string, and proposed a philosophical concept called *The Harmony of Spheres*. This concept introduces the relationship between astronomy, music and geometry, and linked musical notes with numbers, visual angles, shapes and movements.

⁸ Sir Isaac Newton, the great scientist who first demonstrated that white light is made up of a mixture of colours, suggested that each of the seven colours of the rainbow is to be equated with the notes of the natural musical scale: C=red, D=orange, E=yellow and so on (Newton, I. *Opticks*, 1704).

*Clavecin Oculaire*⁹, Bainbridge Bishop's Colour Organ¹⁰, to the early 20th century's Visual Music and abstract films, scholars and artists have made tremendous efforts on presenting musicality in visual compositions, and exploring artistic approaches which can create intertwined experience for both our eyes and ears.

2.1 The History and Definitions of Visual Music

Visual Music is a term that refers to a wide range of studies and artistic practices. It involves the idea that the dynamic and non-objective qualities of music can be presented in visual forms (Mattis, 2005). The origins of Visual Music can be traced back to Pythagoras and Aristotle, then Goethe, Sir Isaac Newton, and other texts. After the Renaissance, Colour Music came into existence (Lund, 2004). This line of research focused on the correspondences of visual and auditory elements (such as colour and sound, and light and music), and the utilization of visual-musical instruments (i.e., the "colour organ") to show how music can be converted into visual representations. In 1725, Louis Bertrand Castel developed

⁹ Ocular Harpsichord, proposed by Castel in 1742, was an instrument (a visual keyboard) on which colours and notes were struck simultaneously to produce both sound and matched light colours.

¹⁰ In 1877, US artist, inventor Bainbridge Bishop received a patent for his first Colour Organ.

a machine called the “Ocular Harpsichord” to map coloured light with rhythmic structures applied in music. He also proposed that there is a mapping relationship between colour spectrum and seven units of musical scale. Later, Bainbridge Bishop (1876), Alexander Wallace Rimington (1893) and other artists also published their own colour organ designs.

In the early 20th century, influenced by the idea of “Gesamtkunstwerk” (Wagner, 1849), avant-garde artists tried to explore the relationship between cinema and other art forms such as music, painting, architecture, and sculpture. During this period, artists such as Viking Eggeling, Walter Ruttmann, Hans Richter, Len Lye, and Oskar Fischinger began their explorations in abstract film, which had great influence on later Visual Music artworks (Keefer, 2009).

Nowadays, Visual Music has become a rapidly-expanding genre. Artists and scholars from diverse fields (including animators, video artists, experimental filmmakers, CG artists, VJs, installation artists, painters and musicians) are creating artworks which they refer to as Visual Music. These new concepts and practices have further progressed this genre, and broadened the definition of Visual Music.

In the literature, there are a number of ways that Visual Music can be defined. For example, William Moritz (1986) defined Visual Music in *Towards an*

Aesthetic of Visual Music as “a music for the eye comparable to the effects of sound for the ear”. Ox and Keefer (2006) outlined four ways in which Visual Music can be defined:

“1. A visualization of music which is the translation of a specific musical composition (or sound) into a visual language, with the original syntax being emulated in the new visual rendition. This can be done with or without a computer. This can also be defined as intermedia.

2. A time based narrative visual structure that is similar to the structure of a kind or style of music. It is a new composition created visually but as if it were an aural piece. This can have sound, or exist silent. Theorist/inventor Adrian Klein wrote in 1930: ‘...somehow or other, we have got to treat light, form and movement, as sound has already been treated. A satisfactory unity will never be found between these expressive media until they are reduced to the same terms’.

3. A direct translation of image to sound or music, as images photographed, drawn or scratched onto a film’s soundtrack are directly converted to sound when the film is projected. Often these images are simultaneously shown visually. Literally, what you see is also what you hear. (An early example is filmmaker Oskar Fischinger's *Ornament Sound* experiments c. 1932). There are many examples in Visual Music film of this process, e.g. McLaren, Spinello, Damonte and other contemporary filmmakers, including sections of Pengilly’s work in this show. This method has been called a “pure” type of Visual Music.

4. A visual composition that is not done in a linear, time-based manner, but rather something more static like a 7’ x 8’ canvas. However, as in Klee, the movement of the painted elements can and have achieved a kind of Visual Music, serving as an artist's visual interpretation of specific music.”

In *What is Visual Music*, Paul Friedlander (1998) explains his understanding of three kind of Visual Music as follow:

“First Kind: Visual Music is a means of converting music to images using a system or set of rules which can be implemented as a machine or computer code. There are screen savers which respond to sound, but apart from synchronisation of sound and image, what do they do? How can they express the content of the music? This idea has been around longer than either the computer or the ‘sound light converter’ found in night clubs. Some famous people have speculated about this, Goethe for one, and Beethoven also was known to have produced a table of equivalence between musical key and color. Beethoven and Goethe did not agree as to which color corresponded to which key and the whole process of establishing a 'sound light' relationship is an ongoing and unfulfilled activity.

Second Kind: Visual Music is a means of expressing music in visual form requiring the active involvement of an artist, designer or director to interpret the music and find the means to express it visually. This is perhaps too narrow a definition since many of the events and happenings of the 60s involved a collaboration between different forms: theatre, dance music, etc. where no single element prevailed but the performance was a kind of Visual Music. This is also where the word multimedia originated. Rock videos could be said to fall into this category but the most wonderful examples are more abstract and can be spell binding, awesome even. The presentation of a Pink Floyd concert is a perfect example of this second form.

Third Kind: Visual Music has no relationship with music as such, although it maybe viewed with or juxtaposed with music. Visual Music is about creating visual relationships which change over time. It is primarily about abstract qualities of movement or changing form or colour. This is the kind of Visual Music closest to my own sensibilities, it is perhaps the most illusive or least understood form. The earliest proponents used mechanical or optical means. The Whitney Brothers started making what would now look like psychedelic (before the word had been invented) animation's in the 50s and 60s.

The first great creation of Visual Music to receive widespread notice by the public was the Stargate sequence in the movie 2001. In the 70s, artists like Tom DeWitt and Richard Monkhouse started creating special analogue electronic ‘image synthesisers’. More recently with the advent of desk top computers, there has been an explosion of activity in this area. But much of this work is animation which is restricted by the fact that it must have a beginning, middle and end. I prefer a form without time limits, where you can watch for a minute or an hour, it all depends on your state of mind. No beginnings, no endings, no fixed form, ever changing, every time you return to the piece, something slightly different happens.”

In the practical field, the idea that music is linked to visual art had been long-explored before the concept of Visual Music was proposed and established, and there are also a variety of forms that Visual Music can be presented. For example, some of the artists are interested in combining the music and visuals in the process leading up to a work, instead of demonstrating its intersection in a final product. Wassily Kandinsky, as representative of these artists, created a series of abstract paintings which had no representational resemblance to musical notation of any sort. Yet, he titled these paintings as “Composition”, and often commented on their “playability”. For Kandinsky, who was believed to have synesthesia¹¹, colours and painted marks are linked with certain sounds or notes. Other artists, such as Stuart Davis, attempted to visually represent musical mediums. In Stuart Davis’s painting *Hot Still-Scape for Six Colors - 7th Avenue Style* (1940), a

¹¹ Synesthesia is a blend of the Greek words for together (syn) and sensation (aesthesia). It is a condition allowing people to simultaneously appreciate sounds, colors or words.

sensory experience of the modern city was created through the lens of jazz music and the lens of visual art. It is considered to be the visual equivalent of the syncopated rhythms of jazz music.

Based on Ox, Keefer and Friedlander's definitions and the practical examples, the current study defines Visual Music as the artistic approach of composing visual elements musically. To be specific, it is a means of organizing / reorganizing¹² the visual elements (colours, shapes, movements, and etc.) under musical structures to express artistic emotion and elicit listeners' emotional responses. It can be regarded as an analogy to expressing artistic emotion with the composing of musical elements. The contents can be either representational or non-representational as long as the aim of the work is to express the artistic feeling, emotion, or related thought, and the composition of this work is based on a musical structure.

¹² By "reorganizing", the author intends to indicate that the visual elements exist and appear with their original structures. Sometimes we need to break these structures and build new relationships between the individual elements based on our specific musical rules or the emotion need to be expressed.

2.2 Development of Visual Music and Pioneering Artistic Practice

2.2.1 Visual Music from 2D Surface to 3D Space

Based on the idea of “the colour and sound are similar phenomena” and “the colours in a painting can be orchestrated in the same harmonious way that a composer arranges notes in a symphony”, Stanton MacDonald-Wright (1890 - 1973) and Morgan Russell (1886 - 1953) created a series of synchromism¹³ abstract paintings, and claimed that “by painting in colour scales, the visual artwork is able to evoke the same complex sensations as music” (Hughes, 1997, p.345).

In 1914, Paul Klee (1879 - 1940) painted his first pure abstract, *In the Style of Kairouan*. The painting consists of a series of coloured rectangles and a several circles. These coloured rectangles became his basic building blocks. Klee associated them with musical notes, and composed these blocks to create a visual harmony analogous to a musical composition. He selected a set of particular colours to make a palette which emulated musical keys, and used

¹³ Synchromism, an art movement founded by American artists Stanton MacDonald-Wright and Morgan Russell, started in 1912 and ended in 1924. Morgan Russell coined the term by putting the two words “symphony” and “chrome” together. They called the resulting paintings as Synchromies, which referred to the paintings where the colours are arranged in the way that the musical notes might be arranged in a musical piece. MacDonald-Wright and Russell wrote that “Synchromism simply means ‘with color’ as symphony means ‘with sound’”.

these “colour keys” to reflect his connection with musicality. Klee’s abstract paintings presented an example of “music on paper”.

In the early 1920s, Walter Ruttmann (1887 - 1941) released his first experimental films *Lichtspiel: Opus I* (1921) and *Opus II* (1923). His works are regarded as great examples for new forms of film expression. His experiments enriched the language of film, and brought the early abstract films a far-reaching influence.

Influenced by synaesthesia, Alexander Scriabin (1871 - 1915) created *Prometheus* in 1910 (Figure-2). He associated colours with the harmonic tones of atonal scale. This was the first work, and also the first one using spatial concept by a serious composer, in which music and ordered coloured forms assembled together. *Prometheus: The Poem of Fire*, Op. 60, is composed for piano, orchestra, optional choir, and *clavier à lumières* (a colour organ invented by Preston Millar). The colour organ consists of two parts: one produces colour which Scriabin associated with each key on the organ according to the harmony; the other consists of longer notes sustained across bars, which is less relevant to the first part or the harmony, but slowly rises up the scale a whole-tone at a time. During a performance, two different colours are presented at the same time. Sources interpret Scriabin’s intentions for the presentation of the colour organ parts differently: some believe that the colours were shown purposely on the

screen in front of the audience; while others claim that the colours were originally designed to “flood” the entire concert hall and however, showing them on a screen was merely a form of compromise when realizing that flooding the concert hall was practically impossible. Scriabin’s work inspired Wassily Kandinsky to develop this synthesis further.

Figure 2 – Alexander Scriabin, *Prometheus: The Poem of Fire*, 1910

In 1947, Oskar Fischinger (1900 - 1967) completed his experimental film *Motion Painting No. 1*, which is an abstract animation created by painting with oils on Plexiglas. *Motion Painting No. 1* comprises an exuberant series of intricate transformations. Fischinger presented the dynamic relationship between sound and image in this work. The film’s unique combination of visual and aural tonalities is considered to be aesthetically, culturally, and historically significant.

In 1950, Oskar Fischinger patented his invention “*Lumigraph*” (Figure-3), an instrument for playing lights (Betancourt, 2004). It allows the players to create dynamic light effects by pushing a rubberized screen, on which sets of coloured lights are projected. Moritz (2004) described the *Lumigraph* as follow:

“It consists of enclosing a three-foot-square screen area; the lighting elements are inside the frame, which only allows the light to escape through thin slits, so that just a thin area a quarter of an inch in front of the screen contains colored light. If the performer and the area behind the screen are blackened, then only something protruding into the light area will be visible, whether it be a screen pushed forward, or the hands of the performer (wearing white gloves) without a screen.” (p.137)

Figure 3 – Patent sketch for the *Lumigraph*¹⁴ and photos of the performance

¹⁴ Picture from <http://www.centerforvisualmusic.org/Fischinger/Lumigraph.htm>, accessed December 11, 2014.

Fischinger's instrument provided an example of associating physical space with Visual Music performance. In particular, the lighting elements create a three-dimensional light field in front of the screen. The visual effect is determined by how much an object (screen, hands or other props) is pushed into this light field. If we draw a three-dimensional Cartesian coordinate system for this light field (Figure-4), then the degree of depth (z) can be mapped with musical elements such as volume and accents, which can enhance the richness of artistic expression.

Figure 4 – Three-dimensional coordinates of the light field

With the technological advancement in the past few decades, Visual Music artists have made great efforts on exploring the presentation of image and sound in the digital world. This can be evidenced by the growing body of research on 3D / stereoscopic Visual Music in the recent years. For example, the stereo

paintings and films of Oskar Fischinger, Dwinell Grant's *Composition 4* (*Stereoscopic Study No. 1*), and Norman McLaren's stereoscopic film *Around is Around* with Louis Applebaum's stereophonic music (Moritz, 1999). Vibeke Sorensen works on stereopsis (e.g., *Fish and Chips*, *Microfishe*, and *Parrot Bits*), stereo sound (e.g., *Voyage*, 1981), and stereoscopic animations (e.g., *Maya*, 1993) to create new genre of synesthetic experience.

In 2009, Boston-based artist Nathalie Miebach, created a series of 3D musical sculptures (Figure-5), in which weather and climate change data are translated into vibrant, whimsical and other musical elements. These sculptures, according to the artist, can be regarded as musical scores for a string quartet to play (Smith, 2014).

Figure 5 – Nathalie Miebach, 3D musical sculptures, 2009¹⁵

¹⁵ Source from <http://www.brainpickings.org/2011/07/12/nathalie-miebach-musical-weather-data-sculptures/>

A recent work involving the utilization of physical space (i.e., changing of physical distance) is *Firewall* (Figure-6), created by Aaron Sherwood and Mike Allison in 2012¹⁶. It is an interactive installation which allows a performer / audience to “play” with a stretchy sheet of spandex to create synchronized visual and sound effect. In particular, when an area of the spandex is pressed, a piano music starts along with the visual effect of “fire lines” turning into “fire nets”. The more the screen is pushed forward, the faster is the rhythm of the music and the larger is the fire net area.

Figure 6 – Aaron Sherwood and Mike Allison, *Firewall*, 2012

Sherwood and Allison (2012) described the stretchy spandex as it “acts as a membrane interface sensitive to depth that people can push into and create fire-

¹⁶ Source: <http://aaron-sherwood.com/blog/?p=558> (accessed December 29, 2014).

like visuals as well as expressively play music (para.1)¹⁷”. According to Sherwood and Allison (2012), in another performance piece titled *Mizalu*, where the original concept stemmed from, both the stretchy screen and the action of push take on symbolic meanings: to illustrate the idea of death and experience of reality, the membrane represents a plane that you can experience but can never get through. As hard as one tries to make sense out of life and death, one will never fully understand “them”.

Andrea Polli’s installation works focused on the relationship between physical space and the virtual space of memory. In her early works, she used physical objects to embody specific memories. Later, she used a specific area as a “container” to “store” history and memory. Finally, she shifted her research focus from working with positioning objects in space to the exploration of the space per se, geographically and architecturally (Polli, 1998). *White Wall / Black Hole* (1993) was one of the first pieces she created using a spatial metaphor for memory. She describes it as follow:

“The piece consisted of a flour-coated gallery wall shaken by live sound received from the city streets outside the building using a police radio scanner. The flour on the wall slowly fell to the floor of the space due to the vibrations caused by the sound. The flour-coated wall resembled a topographical map; the landscape changed slightly with each new bit of audio information. The acquisition of power through information—in

¹⁷ Video available at: <http://vimeo.com/54882144>.

this case, represented by the manipulation of physical space—was contrasted with the content of the live police radio dispatches.” (p. 104)

Andrea Polli’s other installation artwork *Appetite 4* (1995) used shadows to create physical metaphor of memory. She described her work as follows:

“I lit each object with a dramatic spotlight, which created exaggerated shadows on the walls of the space. In *Appetite 4*, Lighting served to give the objects a larger-than-life presence in the space. I wanted to create a physical space that would refer to the mind’s virtual space during the act of remembering events and objects. Certain events have prominence in the mind, and the physical metaphor of size in relation to importance is utilized in the space through oversized shadows—foggy reproductions of actual events / objects. I selected the objects as signifiers of personal experiences related to past relationships.” (p. 106)

Morocco Memory II (1999) is an interactive installation created by Vibeke Sorensen based on her personal experience and shared memories in Morocco. A tent was build with scale and structure carefully designed so the audience can feel safe and comfortable to “communicate” with the “memories” of the place. The tent creates a relatively isolated space, separating the audience from the surroundings so they can feel that they are “detached” from their original life and actually traveling back to Morocco in 1960/70s. Moreover, the back wall as another important component of the installation, is also designed with careful consideration of the role of space. Vibeke Sorensen (2014) explained that “the entire back wall from floor to ceiling was a large screen for rear-projection. Images projected onto it varied from textures that reinforced the screen’s wall-

ness, to street scenes that were carefully composed and proportioned so that the wall disappeared, becoming a large opening or doorway into another location such as a street market scene in Marrakesh” (para. 14). In such a way, the physical space and the virtual space are combined to make strong artistic expressions.

2.2.2 City Symphony

Henri Lefebvre claimed in *The Production of Space* that each society creates its own space, and the history of human development is recorded within it. “Objects do not exist without first existing in physical space, which an object appropriates by its sensorial apprehension of its surroundings and its separation from them” (Lefebvre, p. 31).

In the current research, the author is trying to explore a way of using Visual Music and physical space to create poetic experimental animation which gives rise to an abstract portrait of life in Beijing. In the process, it is worth to mention the “city symphonies”, considering its significant relevance.

Man with a Movie Camera, directed by Dziga Vertov in 1929, is one of the first films that aim at capturing the rhythms of city. In this film, Dziga Vertov recorded the actual space as object. The film moves with the speed of a passionate musical composition, and the space of the city plays a role as a musical instrument that produces Visual Music of the daily life (Norden, 1984).

Another example is *Berlin, Symphony of a City*, directed by Walter Ruttmann in 1927. As mentioned by Weihsmann, “for Ruttmann, the essence of a city is its rhythmic spatial organisation and time structure, changing by the hour, provoking not only the viewer’s perceptions of its diverse patterns, but also through the ‘camera eye’ and his own sense of perception of his environment.” (Weihsmann, p. 23)

The *Mondrian Variations*¹⁸ are a set of short Visual Music animations created by Jaroslaw Kapuscinski in 1992. These animations are visual and musical ruminations and transformations of original graphical works by Piet Mondrian¹⁹. Kapuscinski composed the music with actual sounds of the city. The animation begins with traffic noises and buzzer of jackhammer, turns to spare chords with blue timbres, and finally arrives at Boogie-Woogie matching the Mondrian piece. This series of animations set an example of presenting the rhythms of city as Visual Music.

¹⁸ Source: <http://jaroslawkapuscinski.com/work-mondrianvariations.html>

¹⁹ Piet Mondrian completed the painting *Broadway Boogie-Woogie* in 1943 after he moved to New York. This painting was inspired by the city grid of Manhattan and the Broadway boogie-woogie music.

Source: http://www.moma.org/collection/browse_results.php?object_id=78682

Sarah Morris's Rings (2007-2009)²⁰ also echoes Mondrian's Broadway Boogie-Woogie. The ring element used in these paintings is inspired by the urban grid of Beijing. Sarah explained that Beijing is a decentered city composed of several increasingly congested traffic arteries known as the "Ring Roads". This ring-structure is "constantly expanding, with no real architectural markers against which to situate yourself. You have this feeling of Déjà vu (already seen) as you're going around and around." (Turner, 2009)²¹

2.2.3 Expanded Cinema

In the late 1920s, Oskar Fischinger (1890 - 1967) began to perform multimedia shows, including those entitled *Fieber (Fever)*, *Vakuum (Vacuum)*, and *Macht (Power)*. According to Fischinger's texts, these multimedia shows are his attempts to create some of the very first cinematic immersive environments. In 1926, Fischinger and Alexander László (1895 - 1970) presented a multimedia performance using multiple projectors. The title of this show is *Raumlichtkunst (Raumlichtmusik)*, which Fischinger described as "A New Art: Space-Light-

²⁰ Source: <http://www.petzel.com/artists/sarah-morris/>, <http://www.barbarakrakowgallery.com/sarah-morris>

²¹ "Beijing City Symphony" originally publicized in the July/August 2008 issue of Modern Painters. Online at <http://br.blouinartinfo.com/contemporary-arts/article/31034-beijing-city-symphony> (Accessed on 1st February 2015).

Music”. In it, Fischinger’s abstract films, combined with coloured lights from László’s colour organ instrument, were projected into a large space. First shown in Germany in 1926 and re-created as a three-screen installation in 2012, *Raumlichtkunst* (Figure-7), has been regarded as one of the first multiscreen multimedia projections ever made and the origins of immersive media environments (Fischinger, Keefer & Guldemon, 2013).

Figure 7 – Oskar Fischinger, *Raumlichtkunst* (*Raumlichtmusik*), Whitney Museum of American Art, New York, 2012 (Re-creation from Fischinger’s 1920s originals)

Fischinger’s exploratory practices broke through the limitation of the rectangular film frame and expanded his work beyond traditional screens into three-dimensional spaces. With the utilization of multiple cinematic projections, he combined cinema with other art forms to create a greater audio-visual experience for the audience. Throughout Fischinger’s career, his innovative artistic experiments continuously pushed the boundaries of cinema (Fischinger, Keefer & Guldemon, 2013).

In 1958, Milton Cohen started to develop a system, called “Space Theatre”, which is an environmental projection system for intermedia events. The motivation of this system was “to free film from its flat and frontal orientation and to present it within an ambience of total space” (Youngblood, 1970, p.371).

While these pioneering studies and practices bring Visual Music from screen to three-dimensional space, they were not merely adding a third dimension to represent reality but rather constructing space with the purpose of conveying artistic information. The setup of spatial features therefore become part of the artistic presentation and, under some circumstances, plays the pivotal role in the performance.

Despite the fruitful results that 3D Visual Music research has gained, the vast majority of discussions on the utilization of space stay in the stage of taking space as the container for audio-visual events, instead of treating the spatial parameters as compositional elements for Visual Music composition and showing the composed musical space as the main subject. Compared to other art forms (e.g., sculpture, architecture, and painting), there has been limited attention to composing the physical space in the field of Visual Music. This is largely due to the lack of the theories on “how visual and auditory information can be split, distributed, and reassembled in a way to enhance artistic expression along spatial dimensions”.

3. SPACE

The thirty spokes share one hub; but it is due to the empty space (of the hub for the axle) that the wheel is useful. Clay is molded into vessels, but it is due to their empty space that they are useful. The door and windows are cut out (from the walls) to make a room, but it is due to the empty space that they are useful.

— Laozi

Space has always been a major concern throughout the history of art. The relationship between physical and perceived space has been a topic of investigation for centuries. (Stella, 1986; Tyler & Ione, 2001) The studies on the relationship between the visual perception and representational paintings have had interesting results in the field of art (Dundas, 1981). The establishment of an indirect sense of spatial perception is the basis and premise to appreciate the spatial information in artworks (Hershenson, 1999). When the space in artworks is directly or indirectly perceived to the observers, it will be possible to affect the observers' feeling and emotional response, and this kind of influence is what the author attempts to explore and apply to Visual Music creation.

3.1 What is Space and How Do We “Feel” It

The term “space” has been defined differently in different fields of study. In classical physics, it is interpreted as a three-dimensional Euclidean space within which any point can be assigned coordinates in a Cartesian coordinate system,

and distance between points can be measured in units along three orthogonal axes (Hershenson, 1999). The perceived world is a three-dimensional space. It is filled with objects. Human beings, as observers, exist in it, move about, and interact with the objects. This three-dimensional space can further break down into two different kinds of space: the empty space (the space that is limited by objects) and the occupied space (the space that is occupied by objects).

The empty space can be described by a number of attributes such as depth, distance, width, height, volume, location and direction. The objects (occupied space) also have spatial attributes such as size, shape, volume, direction, position, and movement (Hershenson, 1999).

Based on present understanding of the physical world, there is no space that exists absolutely not limited, and there is no object that can exist without occupying any space²². Therefore, the relationship between the space and the object in our world can be understood as an interdependence, and the appearance or status of one can be indicated by describing the attributes of the other. In other words, they

²² In macro field, the known astrospace is a partial vacuum with a foam-like structure. Clusters and groups of galaxies are distributed in it, occupy space, and shape/limit the intergalactic space (Wszolek, 2013). In micro field, experimental evidence shows that even an elementary particle occupies a nonzero volume. For example, the size of an electron is less than 10^{-18} m (Gabrielse & Hanneke, 2006). These scientific studies inspired the author in the ideas of “regarding space as entitative object” and “taking spatial parameters as compositional elements” for Visual Music creations.

are mutual referents: we can hint the characteristics of a space by describing the state of the objects that are placed in it, or by describing the space outside the object to suggest the state of the object. Of course, there are preconditions: the reason why these descriptions and hints are feasible is that human beings have the ability to indirectly perceive space. The indirect spatial perception involves two concepts: physical space, and perceived space.

3.1.1 Physical Space

The study of space perception is based on the existence of the physical space. What is physical space? In the realm of physics, physical space is defined in term of measurement - space intervals described by the number of pre-determined measurement standard which is called meter. It is a three-dimensional expanse in which all material objects are located. It exists independently of the observers (Hershenson, 1999): the physical space exists outside the observers, and it is always there, regardless of the presence of observers. Newton asserted that physical space is absolute. To him, it is inert, rigid, constant, and does not interact with objects placed in it. It can be described by Euclidean geometry, and is everywhere the same (Shlain, 2007): the length of a unit, such as one inch, does not change its span as the location changes. Euclidean geometry is considered as the basic mathematical system that provides an approximation of the structure of the physical space.

Based on the Newtonian notion of space, it is believed that objects placed in physical space can be moved and rotated without deformation (Hershenson, 1999). For example, an object in physical space can be rotated without changes between related points. This rotation is a relative location/position change between the object and the space around it. However, if an object painted in a pictorial plane needs to have a rotation (not parallel to the plane), usually the painter need to deform at least one side of this object to imply the rotation, and this rotation is a relative position change between related points of the painted object. This kind of pictorial implication of rotation is effective because it is based on our knowledge of similar situations in physical space. The deformed shapes painted on a picture plane describe a single frame of an individual observer's perceived space from a specific observation point in physical space.

3.1.2 Perceptual Space

The perceptual space is what each of the individual observer experienced. The previous section discussed on the concept of physical space, as a premise to human being's space perception. This section introduces the concept of perceptual space, which is perceived through visual and auditory systems²³. Also

²³ The current thesis puts the focus on the studies of visual and auditory senses, and the spatial information provided by the visual and auditory evens. But the ways of perceiving a space is not limited to these two sensory systems. Some other sensory systems are able

introduced in this section, is the concepts of “direct” and “indirect” sense of space, and the establishment of the “indirect” sense of spatial perception, which is the basis and premise to appreciate non-physical space in artworks. This part provides the theoretical basis for creating and reconstructing artistic space, which is a foundation for the following discussion of Spatial Visual Music.

Visual Space Perception

The eye is one of the most important human organs for obtaining spatial information, and vision is one of the senses which is most closely associated with space perception (Millar, 2008). Around 80% to 90% of information about the environment is taken in visually (Griefahn, 1996). A wide range of disciplines rely on the visual-spatial thinking in their theory development process, such as “deformation, arrangements and movement of objects” in space (Millar, 2008). Hershenson (1999) stated that “the geometry of visual space is unknown and, therefore, must be determined empirically. This geometry must be different from that of physical space because it must take the perceiver into account. When visual space is described with respect to the perceiver, at least two qualities of perceived space can be distinguished: direction and distance. Note that these qualities of space only have meaning when there is a referent — the perceiver.

to deal with spatial information. The future studies could involve other sensory systems such as haptic system as well.

Therefore, direction and distance from a perceiver are usually described using polar coordinates. A polar coordinate system refers the perceived qualities to a single point, a single real eye or the centre of the ‘body image’ (e.g., the bridge of the nose) of the viewer. By specifying an origin that corresponds to a perceiver, it is possible to measure visual space in terms of angular direction and radial distance from the origin (p. 3)”.

A physical space can be observed directly, while a perceptual space cannot be observed directly. Therefore, according to Hershenon (1999), “in the scientific study of perception, an additional component must be included in every observation of an act of perceiving — there must be an observable behavioural response to indicate that a particular perception is occurring. Thus, in experimental situations, instructions or training are used to produce behavioural responses that can be observed by an experimenter. (p. 4)”

Figure-8 shows the mapping between the three-dimensional distal world and its representation on the two-dimensional receptor surface. “Each component of the perceptual act — distal stimulus, proximal stimulus, percept, response — can be described geometrically. Consequently, the relationship between adjacent components in the sequence may be described by mapping the geometry of one component into the geometry of the next component. For example, the Euclidean geometry of the three-dimensional distal world can be mapped into its

representation in the proximal stimulus on the two-dimensional receptor surface, and the proximal stimulus can be mapped into the 3D world of perception centred on the perceiver (Hershenson, 1999, p. 4)”.

Figure 8 – The mapping between the 3D distal world and its representation on the 2D receptor surface

A wide variety of disciplines rely on visual-spatial thinking, or “thinking about the shapes and arrangements of objects in space and about spatial processes, such as the deformation of objects, and the movement of objects and other entities through space” (Hegarty, 2010, p. 266). In fact, Rudolf Arnheim (1969, 1974), as a gestalt psychologist, proposed that all thinking can be visualized and this is determined by its nature. In many ways, vision is the primary human sense.

Auditory Space Perception

Auditory sense as another major channel of environmental and spatial information collecting, is certainly important, especially in blind conditions.

Sound usually come from multiple sources and therefore, hearing often involves

complex computation in order to separate out the sources of interest, often by estimating the distance and directions (Smalley, 2007). “The direction and location of an external sound source can be gauged from time differences in the arrival of sounds at the two ears. Variations in the intensity of a sound can convey variations in the distance of a moving external object (Millar, 2008, pp.1-2).” In *The Soundscape of Modernity*, Emily Thompson (2004) examined the acoustical technologies that produce sound and manipulate auditory space. Thompson and Wallace Sabine studied on the methods which are effective in taming the acoustics of large public spaces such as concert halls, and the factors that affecting the audience perception of the aural environments. In the realms of both art and science, the subjects studying the relationship between sound and space include spatial sound (spatial music) and sound spatialization.

The Establishment of Indirect Sense of Spatial Perception — the Basis and Premise to Appreciate Non-Physical Space in Artworks

As mentioned in previous sections, Fortunately, both the physical world and the perceptual world have structure. The structure of these worlds and the relationship between the structures can be described by geometry. According to Hershenon (1999), there are two types of observable response that are used to describe the scene: verbal responses and motor responses. A person can infer the existence and properties of an observer’s perception of a certain scene when the

observer says, for example, “there is a tree on the right side of the road”, or when the observer points to the direction of the tree (Hershenson, 1999). The person’s experience of her/him self observing the physical space helps this person to understand the others’ description of a scene.

To be specific, a transference from the other’s description to a person’s own experience will be made during the process of “receiving an information of somebody’s visual experience of a physical space, mapping this information with self-experience, picking-up matched experience, and creating an inferential scene of the physical space”.

The experience of inferring a physical space based on the other’s verbal or motor responses, helps people to establish an indirect sense of spatial perception, this kind of indirect spatial perception is the basis and premise to appreciate the artworks in which the physical space is represented into non-physical space such as the pictorial space.

3.2 Space in Artworks, and Its Ability of Enhancing Emotional Expression and Interaction

The reason for using space to enhance the emotional expression of a Visual Music artwork and enriching the interactive activities between the artwork and the

audience is because space has powerful abilities of influencing people's feelings and affecting the visitor's emotional response to the designed environment.

3.2.1 Visual Space

As Sir Ernst H. Gombrich (1960) has impressed upon us in *Art and Illusion: A Study in the Psychology of Pictorial Representation*, that “making” precedes “matching”, and that people make their own sense of pictures by collating what they see on canvas with what they know and what they remember. They tend to match the depicted world on the canvas to their visual experience of the real world. For example, the Renaissance modification of perspective and the solution of dealing with pictorial space that brought the depicted objects closer to actual visual experience, resulted from a general concern to make a painting tell a story convincingly (Dundas, 1981). Therefore, the most important function of pictorial space was representing the real world. In creating a simulacrum of the real world on canvas, one of the most effective solutions was linear perspective, which is capable of creating a coherent relationship between the individual figures, objects and the surroundings. (Dundas, 1981)

While we try to classify artworks as Fauvism, Cubism, Futurism, Surrealism, and so forth, these categorizations fail to reflect how diverse the practices are in dealing with space (Ione, 2005). Nevertheless, a common understanding of the

function of space in art is that the space is a form of mental representation rather than an objective reflection of reality. In *Warped Space: Art, Architecture, and Anxiety in Modern Culture*, Anthony Vidler (2001) wrote:

“Space, in these various iterations, has been increasingly defined as a product of subjective projection and introjection, as opposed to stable container of objects and bodies. From the beginning of the century, the apparently fixed laws of perspective have been transformed, transgressed, and ignored in the search to represent the space of modern identity. Thus the body in pieces, physiognomy distorted by inner pain, architectural space as claustrophobic, urban space as agoraphobic, all warpings of the normal to express the pathological became the leitmotifs of avant-garde art.” (p.1)

Frank Stella (1986) also said that “the aim of art is to create space — space that is not compromised by decoration or illustration, space within which the subjects of painting can live” (p. 5).

Painterly space, for example, has been utilized to express historical, cultural, metaphoric, philosophical, and religious ideals in the field of architecture since the ancient time.

“...the murals of Pompeii attest to the fascination of the Romans for enhancing the space of their windowless rooms, while much of the power of Renaissance art grew out of its ability to use perspectival techniques to create the illusion of three-dimensional space on the walls in their villas.”

“...Illusionistic space was also a dominant theme of ceiling decorations from the High Renaissance through the Rococo styles of the eighteenth century.”

(Tyler & Ione, 2001, pp.1-2)

In the realm of painting, it is important to note Paul Cézanne's effort in giving solid form an impressionistic connotation (Tyler & Ione, 2001). It is therefore proposed that the space in the eye of a painter includes the actual physical space, the painter's sensation of the space, and the way of interpreting it. Cézanne was a pioneer to make the interplay between these elements of space in his work: he intended to display the subject accurately and at the same time, trying to record his sensation towards the subject (Gombrich, 1995).

Cubism is a remarkable experiment in which artists explored the non-representational function of space. Pioneered by Pablo Picasso and Georges Braque, Cubism proposed an approach to spatial deconstruction on a flat, two-dimensional surface of the picture plane. Cubists found breakthrough in the traditional theories of perspective, foreshortening, modelling and the purely imitation of nature, and tried to show multiple sides of the subjects all at once.

The design of space is also considered to be important in the field of cinematic art. Different from the canvas, the world inside the film screen is not the entire film space. It is just the visible part. There are invisible spaces outside the frame of the screen, even in the silent films (Low, 1984). In addition, since human spatial awareness is psychological rather than physical (Hunter et al, 2002), the "space magic" performed by filmmakers became possible. The story unfolds in

motion. When the camera starts to move, the original space will be excluded from the screen, and the new space is displayed in the picture. The filmmakers design the different types of space in various ways to give clues or interact with the audience.

Consider one of the scenes in Alfred Hitchcock's 3D film *Rear Window* (1954) as an example (Figure-9), where before Grace Kelly closed the curtain, there were two major spaces inside the screen: the space of James Stewart's room, and the space outside of the window. Then, the closed curtain separated the two spaces, removing the "outside world" from the screen. However, this "outside space" was not thoroughly removed, as we could still hear the sound of a piano and people chatting, and those auditory elements together reconstruct the space out of sight (Figure-10). At this time, as the audience has already been told that something terrible is happening in the opposite building, they are much more interested in the outside space. The separation and the exclusion of the space make the audience more eager to see the what's happening in the space behind the curtain. In this way, Hitchcock made an interaction with each individual in the audience. Such an arrangement (the separation of space) raised audiences' curiosity and attention, which helped the story-telling to a great extent.

Figure 9 – Screenshot from Alfred Hitchcock's film *Rear Window* (1954)

Figure 10 – Diagram of the separated spaces

Another example is equally dramatic. In *Rope* (1948), the space of the living room, which we have already known, is separated by James Stewart (Figure-11): on his left side is the screen space - Edith Evanson is carrying books back to the box; the space on his right side²⁴, where people are talking with each other, is totally outside the screen, and we are aware of its existence because of the sound.

²⁴ In this scene, showing the image of James Stewart's back is not superfluous. His orientation provides a hint of the other character's location.

Such an effect triggers the audience's intention to remove the separation and brings John Dall from the outside space back into the screen to stop Edith from opening the box. This kind of unshown space seems to be removing information from the screen, but it is actually adding information to each of the individual audience's mind.

Figure 11 – Screenshot from Alfred Hitchcock's film *Rope* (1948)

Performance art includes a variety of disciplines such as opera, theatre and musical theatre, mime, puppetry, circus arts, public speaking, which all to a certain degree, involve the utilization of physical space. In the current study, the author takes Chinese shadow puppetry as a special²⁵ example to discuss how the use of physical space helps its performance. Shadow puppetry performance can

²⁵ Shadow puppetry performance is “special” because its narrative is not considered to be presented in a three-dimensional space as the other forms of performance art from the conventional understanding.

be considered as 2D art creation, in the sense that flat puppets and a screen are used and there is no depth in the performing area. Nevertheless, the physical space can still reveal information regarding the depth of a scene by managing the distance, position, angle and direction between puppets, lightings elements, and the screen.

Figure-12 shows an example in which physical distance is used to create a scene with depth. Figure-13 gives another example in which the distance between puppets and screen is changed so that a dynamic blurry effect can be created to simulate an “under-water effect”.

Figure 12 – Blurry effects indicating depth²⁶

²⁶ Figure-12 is a screenshot extracted from classical shadow puppetry *Yu Bang Xiang Zheng*, which means the grappling between snipe and the clam.

Figure 13 – Blurry effects used for simulating under-water scene²⁷

In the process of using a blurry effect created by physical distance to indicate the depth of a scene in shadow puppetry, utilization of aerial perspective is involved²⁸. George Mather (1996) explained the “image blur” as a pictorial depth cue as follows (Figure-14):

“Demonstrations presented here show that this selective image blur also acts as a pictorial depth cue, even when other pictorial cues are removed. Experimental data indicate that the degree of blur at borders between blurred and sharp image regions is used by the visual system to establish the depth ordering of different regions. Selective image blur is thus a potentially useful addition to computer-generated and cartoon images to enhance the impression of depth they convey. It may well also contribute to depth perception in natural retinal images, because the depth of focus of the human eye is limited.

Although the eyes receive flat, two-dimensional images of the world, we experience a rich, vivid impression of three-

²⁷ Figure-13 is a screenshot extracted from classical shadow puppetry *Da Nao Tian Gong* (Havoc in Heaven). In the picture is the scene of the Monkey King traveling to the Dragon Palace under the sea.

²⁸ Chinese landscape paintings also use aerial perspective to show recession in space.

dimensional space. A range of visual cues allow accurate judgments to be made about the relative depths of objects in the scene.

It will be demonstrated that image blur makes a significant contribution to perception of depth relations in photographic images, and may also contribute to the depth seen in natural retinal images.

Rather than modulating other cues, it will be argued here that blur itself can act as a pictorial depth cue.”

(Mather, 1996, p. 169)

Figure 14 – Blurry effects as depth cue²⁹

Influenced by Buckminster Fuller’s spheres, Stan VanDerBeek had an idea for a spherical theatre, where people would lie down to experience the movies around them. In 1957, he started to produce film sequences for his large-scale *Movie-Drome* (1963) in Stony Point, New York. In *Movie-Drome*, the floating multi-images replaced straight one-dimensional film projection. His intention went far beyond the building itself and moved into the surrounding biosphere, the cosmos, the brain, and even extraterrestrial intelligence (Claus, 2003).

²⁹ Source: Mather, G. (1996) Image Blur as a Pictorial Depth Cue. *Proceedings: Biological Sciences*, 263, 169-172.

The pioneering holographer Ken Dunkley created an experiment called *Thoughts* in 1973, which is believed to be the earliest recorded works of “serially connected” visual spaces (Figure-15). In this experiment, the first visual space is designed to have a second visual space nested within it and yet entirely independent from the first one, and the second visual space further has a third independent space nested within it, and so on. This experiment is identified as the first attempt of using hologram art to explore the role of medium and has been viewed highly as it represents a major breakthrough in the theoretical development of holography.

Figure 15 – Ken Dunkley, *Thoughts*, 1973

Artists also have successfully combined visual art, music, and physical space in installation pieces. Keith Haring’s *Pop Shop*, created in 1986 (Figure-16), is an example of installation work, in which physical space is involved and combined

with the visual elements to create an environment. Haring attempts to use this environment to help him extend and amplify the meaning of his work. He stated that “if I only made paintings in a gallery I would probably be frustrated”. The space is filled with repetitive and continuous imagery along walls and pillars to produce an effect of engaging.

Figure 16 – Keith Haring, *Pop Shop*, 1986

The electronic music maven Amon Tobin brings visual projection mapping and set-design together in a bombastic fashion with his show ISAM³⁰. The depth and scope of Tobin’s works have had a far-reaching influence, garnering respect amongst producers and artists both within and outside electronic music.

“*The Visitors*” is an installation created by Ragnar Kjartansson in 2012 (Figure-17 and Figure-18), which features nine different screens. These screens are

³⁰ Amon Tobin, “ISAM” live audiovisual show, official vimeo channel, <https://vimeo.com/47216543> (accessed December 11, 2019).

placed continuously at an angle to each other in the performing room. Each of the nine screens featured one or a group of musicians or artists in different places performing the same lyrics simultaneously but separately. Each of the performers uses different instruments to play the lyrics with their independent emotional connection to the music. The work is an hour-long piece, and is incredibly immersive in its surround-sound, continuously engaging visuals and cohesive effect.

Figure 17 – Ragnar Kjartansson, *The Visitors* sheet music, ink and water colour on paper, 2012

Figure 18 – Ragnar Kjartansson, *The Visitors*, 2014

Another example of installation, which combines virtual spaces with visuals and sound, is *Sounds for Virtual Spaces* (2016) created by British composer and sound designer Tom Clarke (Figure-19). It is a virtual installation. The goal of this work is to form a dialogue between visual and auditory materials in an immersive environment. The installation features three separated parts in which the spectator can engage with one of the three environments: a mechanical, polyrhythmic sound space, a haunted cabin scored by creepy music, or a therapeutic pitch-based installation. The three parts of the environment are all interactive and highly immersive with the employment of surround sound and interactive imagery.

Figure 19 – Tom Clarke, *Sounds for Virtual Spaces*, 2016

3.2.2 Auditory Space

The spatial relationships between musical components has been of great concern to the artists and performers in the field of auditory art. The earliest published works that use physical space as a compositional element date back to the mid-

16th century. In 1550, an early incarnation of spatial music work, which presented a call-and-response pattern³¹, was performed in the Basilica San Marco in Venice, Italy. There were two organs placed in this church that facing each other across the basilica. Adrian Willaert therefore designed his antiphonal works for two spatially separated choirs and instrumental groups to fully take advantage of such arrangement (Zvonar, 2009). His 8-part *Vespers* (1550) is the earliest work to be known as taking on a ‘dialog form’ and using echo effects. Such a practice was supported and further developed by composers such as Willaert’s pupil Andrea Gabrieli and many others and it gradually became a trend for the Venetian musical practice.

Another example of similar type is *Spem in Alium*, which was composed by Thomas Tallis to honor Queen Elizabeth’s 40th birthday in 1573, in which forty separate vocal parts divided among eight 5-voice choirs were used. Orazio Benevoli’s *Festal Mass* for the dedication of Salzburg Cathedral in 1628, is also a good example. In this work, 53 parts (16 vocal and 34 instrumental) plus two

³¹ Call-and-response is a compositional method in music. It works similarly to a conversation. A phrase of music serves as the “call,” and is “answered” by a different phrase of music. These phrases can be either vocal, instrumental, or both. Call-and-response patterns can be identified throughout history and across different cultures. In Europe, for example, composers such as Adrian Willaert, Andrea and Giovanni Gabrieli, and Orazio Benevoli applied the antiphonal call-and-response technique to elaborate the medieval church music which is featured by polyphonic choral.

organs and basso continuo were involved. Such a practice continued throughout the entire Baroque period, and gradually tapered off afterwards.

From the late Baroque period to the end of the Classical period, people seem to show little interest in spatial antiphony creation, but in the Romantic period people once again identified a trend for spatial placement being used for special theatrical effects. For example, in Tuba Mirum section of Hector Berlioz's *Requiem* (1837), four separate brass ensembles make the dramatic opening, as the entrance of the choir is introduced from the four points of the compass. Similarly, Giuseppe Verdi's *Manzoni Requiem* (1874) and Gustav Mahler's *Symphony No. 2* (1895) employed off-stage brass ensembles to achieve similar effects.

In the twentieth century, artists and composers such as Charles Ives, Henry Brant, Karlheinz Stockhausen and Luigi Russolo composed a large number of spatial musical works that involving the use of multiple orchestras (e.g., Charles Ives, *The Unanswered Question* (1908), Karlheinz Stockhausen, *Gruppen* (1955-57)), or large numbers of loudspeakers (e.g., Iannis Xenakis, *Hibiki-hana-ma* (1970)), and even the entire city center of Amsterdam (i.e., Henry Brant, *Fire on the Amstel* (1984)).

In one particular example, Ives's father George Ives was a Civil War bandmaster and music teacher, who run his own experiments with spatial music by directing two marching bands to move around the town square with different directions. Inspired by such practice, Charles Ives began to work with multi-layered musical forms using independent ensembles and created *The Unanswered Question* (1908). In this work, strings are placed offstage in opposition to the on-stage trumpet soloist and woodwind ensemble.

In a similar way, Brant's *Antiphony I* (1953) involved five spatially-separated orchestras. *Voyage Four* (1963) a 'total antiphony' required three conductors to direct percussion and brass on stage, violins on one side of the balcony, violas and celli on the other, basses on floor level at the rear, woodwinds and a few strings in the rear, as well as individual performers around the audience. *Windjammer* (1969) had a stationary horn soloist and several wind players who marched along specific routes while playing.

One of the advantages of spatially separated groups of musicians or loudspeakers is that multiple, independent lines or musical layers can be easily followed by the audience. Composers such as Charles Ives, Henry Brant and Karlheinz Stockhausen used spatial distribution of musicians or loudspeakers to enhance the performance and the audience's perception of music simultaneously, allowing complex layers of independent and sometimes even dissonant material

to be perceived more precisely (described beautifully by John Cage as the “*co-existence of dissimilars*”). Such spatial separation practice is very necessary when musicians are performing completely independent material (e.g., at different tempos and in different keys).

For electronic music, the use of multiple loudspeakers is also beneficial in some ways. Surrounding the audiences with loudspeakers allows them to experience an immersive and synthesized sound scene in a way which is very difficult to accomplish using simple sound source. In addition, the ability to move sounds around the space can be very effective in terms of artistic expression, due to the fact that strong sense of physicality and gesture of *acousmatic* music can be furnished.

In 1998, David Worrall wrote an article titled *Space in sound: Sound of space*, in which he introduced his experiments in using physical space³² for musical composition. His research focused particularly on the connections between physical space and the characteristics of sound:

“... A prime concern during the development of this performance environment was how to integrate 3-space into

³² In Worrall’s article, he called the space as “3-space”, which means concrete space, or real space. OED defined the concrete space as: “1. Continuous extension viewed with or without reference to the existence of objects within it; 2. Interval between points or objects viewed as having one, two or three dimensions.”

different composing methodologies. I began, perhaps naturally enough, to think of 3-space as a locational aspect of sound which could be added as another dimension to an abstract multidimensional musical space of pitch, duration, dynamic and timbre.” (1998, p. 94)

“Just as it has become compositionally useful to find more interesting ways to explore the nature of timbre space, it has become important to find more appropriate ways to explore the nature and use of 3-space so as to avoid using it purely decoratively in effects such as sounds ‘whizzing’ around the auditorium.” (1998, p. 94)

Elena de Bértola is another artist who associated space with auditory art. In *On Space and Time in Music and the Visual Arts*, she pointed out that “how music, an art considered to be essentially temporal, also produces in listeners a consciousness of space” (de Bertola, 1972, p. 28). She explained:

“When one speaks about ‘sound’ space, it is as an appropriate analogy of visual space. In effect, whenever one speaks of ‘space’, one generally means visual space and, in a parallel sense, whenever one speaks of spatial perception, one thinks of visual perception.”

“In what ways is a musical piece ‘spatialized’? Musicians have long known that different instrumental timbres produce particular effects: the sounds of trumpets ‘appear’ in relief and can give the impression of sounds approaching or receding in space. It is very common to find in all sorts of compositions ‘protruding’ themes and ‘sound volumes’ that depend on the character and combination of sounds produced.”

“Spatial music, produced by several sound sources (loud-speakers) placed in different regions of space, multiplies or diversifies the spatial effects of sounds.”

(de Bertola, 1972, p. 28)

She also provided an example of interactive auditory space design (Figure-20).

“By increasing and decreasing the volume of individual loudspeakers placed in opposite corners of a room, one can produce sounds that appear to travel around the room, that appear to jump to one side, to echo, etc. In the sound environment that was designed by F. Winckel and the composer Boris Blacher for the German pavillion at the International Exposition at Osaka, the effects of expansion and contraction were systematically exploited. The capability of the ears to notice ‘spatial’ effects of sounds has also been exploited by other composers.” (p. 28)

Figure 20 – Auditory Space Diagram^{33 34}

AUDIUM (Figure-21) is a theatre created by composer Stanley Shaff and equipment designer Douglas McEachern. The theatre is a sound-sculptured

³³ Diagram is from Elena de Bértola’s thesis *On Space and Time in Music and the Visual Arts*. “Directions in which the audience faces and the positions of four orchestras (indicated as conductors) for the performance of K. Stockhausen’s composition ‘Carre’, written in 1958-1959” (de Bertola, 1972).

³⁴ The arrows indicate the directions to which the audience faces.

space consists of 176 speakers and 49 seats. It presents spatial-sound performance every Friday and Saturday night since October 1975, pioneers the exploration of the language of space in music. The entire theatre is a sound-space continuum. According to Stanley Shaff (2002), it is a “sound-sculptured space”, which performs works that are sculpted by 136 speakers (now there are over 176 speakers). The performances are in complete darkness. The theatre is designed for heightening the spatial effects of sound and choreographing sound in space.

Figure 21 – The interior of *AUDIUM*. (photo credits: Mark & Alex Akamine)

In 1991, based on the concept of “creating musical experiences and environments that open doors of expression and creation to anyone, anywhere, anytime (Machover, 1996)”, Tod Machover started to build hyperinstruments for non-professional music lovers. A system called “Joystick Music”, which allows a piece of music to be steered, modified, and shaped by manipulating two videogame joysticks, was created to perform “active music (Machover, 1996)”.

Machover tried to build a structure which allows people to play with each of the individual musical elements, get to know them, add to them, and see the fragments fit together like a giant puzzle.

In 1994, Machover began to work on the *Brain Opera*. It is a maze of specially designed hyperinstruments, in which the audience is involved in the performing and creating of the music piece. *Brain Opera* lets people play with different aspects of music (including rhythm, harmony, melody, and etc.) before attending the performance where a complete version of the piece will incorporate the sounds and music that have just been created by them. In the *Brain Opera*, there are a lot of precomposed music pieces which are modifiable by the audience. According to Machover, “the way that precomposed and new material is combined varies from section to section, and there are actually at least twenty different models in the *Brain Opera* of how pre-existing music and audience/performer modification can be combined (Machover, 1996)”. Machover’s “active music” sparked the author’s idea of creating an interactive Visual Music environment which involves the audience to be part of the performance (please refer to the concept of “Mmeoryscape” which is introduced in Chapter 4).

3.2.3 Interplays Between Visual Space and Auditory Space

From a scientific perspective, “vision and audition are often charged with conveying information of a similar quality about the same (or at least related) objects and events” (Bulkin & Groh, 2006, p.415). Because of this overlapping function, visual and auditory systems can jointly work in a number of ways to initiate interactions with the audience. For example, Bulkin and Groh (2006) stated:

“When the two sense systems provide information about exactly the same object or event, combining the signals from each modality can enhance the accuracy of the resulting percept. This type of interaction can be illustrated by illusions in which the visual and auditory information is actually slightly discrepant but the percept is unified”. (p. 415)

“In the McCurk effect, a video of a person’s mouth saying “ga” is dubbed with a soundtrack of a voice saying “ba”, resulting in a percept intermediate between the two, such as “da”. This illusion reflects a strategy employed by the brain of combining visual and auditory information to provide a single percept consistent with both sources of information, a strategy that, under normal circumstances, produces greater accuracy and / or speed of speech comprehension when the two sources of input are matched.” (p. 415)

Meanwhile, the visual and auditory system can also provide complementary information to each other, as Bulkin and Groh (2006) wrote:

“the visual system, although generally excellent at providing spatial information, cannot detect the locations of occluded objects, objects located beyond the field of view, or objects in the dark”. (p. 415)

Since both sensory systems are concerned with objects at some distance from the body, and are capable of providing reasonably accurate spatial information, the overlapping and complementary function of the visual and auditory systems enables the design of interactive effects using physical space. Visual Music, as a special art form that is concerned with both visual and auditory effects, should also involve consideration of the use of physical space in its creation process.

The above findings provide the scientific grounding of why visual and auditory systems can be unified to create a synchronized experience. In the field of Visual Music, artists have more liberty in combining the two sensory systems to evoke the kind of emotional response they want (Betancourt, 2006). The literature generally suggests that “the structure of Visual Music is provided by pre-existing musical form that is translated into the structure of visual composition” (Betancourt, 2007, p.1). Nevertheless, many Visual Music artists also use the animation as the score or coding rules to generate music, or for designing visual and sound effects in a parallel mode.

From an artistic perspective, there has been a long tradition to include physical space as part of the presentation, as mentioned at the beginning of this section. Comparing with other media that Visual Music artworks usually dwell upon, physical space has its unique features such as straightforward, touchable and allowance for a walk-in experience, which thus leaves plenty of room for artistic

imagination. However, while artists and scholars devoted great efforts on exploring 2D and 3D / stereoscopic Visual Music, there is not much theory regarding the creation of Visual Music artwork through the design and construction of physical space.

3.3 Space Consciousness in Chinese Classical Art Aesthetics and Taoist Ideology

After the elaboration on the definitions of physical space and perceptual space, and the discussion on the role of space that is presented in different kinds of art forms, it is necessary to define the “space” to which the current research is referring. Since most of the sculptures and installations are built in space, it is important to differentiate between the artworks that simply occupy the physical space and the ones that regard the spatial attributes as compositional elements. The former was built in real space and uses the space as a container for its contents. As a result, the change of spatial parameters does not significantly influence its meaning or performance. In comparison, the latter considers the physical space more than a container, and rather as an entity (an object), which can be designed and composed according to the artistic emotion that needs to be conveyed.

3.3.1 Negative Space, “Liu-Bai”, and “Entitative Space”

(1). Negative Space

According to the nature of existence, space can be divided into “physical space” and “non-physical (virtual) space”. According to the status of constitution, space can be divided into “space of entity” and “space of emptiness”. The former is the space that is occupied by entities, while the latter is the space that is limited by entities (the space around and in between objects). This concept can be associated with the concept of positive and negative space in pictorial art:

“Positive space can be defined as the space in a painting occupied by the object depicted. Positive space is also considered to be the areas of an artwork that is the primary subject or object. Positive space defines the subjects outline. In other words, positive space is the areas of a painting or sculpture which are occupied by forms or images.” (Artopium’s Art Dictionary, 2018)

“As contrasted with positive space, negative space is the space in a painting around the objects depicted. It is the “empty” areas where no forms/images are located. The areas of an artwork that are not the primary subject or object. Negative Space defines the subject by implication.” (Artopium’s Art Dictionary, 2018)

In the area of painting or sculpture, the depicted figures and objects are considered as the positive space, and the “empty” areas where there are no forms exist in are regarded as the negative space. Comparing to positive space which is actually occupied by forms in a painting or sculpture (the figure in a portrait), negative space is the other side of the coin. The negative space means the areas

which have no forms or objects (sometimes also called the “background”) in painting and the “holes” between forms or within a form in sculpture. Both “space” and “emptiness” suggest a lack or a shortage of something.

(2). “Liu-Bai” — the “Empty Space”³⁵ in Chinese Classical Art

A vital difference between the treatment of space in Chinese Art and Western Art, especially in paintings, is in the utilization of empty space. The awareness or consciousness of space, and the relationship between natural and spiritual space, has importantly appeared in ancient Chinese literature and art (including architectural art). In a large number of Chinese literary and art works, the concept of space, particularly the concept of “empty space”, seizes a unique position and carries important symbolic meanings.

In traditional Chinese ideology, especially in the thought of Taoism represented by Lao Zhuang (the philosophy of Lao-zi³⁶ and Zhuang-zi³⁷), “empty space”

³⁵ The author uses quotation marks for some of the “empty space” in this thesis for the reason that in Chinese ideology the “empty space” (*kōng*) is not regarded as empty.

³⁶ Lao-zi (standard written Chinese: 老子, also known as Lao Tzu and Lao-Tze, born: 601 BC) was a Chinese philosopher and writer credited with founding the philosophical system of Taoism. He is the reputed author of the *Tao Te Ching*.

³⁷ Zhuang-zi (standard written Chinese: 庄子, also known as Zhuang Zhou, 369 BC – 286 BC) was an influential Chinese philosopher. He is the author of the book *Zhuangzi*, an ancient Chinese collection of anecdotes and fables, which is one of the foundational texts of Daoism.

(standard written Chinese: 空, Chinese Pingyin: *kōng*) is regarded as a meaningful entity rather than a concept of vacancy. Scholars and artists create artworks to either review their inner feelings or communicate with the spectators not only by depicting concrete objects, but also through the elaborately arranged “spaces”.

In Chinese classical art aesthetics, there is a term referring to this kind of “empty space”, which is called “*liu-bai*”. It is both a noun and a verb. As a noun, “*liu-bai*” refers to the “blank” or “empty space” in artworks. As a verb, “*liu-bai*” refers to a frequently used artistic expression technique in many fields of Chinese art, including painting (especially in Chinese landscape painting), calligraphy, garden and architecture design, poetry, and even performing arts, which can be literally translated as “leave a blank” or “leave an empty space”. It means to intentionally leave part of the pictorial space or the content of artwork to be “empty”, without being filled with depicted objects or concrete content. The categories of “*liu-bai*” (blanks) mainly include: semantic “*liu-bai*” (semantic blanks), artistic “*liu-bai*” (artistic blanks), and philosophical “*liu-bai*” (philosophical blanks).

Relevant in every Chinese art form, from Chinese classical ink painting to Chinese garden and architecture design, “*liu-bai*” is considered a particularly valuable sort of space, not seen as negative or empty (Ma, 2003). In pictorial art,

“*liu-bai*” carries a room for imagination inside the pictorial frame, and establish a bi-directional communication. It plays a critical role in passing information, expressing artistic emotions, and bearing artistic spirit.

The concept of “*liu-bai*” enlightened the author on the idea of “using space as compositional element”, and helped the author to form a concept called “entitative space”³⁸. This special kind of “empty space” in Chinese classical art has strong connections with the concept of negative space from the perspective of the form in which they are presented. However, from the perspective of the artistic expression, they are quite different.

(3). The Differences Between Negative Space and “*Liu-Bai*”

As introduced previously, the negative space refers to the space that exists around the depicted objects. Negative space is a broad concept. It includes almost all kinds of areas in artwork which is not occupied by entities. It is usually presented in artworks as empty areas where no objects or images are located, and these empty areas in an artwork are not normally considered to be the primary subject or object. Sometimes a negative space in a work is intentionally designed to form a relevant shape, and is used to implicate concrete objects. This is the circumstance when negative space conveys suggestive information and symbolic

³⁸ The concept and definition of “entitative space” will be introduced in Section (4).

meanings. In this type of artwork, the negative space that is outlined and presented by the positive space is frequently used to depict another independent object — the shape of the negative space, by itself, can be understood, without recognizing the depicted objects in the positive space, and vice versa. For example, in Figure-22, the shapes of the lamp and the two faces can be recognized by the outlines of themselves. These two shapes represented by the positive and negative space can exist and have meanings independently. They are not related to each other in meaning, and there is no mutual association between them. In other words, if we extract the two shapes and observe them separately, both of the shapes make sense by themselves.

Figure 22 – Negative Space Illustration Which Depicts Two Faces and A Lamp

However, a “*liu-bai*” will not convey any meaning or information without the existence of the depicted objects or presented contents. For example, in Figure-23, the artist depicted a boat with two people on it, and left all the other pictorial area to be empty. There is no line or plane that actually holds the boat.

Nevertheless, the information conveyed by the depicted objects, such as the boat and the figures' action, can indicate the existence of the water. For the observers, based on the clues given by the depicted objects and their experience, it is easy to imagine that the “empty” pictorial area is full of water. The “empty” space is thus filled up with the observer's imagination. This imagination is based on the observer's personal experience and the information provided by the depicted objects, instead of the shape or outline of the empty area (“*liu-bai*”).

Figure 23 – A Chinese Ink Painting in Which the “*Liu-Bai*” is Used to Indicate Water, Which is Not Depicted

By comparing the definitions, descriptions and examples of negative space and “*liu-bai*”, the author makes a summarization of their characteristics as follows:

- 1) Negative space refers to the space that exists around the depicted objects.

It is a broad concept which includes almost all kinds of unoccupied areas in an artwork; “*Liu-bai*” is an artistic expression method which refers to the action of intentionally leaving an area blank for the purpose of

carrying a room for imagination. Therefore, the empty space created by “*liu-bai*” can be regarded as a special type of negative space which carries symbolic meaning.

- 2) Negative space represents certain objects or conveys certain meanings when it is given a concrete shape or outline by the depicted figures; “*Liu-bai*” represents certain object or conveys specific meanings by the provided hints, clues, or limited information from the depicted figures or the context.
- 3) The information conveyed by negative space and the positive space are not necessarily related; The information conveyed by “*liu-bai*” and the depicted figures are interrelated, and need to be used to implicate each other and complete the meaning of each other.
- 4) The objects defined by negative space are presented as their appearance and can be recognized from the shape or outline of the negative space; The objects defined by “*liu-bai*” are not presented in their appearance, and cannot be recognized from the shape or outline of the empty space per se.

- 5) The shape of the negative space itself is the object it symbolizes or represents; “*Liu-bai*” implicates the objects which exist within the area of “*liu-bai*” but are not explicitly depicted.

(4). “Entitative Space”

Based on the concept of negative space and “*liu-bai*”, the author proposes a term called “entitative space” for Visual Music creation. It refers to the kind of space which is not occupied, but is utilized to indicate or symbolize specific entities exist in this area. It is closely associated with its surroundings, and is reminiscent of certain objects or events that are not presented. In other words, the “entitative space” can be understood as “the space of the hidden and invisible entities”, not seen as negative or empty.

The concept of “entitative space” originates from both the concepts of negative space and “*liu-bai*”, and is subsumed in the range of negative space (Figure-24). Therefore, the “entitative space” can also be called “entitative negative space”, which refers to the type of negative space that indicating entities. In the same way as negative space and “*liu-bai*”, the “entitative space” appears as an “empty space” that is limited and shaped by the presented contents. However, the primary difference is that the “entitative space” serves as the main subject of an artwork, and is used to carry and convey the core idea of the artist. Table-1 makes a comparison between negative space, “*liu-bai*”, and “entitative space”.

Figure 24 – The Relationship Between Negative Space and “Entitative Space”

	Negative Space	“ <i>Liu-Bai</i> ”	“Entitative Space”
Space in artwork that is not occupied by entities	Yes	Yes	Yes
Interrelated with depicted objects in meanings	Not necessarily	Have to	Have to
The primary subject in artwork	Can be	No	Yes
Indicates objects / conveys information by the appearance of the areas	Can be	No	Can be
Indicates objects / conveys information with the clues provided by the given objects	Can be	Have to	Have to
Serves for the same theme as the given objects	Not necessarily	Yes	Yes

Table 1 – Differentiations Between Negative Space, “*Liu-Bai*”, and “Entitative Space”

The interactive mechanism of “entitative space” is closely connected to one of the Gestalt principles, which is called “completion”. This is where the

audio/visual information may not all be presented, but where our brain completes the event for us. This kind of “empty space” can be used in artworks to suggest objects or subjects while leaving freedom of imagination for the viewers at the same time.

3.3.2 Space in Chinese Classical Art

Chinese painting has a long history of developing the methods of creating and utilizing space. It is different from the Renaissance solutions. Although in the eyes of many, most of the traditional Chinese paintings look relatively “flat” compared to those Renaissance paintings which employ, for example, linear perspective, the Chinese philosophers and artists have developed their own schemata of creating (the sense of) space based on the local Chinese ideology and aesthetics. Ernst Gombrich (1969) wrote in his book “the language in which we discuss pictures differ so radically from the critical terminology of the Far East that all attempts to translate from one into the other are frustrated by this basic difference of categories.” (p.150) Indeed, the differences shown by the appearance of the paintings and the solutions of translating natural space into pictorial space come from the different understandings of space.

(1). Multi-Spot Perspective

The most common perspective methods are one-point perspective and two-point perspective. These are static spatial composition methods – one piece of painting presents a single frame of an individual observer’s perceived space from a specific observation point in physical space.

The multi-spot perspective is the most typical perspective in traditional Chinese painting, especially in Chinese classical landscape painting. It is a dynamic spatial compositional method, which breaks through the limitations of time and space. In one piece of painting, the viewpoint keeps shifting. The objects that are being viewed at different time points along the timeline are put together into one composition. Similar to a panorama, looking at a painting is like walking through the landscape during a certain time period.

The multi-spot perspective inspired the author on the idea of “deconstructing the original physical space, and reconstructing a musical space”. It provides the basic grammar for the author’s proposition of “composing a space musically”.

(2). Space in Chinese Classical Art

Landscape painting, which in Chinese is called *shan-shui-hua* (literally as “the painting of mountains and waters”), is an important branch of traditional Chinese painting. On the utilization of space, the landscape painting is relatively

representative among various kinds of Chinese paintings. We can have some insight into the traditional Chinese aesthetics and ideology of space through the analysis of Chinese classical landscape paintings.

The earliest examples of Chinese landscape painting are found in the Han Dynasty (202 B.C. – 220 A.D.). Since the Tang Dynasty (618 A.D. – 907 A.D.), it became an independent genre, and reached the pinnacle of artistry in the Song Dynasty (960 A.D. – 1279 A.D.). (Chae, 1997)

Among the various genres of Chinese painting, landscape painting stands out for its unique characteristic of the dialectical unification of the objective scenery and the painter's subjective emotion. This characteristic makes landscape painting a popular way of expressing inner feelings and creating an ideal spiritual world for Chinese scholars and artists. "Landscape painters attempted to capture both the spirit and substance of the landscape—that is, the spiritual appearance of nature in addition to a realistic portrayal of physical form as perceived directly by the senses." (Chae, 1997)

The landscape paintings became the favourable art in China, also connecting with the great influence of Taoism (McMahon, 2003), which has unique understanding of space, time and nature. Studying the development of Chinese

landscape painting can help us to understand the Chinese ideology and aesthetics of space.

Chinese classical landscape painting is considered to be a pictorial representation of the spirit of nature. Considered the core elements of nature, mountains (including the rocks and trees on the mountains) and waters (including all kinds of waters like river, streamlet and lake) became prominent in Chinese landscape painting.

Archaic representations of mountains and waters in Chinese closely resembled their ideographic forms: mountains 山 (standard written Chinese: 山, pinyin: /shan/) depicting three mountain peaks, and waters 水 (standard written Chinese: 水, pinyin: /shui/) showing the shape of waves in a river. From the pre-Tang (before 7th century) to the early Yuan dynasty (late 13th century), shown by archaeological evidence, one finds the first primary development stage of Chinese landscape painting. This period is the turning point in the change from ideographic motifs to the establishment of illusionistic space. One of the important compositional discoveries was the utilization of overlapped triangular mountain motifs to suggest recession (Figure-25). (Fong, 1969, 1971)

Figure 25 – Overlapped triangular mountain motifs suggest recession

In Tang and early Song landscape paintings, the pictorial space is “compartmentalized”: a picture is displayed in different stages, each with a carefully designed receding plane tilted at a different angle towards the audience. By revealing different views of a landscape in a pre-designed sequence, a Northern-Song hanging scroll represents no mere retinal impression of nature, but a macrocosmic image. Individual motifs are organized on an additive manner: they are to be seen part by part, motif by motif.

By the seventh and eighth centuries, three basic compositional schemas were developed. These three principal schemas, later in the Northern Song dynasty, were formulated by Guo Xi³⁹ (Chinese: 郭熙, Wade-Giles: Kuo Hsi, active ca. 1068-1085) as the “Three Distances”⁴⁰: “high-distance” (gao-yuan), “flat-distance” (ping-yuan) and “deep-distance” (sheng-yuan) (Fong, 1969). To be specific, according to the text in *Linquan-Gaozhi*⁴¹(Figure-26), when looking at

³⁹ Guo Xi (c. 1020 – c. 1090) was a Chinese landscape painter, art theorist and literate who lived during the Northern Song dynasty and served as a court painter under Emperor Shen-zong (reigned 1068–1085).

⁴⁰ The most important contribution of Guo Xi is the systematic and theoretical conclusion of the three basic compositional schemas for Chinese landscape painting, which he named as “Three Distances”.

⁴¹ GuoXi’s art theories on landscape painting was recorded by his son, Guo Si, in an aesthetics and art theory book entitled *Linquan-Gaozhi* (Chinese: 林泉高, literally translated as “*The Lofty Message of Forest and Streams*”). This book is accomplished in the 7th year of the Zheng-he period in the reign of Emperor Huizong (around A.D. 1117). It is considered as the first comprehensive and systematic treatise on the artistic conception, aesthetics, creation theories and techniques of Chinese landscape painting. (Sullivan, 1979)

a mountain from below up toward its summit, this view is called the “high-distance” view; when gazing from a nearby mountain at one in the distance, this is called “flat-distance” or “plane-distance” view; and finally, when looking at the mountain from the front toward the back, this is called “deep-distance” view (Figure-27 and Figure-28). The “Three Distances” has been the basic rules to Chinese landscape painting ever since. (Sullivan, 1979)

Figure 26 – The original text of “Three Distances” in *Linquan-Gaozhi* (*The Lofty Message of Forest and Streams*)

Figure 27 – Diagram of the “Three Distances” (1), drawn by the author

Figure 28 – Diagram of the “Three Distances” (2), from the book *Manual of the Mustard Seed Garden*

By the early twelfth century spatial continuity was achieved through a simplification of forms. In Li Kung-nien’s *Winter Landscape* (Figure-29), there is no clear ground-plane that links the objects, but the space depicted can still be recognized as unified and continuous. Finally, in the late thirteenth and early fourteenth centuries, physical integration of landscape objects was achieved through the establishment of a consistent and receding ground-plane. In Huang Gong-wang’s (Chinese: 黄公望, Wade-Giles: Huang Kung-wang, ca. 1269-1354) *Dwelling in the Fu-ch’un Mountains*, dated 1350 (Figure-30), an illusionistic technique of fused brushstrokes suggests forms seen through atmosphere, and the forms are construed as physically connected, organic masses (Fong, 1971).

Figure 29 – Li Kung-nien (ca. 1100), *Winter Landscape*

Figure 30 – Huang Kung-wang (1266-1354), *Dwelling in the Fu-ch'un Mountains*, Dated 1350

In *Sailboat in Rain* (Figure-31) attributed to Xia Gui (Chinese: 夏圭, Wade-Giles: Hsia Kuei, active ca. 1195-1224) “...there is no ground-plane that actually links or holds the objects, but the space depicted is unified and continuous. Frontal silhouettes of mountains and trees are made to float and fade into a void, representing a mist which ties the elements in a sequential fashion motif by motif. Disconnected silhouettes of dissolved forms, ranging continuously through space, are united by the mist or void around them” (Fong, 1969, p. 393).

Figure 31 – *Sailboat in Rain* attributed to Xia Gui (Chinese: 夏圭, Wade-Giles: Hsia Kuei, active ca. 1195-1224)

All of these compositions mentioned above show very different methods of dealing with the pictorial space compared to Western paintings, which bring us to the question of how to understand the meaning of “space” in Chinese ideology, aesthetics and art works. The “empty space” in picture carries a room for imagination inside the pictorial frame, and establish a bi-directional communication.

Charles Fabens Kelley (1951) mentioned the ancient Chinese's attitude to nature in *Chinese Painting* as follows:

“...the art of all countries has dealt first with the actions of men and animals as historic recordings, nevertheless, when art began to stand on its own not human beings with landscape background that the Chinese painted, but the world, Nature itself, within which the actions of men might take place. It was nature in a cosmic, not a landscape gardening, sense which appealed to the Chinese. There was always a feeling of mystery and awe and an intense desire to be identified with the surrounding landscape.” (pp.67-68)

This attitude originates from the ancient beliefs of the Chan sect (Zen Buddhism, standard written Chinese: 禅). In the court of the Chan sect perception, all natural phenomena and elements, the stone, flower, tree, are taken as manifestations of the spirit of universal life, and are of equal value with the human being. When landscape painting was coming to maturity in the Song Dynasty, the Chan sect also reached its highest popularity. (Kelley, 1951)

Compared with Song Dynasty landscape painting, when art still generally retained its primary function of representation, Yuan (1271 A.D. – 1368 A.D.) scholar-painters saw painting as an expressive outlet for feelings. (Chae, 1997)

In other words, landscape painters in the Song period were amazed by the suggestive power of the visual image, which was understood as the form itself represented. In the Yuan Dynasty other types of painting were seen as forms of individual artistic expression like calligraphy, and representational aspects were

devalued (Bush, 1971). This literati tradition that peaked in the Song period is fundamentally connected to a Confucian view which emphasizes the character of a man (the qualities of an artist-scholar) over his work.⁴² Chinese landscape painting is an art form “that first was practiced by a social class and then slowly evolved into a stylistic tradition” (Bush, 1971).

“Space is a positive factor in Oriental painting, never mere vacancy as too often happens with us. Perspective was often arbitrary, but the most intricate architectural forms were lucidly drawn in a sort of parallel projection rather than with converging lines. In atmospheric perspective with veiled distances and diminishing contrasts they were supreme, and they never forgot that the logical development of a picture was always in the direction of esthetic fulfillment rather than in statistical completion.” (Kelley, 1951, pp.68)

With panoramic vistas, views of mountains, rivers and valleys, scenes of four seasons, Chinese landscape painting manifests both physical and spiritual depth of space, where the painted and empty space or voids interact in perfect equilibrium like the dualism of yin and yang (explained earlier). (Chae, 1997)

Interconnecting broad ethical, historical, and philosophical texts, Hsu Fukuan in *Chinese Art and Philosophy* (1991) asserts that Chinese culture aims at harmony between humans and nature and does not intend to conquer nature so as to be

⁴² For more elaborate discussion, see, James Cahill, “Confucian Elements in the Theory of Painting,” in *The Confucian Persuasion*, ed. Arthur Wright (Stanford: Stanford University Press, 1960).

used by men. Hsu insists that the emphasis on human nature and the mind in Chinese culture affects Chinese art and aesthetics. Hsu disagrees with some Chinese critics who claim that Chinese painting and calligraphy are abstract arts by pointing out that even the arts in the prehistoric period cannot be classified as abstract in the modern sense. Rather, he sees Chinese art as having been developed with the notion of harmony between artist and beholder, between the painting and its subject, in which one can find reality and abstract qualities, but these relationships are different from Western notions of realism and abstract art.

As mentioned in the above section, the conceptual framework from Taoism and Chan Buddhism provides both the painters and the viewers with more room for expression and discovery by means of their own aesthetic sensibilities. The depicted objects in landscape paintings are elements that selected and composed to express feeling and emotion, instead of representing the original view. In another words, the core idea of Chinese landscape painting is to compose landscape musically.

The Ming Dynasty (1368 A.D. – 1644 A.D.) painter Dong Qi-Chang (Chinese: 董其昌, Wade-Giles: Tung Chi-Chang, ca. 1555 – 1636) declared (translated literally): “Depicting the rising and falling of distant mountains to convey a sensation of power; depicting the varying height of the trees in a forest to express a specific feeling. This is the essence of landscape painting.” As stated by

McMahon (2003), “Chinese painters do not miss a chance to show dynamism and change. The sense of rising and falling, which may not seem like much, is almost everything, because it gives the unique Taoist hint of the cycle, the thrusting out and coming back, the advance and retreat, the journey out and the return home” (McMahon, 2003, p. 69).

Figure 32 – The original text of the art of “view-recreating” in *Linquan-Gaozhi* (*The Lofty Message of Forest and Streams*)

From ancient Chinese texts on the theory of painting we can know that what the Chinese landscape painters pursued is not only the art of “view-finding”, but also the art of “view-recreating” (or “view-recombining”). In *Linquan-Gaozhi*, Guo Xi explicated his principle of “view-recreating” which was influential at that time and affected the later paintings a great extent (translated literally): “A mountain without mist and cloud feels like the spring without flowers and trees. A mountain without clouds is not beautiful enough, without waters is not charming

enough, without paths is not alive enough, without woods is not vivid enough; without ‘deep-distance’ is too shallow, without ‘flat-distance’ is not remote enough, and without ‘high-distance’ is not soaring enough (Figure-32)”. The landscape painter subjectively segments the continuous visual scenery, and recombines the fragments together with the different visual elements arranged at certain locations of the picture, to create an idealized natural landscape (the painter’s own psychological scenery). This kind of landscape is not intended to provide a representation of the objective scenery, but to express the painter’s subjective emotion or convey his determination and lofty ideals. The subjective landscape composed by painters can be regarded as an analogy to the music composed by musicians, which describes the artists’ emotion and mood. Therefore, from the static depicted landscapes, we are able to sense dynamic emotions. These artistic emotions are expressed through composition of the visual elements, which is strongly analogous to, if not just the same as, the composition of musical notes of various melodies to express the subjective feelings of joyfulness or pleasure, dejectedness or melancholy, sadness or sorrow, anger or fear, serenity or calmness.

(3). Interaction Across Physical and Pictorial Space

Different from the “multi-spot perspective” in landscape paintings which present dynamic and switching view points in a single composition, the Chinese classical

narrative illustrations often apply another strategy: a fixed visual center is given in the pictorial space as the definite focus, and the artist utilizes the device of “focalization”⁴³ to intentionally extend the pictorial space into the observer’s physical space in order to form communications between the depicted contents and the observers (Wu, 1996). For example, in an early 6th century stone carving, *Story of Liang the Excellent* (Figure-33, left), the artist created two divided pictorial spaces: (1) the “internal” space inside a depicted room where presents an image of a woman as the central “focus”, and (2) the “external” space outside the room where presents two figures who are looking at the woman intently as the primary “focalizer”. These two figures that depicted in the “external” space reinforce the woman’s centrality in visual perception.

Figure 33 – Stone carving, *Story of Liang the Excellent*, early 6th century (left), and diagram of the pictorial and physical space (right), drawn by Wu Hung

⁴³ A strategy which utilizes the relationship between “focus” and “focalizer” to create interactive effects.

In *The Painted Screen* (1996), Wu Hung explains the mechanism of the separation of space and interaction across space as follows:

“...We know that this kind of large glass screen could not have possibly existed in the third century. The question thus becomes why people imagined such a transparent screen: it did not block one’s view and thus did not fulfil a screen’s basic function of creating a practical enclosure. The answer must be that although the line between interior and exterior had become invisible, the separation between the two spaces was still there and could be mentally envisaged. The advantage of this screen was that it not only divided space, but also allowed people to see into both spaces...” (Wu, 1996, pp. 73-74)

Figure 34 – Diagram of interaction across physical and pictorial space in *Story of Liang the Excellent*, drawn by the author

The relationship between the “focus” and the “focalizer” forms a focus polarity and visual contrariety within the pictorial space: the former, the woman in the

room, occupies an interior space and subjects herself to the latter's gaze; the latter, the two figures outside the room, dominates the exterior space and embodies the spectator's gaze. The "focalizer" (the two figures) extends the gaze of an external spectator, and makes a reconstruction of the pictorial spaces by connecting the "external" pictorial space with the physical space of the spectators, and isolating the "internal" pictorial space to be an independent space. The spectators are thus brought into the story of the artwork and play the same role as the two depicted figures. This is an example of reconstructing the space and form interactive narratives across the pictorial (the depicted figure's) and physical (the spectator's) space (Figure-34). This strategy contains the separating of the pictorial space, and the jointing and merging of the pictorial space in the painting and the physical space in real world.

(4). Space in Chinese Garden and Architectural Design, and Its Ability of Enhancing Emotional Expression

The design and arrangement of physical space has been regarded as an effective way to help the expression and evocation of emotional information in a variety of areas. Architecture and landscape design are typical fields in which the space design is widely employed to affect people's experience, feeling and emotion. Take one kinds of space design which was extensively applied in two Chinese imperial palaces of Ming and Qing dynasty as an example (Figure-35): The

Forbidden City in Beijing, built in 1406, and the Ming Palace in Nanjing, built in 1366. In these two palace, emotion-based space design was widely applied.

Figure 35 – The Map of the Forbidden City (the Palace Museum) in Beijing (left), and the Map of the Ming Palace (also known as the “Forbidden City of Nanjing”) in Nanjing (right)

The designers of both palaces used a series of spatial comparisons and contrasts to intensify the visitor’s feelings of grand and awe-inspiring. A number of contrasts in size, scale, height, width and density make the perceived buildings and landscapes seems more spectacular than they really are.

Figure 36 – Satellite imagery & map (partial) of the Forbidden City (the Palace Museum) in Beijing

Figure 37 – Diagram of the entrance and *Taihe* square of the Forbidden City & the Ming Palace, , drawn by the author

Take the space design of the entrance area of the Forbidden City as an example (Figure-36 and Figure-37): This region starts from Tian'anmen Gate, passes through Duanmen & Wumen Gate, to enter the first square and also the main

square – Taihe Square (in English is the Square of the Supreme Harmony). The pathway leading to *Wumen* Gate is narrow and is encompassed by towering buildings and wall. The designers used the space as an effective tool to create an atmosphere of regal majesty and splendour, and make the visitors deeply impressed by the supremacy of the feudal imperial power.

3.4 Space's Ability of Reshaping the Timelines

The Intervention of Space Can Act on "Time"⁴⁴

Based on the notion of space and time, which declares that space and time are relative and only the speed of light is constant (Shlain, 2007), Albert Einstein made a series of "thought" experiments to illustrate his insight. For example: (1) Imagine that you are standing on a train and your friend is standing outside the train to observe it move. If lightning struck on both sides of the train, your friend is likely to see two lightning bolts simultaneously. But on the train, because you are closer to the lightning that the train is moving forward, you would see it first as the light has a shorter distance to travel. This thought experiment tells us that the time is different for people who are moving and still; (2) Imagine you are standing on a train which departs the train station at 12 o'clock. If this train

⁴⁴ The quotation mark added to "time" is meant to suggest that this "time" is not the objective time. It is a subjective time that established in particular context and depend on the existence and actions of observers or human beings.

hurtles away from the clock tower in the station at the velocity of light, when you look back to see the time showed on the clock, you would see that the time on this clock stands still to be 12:00. This is because the light that contains the message of “12 o’clock” is always traveling with the train at the same speed, and the light of the next minute could never catch up (Shlain, 2007).

Einstein’s “thought” experiments (or gedankenexperiments) on the relationship between space, time and the speed of light reveals: the involvement of physical space is able to create an interactive relationship between the spectators and “time” (the represented time).

Stephen Handel (2006), who research on the relationship between visual and auditory cognitions, considers the act of looking or listening as a recognition process of subjects and the context. He claims that things exist in space and time, and the perceived world is a four-dimensional space within which the objects have the attributes of both space and time. A perceived object’s attributes will not be constant but change over time.

The above studies have given the author great inspiration on the artistic utilization of physical space in Visual Music (as a form of temporal art). Since many of the art forms are time-related and have temporal dimensions, especially those typical time-based media such as video, film and animation, the above

thoughts led the author to an interesting idea: if the intervention of physical space can act on the “time” in a scene and affect the audience’s perception of an artwork’s temporal attributes, then it will be able to create points of interaction between artworks and the spectators, and enrich artistic expression for the artistic creations.

Let’s imagine a scenario, in which the intervention of physical space in a Visual Music performance space allows the artist to map “time” to space, and to reshape and expand the original timeline of the artwork (see Figure-38): Several speakers are placed at different locations in a certain space. Each of them, as an individual unit, plays a music piece along its own timeline⁴⁵. Each piece of music is identified by a straight line with different patterns in the diagram. Since there are several units playing their own music in this space, in Figure-38 we have several straight lines with different patterns to show these different music pieces visually. If an audience member stands still by a unit, he/she would hear a complete piece of music played by it. Now if this audience member starts to move around in this space, he/she will hear several different fragments of music that played by different units while he/she passing by. This action will let the him/her get a new music piece, which is an assembly of the fragments he/she heard along the way.

⁴⁵ To avoid the music mixing with each other in this space, sound localizers, such as a sound dome, can be used in each unit.

This new music piece is showed visually as the patterned curve line in the diagram. Every time the audience visits these units with different sequence, stay for a different time period, and walk with a different speed, he/she will re-compose a new piece of music along his/her own timeline. Different audience members will get different experiences, and even the same person, he/she will not get identical music piece if he/she enters this space twice.

Figure 38 – Space expands the timelines

In this example, the timeline (as one form of the representations of time) is expanded by the intervention of physical space and the movement of an individual audience member in this space, and because of this expansion, the possibility of recomposing music (information) is provided and expanded as well. The intervention of physical space not only expands the single plane to

more layers and a broader space for artistic expression, but derives multiple possibilities of timelines. It helps to upgrade an artistic performance/environment from fixed to highly dynamic, and from limited pre-programmed patterns and movements, to limitless possibilities.

4. SPATIAL VISUAL MUSIC

What art offers is space - a certain breathing room for the spirit.

— John Updike

The previous chapter introduces an overlooked element in Visual Music studies — the space, illustrates the perception of different kinds of space, proposed the concept called “entitative space” which roots in Chinese classical art aesthetics and Taoist ideology, and explains the space’s ability of enhancing emotional expression and interaction. Based on the pervious discussions of space, in this chapter, the author attempts to introduce space (especially physical space) into Visual Music. This chapter extends the previous Visual Music study and proposes an idea of “combining space with Visual Music”. The author asserts that the space can be regarded as a compositional element, instead of a container for audio-visual content, and therefore leads to a new genre of Visual Music, which can be understood as Spatial Visual Music.

This chapter presents the core proposition of the current study. The following sections will introduce: (1) the idea of “combining space with Visual Music”, (2) the concept of Spatial Visual Music and its definition, and (3) the interactive mechanism of Spatial Visual Music, which involves the contents of: (a) the general structure of the Spatial Visual Music, (b) the relationship between time

and space in Spatial Visual Music, and the concepts of “mapping time to space” and “reshaping timelines in physical space”, and (c) two concepts called “Memoryscape” and “Digital-Cortex”. The interactive mechanism provides the theoretical and methodological support for the subsequent artistic practice.

4.1 Spatial Visual Music — The Idea of Musically Compose the Space

In the early 1960s, the American composer John Cage (1912-1992) made a visit to Japan, and in particular to the famous dry rock garden of the temple Ryōan-ji in Kyoto. This experience “delivered a vital impetus for a methodological apparatus that sought to compose-out the garden’s spatial structure” (Fowler, 2014, p.34). The tenets of the garden’s spatial relationships, combined together with his earlier acquisition of the Chinese oracle I-Ching and Zen Buddhist thought on musical aesthetics, provided a valuable model for interrogating the “spatio-temporal dimensions” of his musical aesthetics. 20 years later, an oboe and obligato percussion work, *Ryoanji*, was presented by him as the definitive musical endpoint of his visit to the garden (Fowler, 2014).

The garden, *kare-sansui*, at the Rinzai Buddhist temple of Ryōan-ji is characterized by its simplicity of form and austerity of materials. It is a 15m x 6m rectangular area that is primarily comprised of meticulously raked gravel. Five groups of rocks are placed within the gravel. According to Fowler’s

description, there are fifteen rocks embedded within this area in total, but for the viewer at any point, only fourteen of them can be seen at one time.

This garden was constructed in the late fifteenth century by anonymous garden workers. The intangible origin of this garden leaves a continuous mystery of its meaning, but interestingly, it also provides a context for “across-time-and-space communication” between the garden’s original designer and contemporary visitors. Cage experienced it in his first visit to this site in 1961. During this visit, he was motivated to re-compose the garden as a musical score with a collection of his own fifteen stones. In the end he translated the *kare-sansui* into a musical analog with the “spatial proclivities of the garden’s geometry as a metric and a valuable inter-media transfer tool (p.35)”. Cage’s concept of musical sound-space encouraged the author in her idea of “musically composing the space”, leading to further explorations on the utilization of spatial parameters in Visual Music creation.

4.2 The Definition of Spatial Visual Music

As mentioned previously in chapter 2, Paul Friedlander (1998) gives his understanding of three kinds of Visual Music as: (1) “a means of converting music to images using a system or set of rules which can be implemented as a machine or computer code”; (2) “a means of expressing music in visual form

requiring the active involvement of an artist, designer or director to interpret the music and find the means to express it visually”; and (3). “Visual Music has no relationship with music as such, although it maybe viewed with or juxtaposed with music. Visual Music is about creating visual relationships which change over time”.

Keefer and Ox (2006) identified four kinds of visual structures which can be called Visual Music: (1). “A visualization of music which is the translation of a specific musical composition into a visual language”; (2). “A time based narrative visual structure that similar to the structure of a kind or style of music”; (3). “A direct translation of image to sound or music”; and (4). “A visual composition that is not done in linear, time-based manner, but rather something more static like a 7’×8’ canvas”.

The author, based on Friedlander, Keefer and Ox’s description, proposes a term called Spatial Visual Music, and defines it as a sub-genre of Visual Music⁴⁶. With the emphasis on the qualifier “spatial”, this term refers to a particular type of

⁴⁶ Based on Friedlander (1998), Keefer (2006) and Ox’s (2006) description, the term “Visual Music” refers to one kind of Visual Music — “a time based composition which is about creating music-like visual relationships”.

Visual Music creation in which the artists create music-like visual relationships by composing the physical space.

The term Spatial Visual Music is thus defined as a type of artistic expression, which requires the act of using various compositional elements to process and compose a physical space as a visual score. These compositional elements include but are not limited to, visual, auditory and spatial parameters⁴⁷.

The author makes a differentiation between Spatial Visual Music and Visual Music artworks presented in space. Figure-39 shows the differences of the creative process between Spatial Visual Music and the “non-spatial” ones. It is clear that the most significant difference between a “spatial” and “non-spatial” one, is whether the space is regarded as a third compositional element that to be composed in addition to visuals and sounds.

⁴⁷ More sensory stimuli could be used to reshape a space, for example, aroma, a sensory stimulus which penetrates separated spaces, could be a good tool for building relationships between spaces, and it also has the potential of poetically expressing musicality.

Figure 39 – Differentiating Spatial Visual Music and the “Non-spatial” Ones

Figure-40 gives a formula definition of Spatial Visual Music, and a differentiation between Spatial Visual Music and the other forms of art creation that related to the utilization of space.

Figure 40 – Definition of Spatial Visual Music, and a differentiation between Spatial Visual Music and other forms of art creation that are related to the utilization of space

Generally, there are two common forms of art creation which involve the utilization of a physical space or spatial attributes in the final product: (1) the artworks which present visual and auditory events in a space; and (2) the artworks which make visual and auditory events to be spatial. The first form normally appears as installations that placed in space, but the creative focus does not include the composing of the occupied space (q_{OF1-1}). The second form can also be regarded as spatialization of visuals and sound. It usually appears as artworks like: (1) 3D visual performance (q_{OF2-1}), (2) stereo sound performance⁴⁸ (q_{OF2-2}), or (3) the combination of (1) and (2) (q_{OF2-3}).

Spatial Visual Music requires the process of composing both the actual space (μ) and the perceptual space (μ').⁴⁹ The actual space (μ) refers to the physical space of the performance, which can be affected by adjusting spatial parameters including scale/size, distance/depth, location and relative location, orientation,

⁴⁸ The art practice that creates surrounding sound systems using either multiple loudspeakers or virtual (binaurally generated) surround sound (Rumsey, 2012).

⁴⁹ What most of the kinetic sculptures composed is the visual objects, this is the “positive space”. It is the body of the architecture (landscape), not considering being shaped space surrounding it (the “negative space”). Spatial Visual Music is the genre that requires the act of composing both the positive & negative space, and even more focuses on “composing the positive space for the shaping of negative space”. Therefore, if a kinetic sculpture is designed for and give meaning to both positive and negative space, and uses the shaped space to carry musicality, then this kinetic sculpture can be called “a work of Spatial Visual Music”.

boundary, shape of a space, etc. The perceptual space (μ') refers to a perceptual illusion of space, which is affected by the changing of visual (X) / audio (Y) details⁵⁰. Therefore, the overall experience of a Spatial Visual Music performance is determined by the composition of spatial parameters, and the composition of visual and audio elements.

The author realizes that there is a similar concept, which involves the exploitation and utilization of space, called “spatial music”. Therefore, it is necessary to differentiate the role of sound sources in Spatial Visual Music and “spatial music”.

“Spatial music” is a term referring to the experiments with musical sounds moving in space. It involves the intentional exploitation of sound localization in music composition. The “spatial” in this term can also be understood as “spatialization” which denotes the localization and movements of sound sources in space physically or virtually (Solomon, 2007). In “spatial music”, the location and movement of sound sources are the basic compositional elements and the major focus of creation. Robin Maconie (2005) identified three primary distinct categories when multiple acoustic events are imported into space and treated

⁵⁰ In the current study, the author chooses to use audio and visual elements to compose the perceptual space. In future study and practice, other sensory sources could be involved in the process of composing perceived space (μ') as well.

spatially: (1). The essentially isolated events separated by the space, each with some distinctive characteristics; (2). one or several such distinctive events, separated by passive and profound contextual backgrounds; and (3). performing groups which are physically separated but coordinated in content.

The roles of a sound event and space in Spatial Visual Music and “spatial music” are different (Figure-41): the sound event is the target of the creation in “spatial music”, with the space taken as a place for expanding and spatializing the event (a); while in Spatial Visual Music, the sound source plays a role of “reshaping agent” to be utilized for composing the space, and this space is the central focus of the overall creation, which will be transformed into a three-dimensional visual score (b).

Figure 41 – Differentiating the role of acoustic events in “spatial music” and Spatial Visual Music

Therefore, although the sound sources and techniques utilized in Spatial Visual Music may be similar to those in “spatial music” (Spatial Visual Music may also involve either single stationary / moving sound source, or multiple, simultaneous, stationary / moving acoustic events in multiple locations), the overall design focus and purpose are fundamentally and qualitatively distinct.

4.3 The Interactive Mechanism of Spatial Visual Music

This section illustrates the interactive mechanisms of Spatial Visual Music by introducing its structure and explaining the relationships between time and space in Spatial Visual Music. These interactive mechanisms serve as the theoretical methods for the artistic practical approaches in Chapter 5.

4.3.1 The Structure of Spatial Visual Music — Nested Structure and “Meta-Score”

There is a multi-level nested structure in Spatial Visual Music. As mentioned in the above section, the entire Spatial Visual Music artwork is designed as a three-dimensional visual score that unfolds along different timelines in all directions in this physical space. In addition to this, within the huge overall three-dimensional visual score, there are smaller visual scores nested, and interrelated to each other (see Figure-42): A “unit” is designed as the basic motif in the nested structure. Each of them is a single visual score composed with different kinds of

compositional elements. Then, within a sub-region of the performance area, these “units” are turned into compositional elements, and are utilized to compose “groups” and “blocks”⁵¹, which are small-scale complex spatial visual scores within their own sub-regions. The “group” and “block” are the first and the second nested classes, respectively. When it comes to the entire performance space, these small-scale complex spatial visual scores are transformed, again, into compositional parameters, and are utilized to compose the main score, and form a spatial visual score with a multi-level nested structure.

Figure 42 – Diagram of multi-level nested visual score

⁵¹ A “group” is a combination of two interrelated “units”, and a “block” is a small community of two to four neighbouring “groups” which are sharing a same sub-theme.

In addition, as mentioned above, the entire space is restructured and forms a complex three-dimensional visual score, but this visual score is not a static and fixed one. Both the main score and all of those sub-scores are in continuous communicating with the audience, and thus, dynamically change the audience's perceived result and affect the overall visual music experience: Firstly, when visitors walk inside this huge visual score, they observe those smaller sub-scores or the single events along their own chosen routes, and re-organize them to be a new sub-score (Figure-43). Secondly, since each unit and group will be sensing and responding to the random presence and action of the visitors, the perceived result of these sub-scores will vary from one to another. Besides, since these sub-scores are the compositional parameters of the main score at the same time, the changes of these sub-scores will lead to the change of the main score, and thus affect the overall experience of each individual audience member.

Figure 43 – Main visual score and the “sub-scores” that “re-composed” through different routes

W.J.T. Mitchell (1994) introduces the concept of “meta-pictures”, which are pictures that refer to themselves or other pictures with a nesting structure. He stated that “any picture that is used to reflect on the nature of pictures is a meta-picture” (p.57). Wu Hung (1996) explains further the concept of a meta-picture’s “self-knowledge” introduced by Mitchell. Wu Hung regards the painting both as “image-bearing object” as well as “pictorial image”, and claims that a meta-picture should be interpreted both in terms of medium and representation (p.68). He emphasizes that a meta-picture is not about the “principle of duplication and repetition”, but rather the “dialectical thinking” between medium and image – which aimed at “assert its primacy in order to produce the other” (p.74).

The author regards a multi-level nested spatial visual score, which is a final product of Spatial Visual Music, as a “meta-score”. In a “meta-score”, the role of a visual score (either a singular score or a complex nested score) is dynamically switching between an artwork and a medium. In a music composition, the musical note is utilized as a “material” or a “source” to compose a melody or a musical piece; and the final musical piece is the product of this composing process. Similarly, in a “meta-score”, there are two objects as well: (1). the compositional element which is used to compose an audio-visual composition, and (2). the composition which is the outcome. The difference is that a single score has both of these two identities at the same time (Figure-44):

it is produced to be a composition through the action of composing a number of compositional elements; and it can be transformed into a compositional element as well when being used to compose an upper-level score.

In the dynamic responsive environment of Spatial Visual Music, the audience's interaction with, for example, a basic score, changes a single attribute or a series of attributes of its compositional element, and thus affects the appearance of this score; then, this changed score acts as a compositional element to affect another score in which it is nested.

Figure 44 – “Meta-Score” and Relationship Between Artwork and Medium

4.3.2 Time and Space in Spatial Visual Music

The perceptual world is experienced as a world containing objects that move about in a three-dimensional (3D) space. Most observers are aware of the volume of space as a quality of their experience. They are frequently less aware of the fact that their experience is taking place over time, although the passage of time can easily be noticed when pointed out. Thus, the perceived world is a four-dimensional world — 3D space plus time (Hershenson, 1999). The environment of Spatial Visual Music is a time-space-related environment.

In Spatial Visual Music, the author attempts to provide the audience with a “location/position-related” audio-visual experience through the active and responsive three-dimensional audio-visual environment. This environment is filled with distance-aware “units”. These units are placed in the performance area as motifs based on a designed pattern with each one of the motifs facing a certain direction. The concept of “location/position-related” can be explained from both individual and holistic perspectives.

Viewing the entire performance area as a whole, this entirety provides a “location/position-related” experience: In the environment of Spatial Visual Music, the “units” can be understood as audio-visual instruments that are placed in different locations within the performance area. When the “units” start playing, they emit sounds and project light from all directions, and form a compound of a

synchronized sound field and image field. With the intervention of spatial attributes, the perceived result of this audio-visual polyphony can be varied, depending on the location of each individual audience member.

When viewed within a partial perspective, the entire performance area can be divided into several sub-regions, with different yet related sub-themes under the main theme. Each of these sub-regions provides “location-related” experience as well: Within each sub-region, the distance-aware units are sensitive and responsive to the presence of an individual audience member, as well as his/her location and movements. A group of units act simultaneously based on the relative location relationships of the audience and the units, to form a local ambient audio-visual field.

(1). Mapping “Time” to Space

Among all kinds of relationships between different attributes and objects exist in the environment of Spatial Visual Music, the author paid particular attention to the relationship between “time”⁵² and space. In the environment of Spatial Visual Music, the performance area is designed as a “time-map”: the invisible time span is associated with the tangible physical distance of space. The physical pathways can be considered as timelines (along which the separated units are

⁵² Again, here the quotation mark added to “time” is meant to suggest that this “time” is not the objective time. It is a subjective time that established in particular context and depend on the existence and actions of observers or human beings.

linked), and, the spatial sub-regions are translated into temporal stages (Figure-45).

Figure 45 – Map “time” to space

The most commonly used single linear timeline is expanded to a number of crisscrossed and intertwined timelines that snake in different directions, and thus form a “timeline net” that spread over this entire area. In other words, this physical space is translated into a three-dimensional visual score that unfolds along different timelines (pathways) in all directions.

The “physical distance” brings the attributes of spatial depth into both the audio and visual presentation, and adds new characteristics to the perceived audio/visual information. These new characteristics share a number of common features with the characteristics of a person’s memories, which are affected and reshaped by (the changing of) “time distance”.

(2). Reshaping Timelines in Physical Space

In addition, as explained above, a “meta-score” is composed by a number of sub-scores, and a basic sub-score is composed by visual, audio and spatial elements.

Therefore, a “meta-score” can be perceived not only “score-by-score”, but also “element-by-element” — if we extract, for example, all the audio clips, and re-group them together in a time series fashion, as discussed in chapter 3, what we could get is a logically interconnected new music composition (the curved line in Figure-46). This kind of personalized music composition is generated by each of the individual audience’s movements in the environment of Spatial Visual Music.

Figure 46 – Personalized music composition generated by the audience’s movements

The above discussions on time and space in Spatial Visual Music lead us to more specific and concrete theoretical methods for Spatial Visual Music creation. The following section will introduce two concepts called “Memoryscape” and

“Digital-Cortex” as one of the theoretical methods for the practical approach, and give further explanations on the interactive mechanism of Spatial Visual Music.

4.3.3 “Memoryscape” and “Digital-Cortex”

In 1992, Mark Nuttall proposed a concept called “memoryscape” which is defined as “people’s mental images of the environment, with particular emphasis on places as remembered places” (1992, p. 39). The term “memoryscape” refers to a complex of both the physical environment that is recorded by an individual, as well as the interactions take place within its environment. In Nuttall’s view, human beings perceive the physical world through their senses not merely as a passive recipient, but also a participant that is culturally modifying, ordering, and conceptualizing it simultaneously (1992, pp. 39-40). On the basis of Nuttall’s definition of “memoryscape”, Claudio Aporta (2004) added as follow:

“Memoryscapes are not static entities; on the contrary, the concept expresses both the permanence of memory through time and the dynamics of people’s relationship with their environments. Memoryscapes are not transmitted from generation to generation as a mere corpus of geographical knowledge.” (p. 15).

(1). Definition of “Memoryscape”

From an artistic perspective, the author interprets the term “Memoryscape” (the landscape of memory) as a form of an externalized existence of the person’s memories and inner mind world. In another word, it is an artistic abstraction and

externalized expression of an individual's personal memory or impression of a certain time period. It is defined as a dynamic and responsive environment. Within the region of a "Memoryscape", this environment communicates with the visitors by presenting information, as well as receiving and responding to the visitors' action.

(2). Structure of "Memoryscape" and Its Interactive Mechanism

In "Memoryscape", a three-dimensional environment is constructed to embed the artistically abstracted "memory fragments" and externalize the artist's "memory world" (Figure-47 provides an overview of this environment). Therefore, the first step is to create a space (an environment) for performance. In the current research, the author chooses to use audio and visual events⁵³ as the tools for reshaping this space, and translating the space into a three-dimensional audio-visual environment. In this environment, the spatial parameters, such as location, direction, starting point, pathway, end point, distance and depth, and the occlusion occurring between objects are incorporated into the Visual Music performance. The incorporation of these spatial parameters involves visitors in the exploration of the site as an "audio-visual landscape". This "audio-visual landscape" can be understood as a "spatial visual-music polyphony" or a

⁵³ There could be other types of sources utilized for reshaping and composing a space in the future, for example, aroma and haptic events.

“location-related visual-music performance”. The specific meaning of “location-related” in this project will be explained in the next section.

Figure 47 – Overview of “Memoryscape”

Human beings have a special and useful ability referred to as “mental simulation”, which is the process by which our mind finds out what it already knows, and uses the known information to simulate virtual events. This virtual environment is able to offer the person a “pre-experience” of an event in advance of the encounter, or a “re-experience” of a past event (Gilbert & Timothy, 2007). In other words, the cerebral cortex combines the incoming and stored information to generate a mental representation of the external world. “The mental representation of a past event is a memory, the mental representation of a present

event is a perception, and the mental representation of a future event is a simulation (2007, p.1352).”

In correspondence with the virtual environment (referred to as “mind world” in Figure-48) simulated (simulation①/S₁) by the cerebral cortex, the author attempts to create a physical external environment to simulate (simulation②/S₂) the virtual environment in her brain, and make a “physical representation” of her “mental representation” of the past time. Therefore, the author embeds the elements of her memory into a physical performance space, and turns this space into be a “Memoryscape”. This “Memoryscape” is used to simulate the virtual environment which is simulated by cerebral cortex in the author’s brain.

Figure 48 – Diagram of the “Communication” and “Simulations” Happen in “Memoryscape”

Tim Ingold (2000) stated that “remembering is not so much a matter of calling up an internal image, stored in the mind, as of engaging perceptually with an environment that is itself pregnant with the past” (Ingold, 2000, p.189). During

the process of recalling, the “brain ‘replays’ a pattern of neural activity that was originally generated in response to a particular event, echoing the brain’s perception of the real event” (Mastin, 2010, para.1). These replays and the original are not identical, but are mixed with and affected by the awareness of current situations. Therefore, memories are not frozen in time. There are dynamic exchanges continuously taking place between the information that stored in the brain, and the messages that come in from the external worlds. Newly acquired information could be blended into existing memories over time. Therefore, the memory of a certain event is kept in the status of a continuous “reshaping” process (Hinton, G. E., & Anderson, J. A., 2014, and Mastin, 2010).

In consideration of the recalling process mentioned above, the author further defines “Memoryscape” as a dynamic and responsive environment, which consists of two different types of content: (1) the audio-visual events that are created and presented by the artist as fixed content, and (2) the visitors as mobile content. A “Memoryscape” can be constructed by artists to externalize their memory world, and this environment can be used to communicate with the audience.

In the performance area of “Memoryscape”, the visitors are provided with audio-visual information by either a single “unit” or a complex aggregate of “units”. A “unit”, for example, is designed as an embodiment of a smallest memory

fragment. In the performance area, there are a number of individual “units” that send messages from different locations, and there are many different pathways that lie between the “units”. The visitors are invited to explore “Memoryscape” and collect information from any location through any pathway. They are given the freedom of choosing and re-organizing the “fragments” according to their own interests. In other words, the visitors could collect information from their chosen sub-regions, re-organize them along their chosen routes, and thus produce personalized experiences for themselves.

(3). Relationship Between “Memoryscape” and “Digital-Cortex”, and the Definition of “Digital-Cortex”

The incorporation of the exploratory actions (actions of collecting and reorganizing information) of an individual visitor mentioned above, leads to another concept called “Digital-Cortex”, which refers to a dynamically communicating context. The author defined the “Digital-Cortex” as a complex of a “Memoryscape” and the exploratory actions done by an individual audience member.

In the context of a “Digital-Cortex”, there are two identities for each individual audience member. The audience is both an observer and the observed at same time, and the two identities are dynamically switched: from the point of view of an individual audience member, himself/herself is a visitor and observer of

“Memoryscape”; while from another individual audience member’s point of view, the former’s presence and actions are turned into part of the performance, and the identity of him/her is translated into a part of the content of “Memoryscape”.

Figure 49 – Definition of “Digital-Cortex”, Relationship Between “Digital-Cortex” and “Memoryscape”, and the roles of an individual audience member

Figure-49 gives an illustration of the definition of “Digital-Cortex”, the relationship between “Digital-Cortex” and “Memoryscape”, and the two identities of an individual audience member. A “Digital-Cortex” is a complex of:

(1). a performance space; (2). the content⁵⁴ in the space; and (3). the active exploratory actions (selecting, perceiving and processing information) of an individual audience member. It also can be understood as the combination of a “Memoryscape” and its visitor’s active exploratory actions, as “Memoryscapae” is the composition of the space and content.

(4). Four Simulations in “Digital-Cortex” and the Interactive Mechanism of “Digital-Cortex”

With the participation of the artist and the audience, four types of simulations will take place in the context of “Digital-Cortex”. These simulations take place during the process of producing and performing the environment of a “Memoryscape”, which serves as a communication mechanism between the author and the audience. Table-01 lists the four types of simulations, and the participants, the simulators and the objects being simulated in each of these simulations.

	Simulation	Participator	Simulator	Simulated
1	Simulation① (S ₁)	Artist, External world (A), Cerebral cortex, The artist’s “mind world”	The artist’s “mind world”	External world

⁵⁴ The content contains two parts: (1) the audio-visual events that designed and presented by the author, and (2) the audience, when they are playing the role as a random event that being observed by an observer.

2	Simulation② (S ₂)	Artist, The artist's "mind world" "Memoryscape", Audience	"Memoryscape"	The artist's "mind world"
3	Simulation③ (S ₃)	Audience (as observer), Audience (as observed), "Memoryscape", "Digital-Cortex",	"Digital-Cortex" (the process of establishing cognition)	Cerebral cortex (the process of recollection)
4	Simulation④ (S ₄)	Audience (as observer), Audience (as observed), External world (B), "Memoryscape", "Digital-Cortex"	Audience (as observed) (the process of dynamically changing the context of "Memoryscape")	Internal & external information (the process of continuously reshaping memories)

Table 2 – Four simulations that take place during the producing and performing process of a "Memoryscape"

As we know, each time when we are recalling a past event, our minds would not always go through the same "route". Different fragments of memory would be awakened by us under the influence of many internal or external factors. The "Digital-Cortex" simulates (simulation③/S₃) a retrospective process of a "recollection"⁵⁵ in our brain: each individual audience member plays the role of our mind: starting from a random point, wandering randomly or intentionally

⁵⁵ "Recollection", or "memory recall", refers to the mental process of retrieving events and information from previous experiences. It involves the reassembling of disparate memory fragments from a web-like pattern of cells scattered throughout the brain (Mohs, 2007). A single memory is a complex reconstruction of the separate information that is stored in the brain.

around the separated memory fragments, re-organizing them in a new order, and coming to an end at the target point to accomplish a dynamic retrospective process.

During the simulated retrospective process of a “recollection”, the audience contributes to a fourth “simulation” (simulation④/S₄) — the simulation of the “reshaping” process, and the visitors are simulating the internal and external information / factors, which affect both the process and result of the “recollection”:

An individual visitor involves himself/herself in the “recollection” process by interacting with the “units”, which will affect the performance of each single “unit”, and finally affects the overall experience. This event can be considered a simulation of internal information / factors that act on the “recollection” process.

On the other hand, in the above event, the information that is perceived by an individual visitor can also be affected by other visitors’ actions, and this can be considered a simulation of external information / factors that acting on the “recollection” process.

(5). Memory as Mediator and Moderator in “Digital-Cortex”

Jäncke (2008) in his research pointed out that similar to all auditory signals, musical sounds unfold over time. It is very important to recognize a series of sequentially ordered sounds as a coherent musical piece. Such a “series-to-

parallel transformation” is similar to the mechanism of working memory, which suggested that auditory information was stored temporarily and later processed into a united percept (e.g., pattern, rhythm or melody).

Jäncke (2008) also stated that autobiographical information linked with musical features will be recalled when we hear similar music or when we are once again engaging in conversation in which music or sound used to be important. This is also the reason why hearing music associated with our previous experiences can evoke the feeling of knowing. Jäncke (2008) further elaborated that one can have feelings for songs without knowing the relevant information about it (lyrics, titles, and etc.). However, people are usually better at recalling the titles of the song by remembering these feelings associated than recalling the song solely by remembering its title. The exception is that when remembering vocals, the titles of the songs are more effective cues.

The above findings suggest that music is very likely to be encoded in “semantic memory” which can be of great importance in the cognitive process of Visual Music. It is also generally believed that music is encoded in our mind by “episodic” memory system, which gathers auditory information and processes them into rhythm and melody, rather than by “semantic” memory system, which is solely responsible for meaning encoding. Taken together, these findings suggest that there are certain ways in which semantic memory and episodic

memory influence people's musical perceptions and the mechanisms of the two type of memories are very likely to be different. To extend previous findings into the current research, the current thesis propose that memory may take on the role of “mediator” and “moderator” in the cognitive process between spatial perceptions and visual music experience.

Memory as a Mediator

Figure 50 – Semantic Memory as Mediator

Semantic memory is defined as “the memory of meanings, understandings and other concept-based knowledge unrelated to specific experiences” (Jäncke, 2008, p.2). The relationship between spatial perception and audiences’ visual music experience is likely to be mediated by semantic memory as it provides the coding rules for a match between the two (Figure-50). The patterns perceived from spatial cues trigger memory in a “semantic” manner and further evoke the “feeling of knowing” under visual music scenario. For example, a piece of Visual Music artwork signified by its compact rhythm invokes an audience’s mood of nostalgic because similar rhythm structure associated with his memory of living in a crowded city (e.g., Hongkong) is recalled. What is interesting in this type of

observation is that: first, the content of Visual Music artwork and past spatial perception does not have to be closely linked, as long as similar patterns between the two can be identified, a semantic way of thinking will do the work automatically; second, the proposed mediating effect does have to take place in a short-term base but can rather be applied across different locations, time periods and contexts.

Memory as a Moderator

Figure 51 – Episodic Memory as Moderator

Episodic memory is defined as “the memory of events, places, times, associated emotions and other concept-based knowledge of an experience.” (Jäncke, 2008, p.2). The relationship between spatial perception and the audience’s visual music experience is likely to be moderated by episodic memory as it furnished the background which is able to either amplify or mitigate one’s feeling (Figure-51). The boosting effect is realized in the way that the higher relevancy of the episodic memory, stronger the relationship between spatial cues and visual music experience, and vice versa. For example, given all other things being equal, one

with negative mood at the moment is more likely to trigger the “feeling of tension” when he/she is perceiving a Visual Music artwork in a crowded room than one that is not in such mood. In comparison to the mediating effect of semantic memory, the moderating effect of episodic memory operates very differently: first, the link between the content of Visual Music artwork and past spatial perception need to be there for the memory to manipulate later on, it does have to be a strong one, but it should be direct. Second, memory and moods will have intertwined effects in a relatively short time period and cannot be generalized across different locations, time periods and contexts.

Above discussions have outlined a preliminary theoretical framework of analysing how memory functions in the cognition process of spatial cues and visual music experiences. Due to the research scope of the current study, I intend not to discuss in further details, but future studies are encouraged.

5. PRACTICAL METHOD AND EXPERIMENTAL PRACTICE OF SPATIAL VISUAL MUSIC

*But, after all, the aim of art is to create space - space that is not
compromised by decoration or illustration, space within which
the subjects of painting can live.*

— Frank Stella

The current chapter illustrates a series of experimental practices and conceptual design schemes which are designed and created based on the theoretical framework and concepts that are introduced in the previous chapters. This part of the studies serves as both practical methodology and examples for the Spatial Visual Music creation. A work called “*Hutong*⁵⁶ *Diary*”, which is designed mainly based on the concept of “entitative space”, is introduced as a practical example of one of the author’s theoretical approaches. The conceptual design of two interactive Spatial Visual Music installations, the “*Hutong Impression*” (designed based on the concepts of “Memoryscape” and “Digital-Cortex”) and the “*Hutong Symphony*” Series (designed based on the concept of “mapping time to physical space”), are introduced to elaborate further on the alternative practical utilization of the theoretical framework. Two 3D visual scores, “*Tagu*” and “*The*

⁵⁶ *Hutong* is a lane or an alley. It is the typical narrow alley in Beijing, which formed by *Siheyuan* where Beijing residents used to live in before 2000. *Hutongs* provide a glimpse into the old Beijing – the traditional way of life and Beijing local culture.

Butterfly Lovers” (designed based on the concept of “warping the timeline in physical space”), which are created in three-dimensional physical space, are illustrated as examples of exploring the feasibility, applicability and benefits of combining physical space with Visual Music.

5.1 “*Hutong Impression*” — Conceptual Design of an Interactive Spatial Visual Music Environment

“*Hutong Impression*” is a conceptual design of an interactive Spatial Visual Music environment. The design is based on the concepts of “Memoryscape” and “Digital-Cortex”, and serves as an example of the practical utilization of the theoretical method described in Chapter 4. This work will be built in real space later on during the follow-up studies. The motivation for creating this environment is to present an artistic abstraction and externalized expression of the author’s personal memory and impression of several special time periods in her life. “*Hutong Impression*” is designed as a “Memoryscape” — a dynamic and responsive three-dimensional audio-visual environment, in which the author attempts to use a series of audio-visual elements to externalize her memory and impressions of each special period from her childhood time to college days. The content of the image and sound is designed and composed based on the author’s personal memories and impressions of her life in Hutong (narrow alley) over a span of 23 years from 1993 to 2016.

(1). Motivation and Goal

The motivation for creating this project originates from a simple question of “how can one invite visitors to come into one’s mental space and memory world?”. Based on this question, the author identifies this interactive Spatial Visual Music installation as a “Memoryscape” (defined in Chapter 4) of her memory of the Hutong from 1993 to 2006, which can be considered a simulated environment of the author’s memory world. The author attempts to build a three-dimensional audio-visual environment that involves the audience as co-creators in the exploration of the author’s memory world among externalized memory fragments.

The goal of this project is to build an interactive Spatial Visual Music environment that achieves the following objectives: (1) create a three-dimensional audio-visual environment to provide the audience an experience of “walking into a space of Visual Music”; (2) embed the author’s memories into this interactive audio-visual environment, and transform this environment into a “Memoryscape”; (3) map time to space, associate the physical distance with time distance, and associate the physical pathway with “mental routes”⁵⁷; and (4)

⁵⁷ Memory recall is essentially a reconstruction process which involves assemble of discrete information from different areas of our brains”. It involves a process of re-visiting the nerve pathways when the brain forms and encodes a memory event in the

involve the visitors in the exploration of this “Memoryscape”, capture and respond to their location and movements, give them agency as improvising co-creators of the audio-visual performance, and transform this environment into a “Digital-Cortex”, which is essentially a mental symphony completed jointly by the author and the audience.

(2). Content of “Hutong Impression”

The content of the visual and auditory elements would be designed and composed based on the author’s personal memories and impressions of four major time stages in her life: (1). 1993-1999 is the first time stage, when the author and her family members moved into a Hutong near Ping’an Avenue⁵⁸; (2). 2000-2005 is the second time stage, when the author went to secondary school and high school which was far away from the Hutong region; (3). 2006-2010 is the third time stage, when the author moved into the campus of university which is outside of the “old town” region; (4). 2011-2016 is the fourth time stage, when the author left Beijing for overseas study.

past (Mastin, 2010). The “mental routes” in this thesis refers to the pathways, through which an individual recalls a certain memory from his/her brain storage.

⁵⁸ Ping'an Avenue (in Beijing, China) refers to a road starting from Guanyuan Bridge on the Xierhuang Road to Dongsishitiao Bridge on the Dongerhuan Road. It is constructed from approximately 1995 and completed in 1999.

There are special and significant events taking place in each of these time stages, and had profound influence on the author. These events would be represented by different audio-visual compositions. The author uses the audio and visual sources and spatial parameters as compositional elements to compose this environment into a “Memoryscape”, and thus externalize her memories of the life in Hutongs, and her impressions of the continuously changing landscape and, as a result, the changing lifestyle and living spaces in Beijing.

(3). Structure of “Hutong Impression”

The “*Hutong Impression*” is designed as a compound of fifteen groups of audio-visual units that fills an entire hall (Figure-52). Each “group” consists of two interrelated “units”.

A “unit” is the basic functional module in the hardware system of “*Hutong Impression*”. Each “unit” consists of five major components: a shadow lantern (contains a set of LED belts, a rotor, and a cut-out panorama or shadow puppets), a set of foot pedals (16cm×16cm/piece) and pressure sensors (Figure-53), a chip and control circuit, a speaker and sound dome, and a set of veil curtains. With these components, a “unit” is able to act as an independent instrument to perform a basic interactive Visual Music composition (this “unit” can be understood as the single unit in a “meta-score”, which is introduced in the Section 4.2.1).

Figure 52 – Structure of “Hutong Impression”

Figure 53 – Structure of a foot pedal

A “group” (Figure-54) is a combination of two connected and interactive “units”, which can be called “partner units”. These two cooperating “partner units” work together to form a small-scale two-channel Spatial Visual Music module. All of these modules work together forming an ambient audio-visual polyphonic composition within the hall, and playing pre-composed variations that are generated by the interactions of each individual audience member in real time.

A single “unit” is able to sense a visitor’s presence⁵⁹, his/her distance to the “unit”, and the status of the visitor’s movement: whether the visitor is approaching or coming towards, or moving away from the “unit”. All the while, in “*Hutong Impression*”, the “unit” is designed not to respond to the visitor solely based on the data received by itself. Instead, it produces responses according to the analysed result of two sets of data that are received by both itself and its “partner unit” in a same “group”.

A “group” (the “partner units”) senses the status of visitor’s movement with both of the “partner units”, and responds according to the relative location between the visitor and the two units. There are five major relations that could appear between these three objects (a visitor, “unit A” and “unit B”):

- (1). Approaching towards both “unit A” and “unit B”
- (2). Moving away from both “units”
- (3). Approaching “unit A” while moving away from “unit B”
- (4). Approaching “unit B” while moving away from “unit A”
- (5). Staying static: (i). Close to A, (ii). Close to B

Multiple visitors’ presence is taken as an independent situation and responded to with a sixth effect.

⁵⁹ The circumstance of more than one visitors appearing within the sensing area will be discussed separately in the “Group” section.

Figure 54 – A “group” (two interrelated “units”)

A “block” is a small community of two to four neighbouring “groups”. These “groups” share more common features with each other than the other “groups” that are outside this “block”. These “blocks” form sub-regions within the entire performance space, and play sub-themes under the main theme.

(4). Projection Lantern, Veil Curtain and the Audience Members — the Visual Contents of “Hutong Impression”:

Within the area of “Hutong Impression”, there are projection lanterns, shadow lanterns and veiled curtains placed all around. The lanterns cast light and project images onto the translucent veiled curtains, which are hung either far from or close to the lanterns (Figure-55). The lights and curtains (which fill up the entire performing space) form layers of static or moving images in this area, with some of them clear, some blurred, and some overlapped with the images projected by the other lanterns. These projected images and the lanterns themselves form the

immobile (the curtains and lanterns are fixed in their own location, although the projected images are in motion) visual content. When the visitors enter this performance area, the lights are cast onto their bodies as well (the visitors' action will also interact with the lanterns and affect the lighting effects), and these form the mobile visual content of the performance.

Figure 55 – The Lantern and The Projected Pattern on Veil Curtain

(5). The Transformation from Time Spans to Physical Distances

In “*Hutong Impression*”, each of the “blocks” is translated into each of the different time stages. The sub-theme of each block is designed based on the author’s personal memories and subjective impressions of each time stage in her life. A single “block” can stand on its own and perform independently, so as to be a smaller “Memoryscape” — the “Memoryscape” of a short time period. In this entire environment of “*Hutong Impression*”, the performance area is transformed into a “time-map”: the invisible time span is associated with the tangible physical distance in this space. The physical pathways can be considered as timelines, along which the separated blocks are linked (Figure-56).

Figure 56 – The Transformation from Time Spans to Physical Distances

5.2 “Hutong Diary” Series — Conceptual Design of three Interactive Spatial Visual Music Installations

“Hutong Diary” Series is a conceptual design design of three interactive Spatial Visual Music installations. The design is based on the concepts of “reconstructing space with multiple layers and physical distance”, “mapping time to physical distance”, and “reshaping ‘time’ in physical space”. The physical distance plays important roles in indicating the “temporal relationships” & “psychological” between “layers” in each of the installation.

“Hutong Diary” Series involve several different methods of reshaping the space, such as the separation, segmentation, parallelization, synchronization, and distortion of space. In these three installations, the dynamic changing physical distance reveals the relationships between the present demolished landscape and the neighbourhood in memory.

Memory is a typical example of that which can be appropriately represented by temporal events and physical space (physical distance). Fara and Patterson once noted “the word ‘memory’ reflects a richly layered palimpsest of connotations...” (1998, pp.1-2), they stated:

“Whether we are trying to recall particular details of our own lives, or to construct historical narratives describing broader cultural changes, we must all confront the gaps and distortions inherent in recapturing the past.” (1998, p.1)

“Only through the work of ‘re-memory’ and new forms of understanding can that history be reworked in such a way as to make it liveable for the present, and make the present fully lived. Each generation has the task of making new histories, making a space in the mind for the past, a past reconstituted in the present.” (1998, p.31)

Ratey (2001) also mentioned that past experience and memories come and go every moment with impact on our present life; and the current situation such as the mood and surroundings also change our attitude and in turn, influences the memories. As such, it is reasonable to match memory and present onto different layers and use the physical distance between the layers to symbolize the gap or the connection between now and past. This kind of environment can provide a way to express certain artistic and emotional information.

A certain space can be described by a number of features or spatial attributes, including distance, location, volume, size, density and many others. For example, a single layer of visual information is essentially identical to any traditional flat

visual medium such as paper, canvas, computer screen and extra, which can be used to present an event or an object, static or animated. The 2D surface is one of the most developed media being used for art creation and it has proved to be sufficient to record the details of an object or an event. This is evident by the thriving of paintings, drawings, prints, and photographs. In physical space, it is reasonable to involve more than one layer and investigate how a single layer is related to another. Such a practice can help us describe the relationship between objects or events presented by each layer, such as establishing links between them (e.g., making two objects or events comparable) or distinguishing one from another (e.g., segmenting one or several objects from an overall context / scene, or segmenting events from an entire story).

Distance is another attribute which can be used to describe physical space. When combined with three-dimensional Cartesian coordinate system, it can help us locate an object. When combined with directions (i.e., vectors), it can record and predict the trajectory of that object. When combined with lights, objects and obstructions, it can produce visual elements such as shadows and blurry shapes. In many cultures, shadow (and blurry image) is used to represent hidden or implicit objects or meanings. It is a powerful tool for artistic expression. Lewis, Mojsiewicz and Pettican (2012) explained the role of shadow in art:

“The shadow realm suggests both substance and outline. It can reveal the world for what it is, and it can surprise us with an unexpected glimpse of a positive world turned negative. This shifting dichotomy is what makes this territory such a rich and fascinating world for us to inhabit as artists. We are drawn to the shadow as a recurrent motif in our collaborative practice because of its ability to act as a source of wonder.” (p. 335)

In the “*Hutong Diary*” Series, physical distance plays an important role in indicating the relationship between “layers” (which represents the objects and events that are of interest), such as giving priorities (e.g., primary vs. secondary), focus (e.g., foci vs. context), and orders (e.g., sequential vs. simultaneous).

To sum up, the use of multiple layers and physical distance between them provides important clues or hints to each individual in the audience and is thus useful for both narrative and non-narrative presentation, and has the ability of enhancing emotional expression and arising interaction between the work and each individual audience.

Times Background and Traits of the Post-'80 Generation

The author was born and grew up during a special time period (1978-2008) when China's economic reform and “One-Child Policy”⁶⁰ began to have impact.

⁶⁰ The policy to control birth rate was announced in 1980. According to the policy, each family is allowed to have only one child (the “One-Child Policy”).

Under the 30 years of reform and opening up since 1978⁶¹, China underwent significant changes. China's GDP per capita increased 22-fold in 30 years, from 154.97 USD (1978) to 3,413.59 USD (2008); meanwhile, the population increased from 956.2 million (1978) to 1.325 billion (2008)⁶². Drastic change in the society has cast profound influence on people's life. The "Post-'80", a special population which is made of people who were born between 1980 and 1989 in Mainland China,⁶³ has witnessed the great change of the society and grew up along with these extraordinary transformations.

The rationale behind choosing the memory of the Post-'80s as the central theme is two-fold: First, the drastic changes prevailed with a strong and unique mood of nostalgia among the Post-80s generation: they were confused and struggled between the old and new, local and foreign, which makes an appropriate illustration of how physical space can be designed for artistic expression. Second, identified as one of the Post-'80s, the author would like to use these installations to express her personal memory of childhood and the life in Beijing during that special period, and in a Spatial Visual Music way.

⁶¹ The program of reform and opening up was started in December 1978. From 1978 to 1989 was the first stage of the reforms.

⁶² Data source: The World Bank Group. "<http://data.worldbank.org/country/china>"

⁶³ A large body of literary, film and television work regarding the Post-80s generation has been produced. The collective nostalgia of the Post-'80s, as a popular phenomenon, has attracted considerable scholarly attention.

5.2.1 Segmentation of Space and Guided Visual Musical Experience

Using multiple layers located in different positions can produce the effect of segmentation of space. Through the segmentation of space, music is capable of guiding visual experiences. The utilization of layers (depth) can be used to highlight the main object and event while the physical distance can give a description of the relationship between these objects or events. As a result, while segmenting the space, layers and physical distance also give order, focus, or sequence of the objects or events. Take sequence as an example, it adds a time dimension to the installation, which can substantially improve information communication. In particular, the originally static physical artwork can now “tell” the audiences what object needs attention first, and which one comes later. In such a process, music can take on the role of voiceover to guide the audience and lead them from one fragment (i.e., object or events) in the space to another and eventually complete the whole story.

The first theoretical approach proposes an interesting question for Visual Music research: can we separate visual and auditory presentation in time and space and yet synchronize them at the same time? The question will be further explored in the following illustration.

“Hutong Diary” No.1 – “The Invisible Greatness”

The author chose a specific event in the memory of her childhood as the content of the installation. It was the first time that the author rode a bicycle to school by herself. The dawn comes late in the winter of Beijing. The author left home before daybreak, rode a bicycle alone in the dark alleys (Hutongs) and arrived at school when the sun came out. Along the way, she was a little bit afraid because she thought she was alone. However, she was not – many years later her mother told her that her father was following her all the way, until she locked the bicycle and entered the school building.

The author reconstructed and re-experienced the event according to her mother’s description, including the details of how her father followed her all the way to school (e.g., his clothes, his bike, his movements and eye expressions). Although the author did not see these details herself, it was not difficult to rebuild the story as her father’s love was around her and in her mind all the time, not just for that journey. For example, the caring and anxious look in his eye was always there since the author has memory and therefore the author can imagine that he was looking at her in the same way on that day, even if she had not known he was there at the time.

For most Post-'80s generation individuals, their parents have given all their love and support to them, because they are the “only child” in the family. On the other side, however, how much thought was given to the subject of love offered by their parents, is seldom discussed. The author noticed a typical phenomenon: it is quite common to see middle-aged parent(s) taking their children to the restaurants. However, it was less common to see middle-aged people having dinner with their older parents.

Through this “travel to school” experience, the author felt deeply how much she is loved by her father. She began to understand that sometimes love as an emotion can be too subtle to be “seen” directly. Sometimes, great emotion such as love is hiding behind the details that can be ignored by people, or taken for granted. It is submerged in everyday life, and blurred by noise of trivia. Unless people make efforts to search for it, the emotion of love can remain invisible.

Using the above story as content, the first installation is developed to reflect the author’s attempt to find the “invisible” love. It is designed as a cylinder (Figure-57) which consists of two layers: the first layer (A) is a semitransparent and moveable screen with a still solid image (D) showing the author riding a bicycle; the second layer (B) is a semitransparent projection screen with the silhouette (E) of the author’s father. Figure-58 is the 3D model of this installation.

Figure 57 – Structure of installation I

Figure 58 – 3D Model of installation I

The author chose the cylinder as the basic shape of the installation for two major reasons. First, according to Yao (2001), “the Chinese classical aesthetics is very particular about the whole round, cyclic, harmony, and this is showing the

characteristics of the circular thinking, which in turn is prominently expressed in the theory of aesthetics of Chinese classical logic. It understands the evolution path of the things and history as a kind of spiral circle shape.” (p. 74)⁶⁴. Second, because its arc can create an effect such that audiences cannot see all the information at one time – they have to gather the information by walking around the installation, which is also counted as a part of the effort that being made to discover “love”.

Figure 59 – Shadow play scene 1⁶⁵ (Qing Dynasty)

⁶⁴ All three installations in the current research adopt this point of view and use round circle / cylinder as basic design.

⁶⁵ Figure-59 shows the photo of a scene from shadow puppet play (*The Imperial Palace*). The leather figures were made in Qing Dynasty with the length of 95 cm and width of 170 cm. Source: *An Introduction to Xiaoyi's Shadow Play in China* (Hou, 2009).

Inside the second layer is a paper-cut panorama (C) of a Hutong (the narrow alley typically found in Beijing) where the author used to pass by every day in the past. The image of the Hutong is designed in Chinese shadow puppet style (Figure-59 and Figure-60). The paper-cutting panorama will rotate clockwise to show that the author is passing the streets.

Figure 60 – Shadow play scene 2⁶⁶ (Qing Dynasty)

According to Gilbert and Wilson (2007), humans have the ability of “mental simulation”, which means that the brain collects the information to discover what the person has already experienced, and let the cortex generate simulations for new events. In particular, Gilbert and Wilson (2007) mentioned that mental simulation is the process by which our mind finds out what it already knows.

⁶⁶ Figure-60 shows the photo of a scene from a play *Woman's Face and Peach Blossom*, which is a famous love story in the Tang Dynasty. The leather figures are made in Qing Dynasty. Source: *History of Chinese Shadow Play Art* (Wei, 2007).

When encountering situations in which decisions about certain events is required, the cortex will perform simulations by convincing the subcortical systems to believe that those events are taking place now and then record the feelings that these systems generate.”⁶⁷ In the current scenario, in order to help the audiences to “simulate” the events they had never experienced before, the author includes complementary information in the projected animation such as the impression of Hutong, objects that people used 15 years ago and so on. In comparison to other art forms, animation is a flexible and effective way to provide this information to help the audiences complete the simulation.

In order to realize the above design, a set of projectors will be placed at the centre of the cylinder (1 to 5 in Figure-57) projecting animation of the author’s journey: star-filled predawn sky transformed into golden sun rise, street lamps, the lights from houses, the food stall opens in the early morning, other students who are going to school under the moonlight, and the falling snow which makes the world look murky and dreamy. Another projector (6) will be placed in the front of the cylinder to project changing patterns onto the cutout of the author (D) through a

⁶⁷ Gilbert and Wilson (2007) also pointed out that memory is essentially the mental representation of past, perception is the mental representation of present, and simulation is the mental representation of future.

mask⁶⁸ (F). Visually, the entire installation looks like a hand-scroll, which is commonly used in traditional Chinese painting (Murray, 1998) that brings the audiences to a journey as the scroll unfolds.

The auditory system of this installation consists of three parts: 1. The music which represents the inner voice in the author's mind, and the sound of the author riding the bicycle; 2. The sound of the author's father which is fine and fuzzy so attention is needed in order to discover its existence and comprehension; 3. The theme music that sets the overall atmosphere and environment. The speakers used to play the different sound tracks are located separately in different directions of the cylinder.

Figure 61 – A prototype of the cylinder⁶⁹

⁶⁸ The mask is used as a filter for projector 6. It will limit the range of the projection inside the area of the author's cutout.

⁶⁹ Prototype of the cylinder is made by the author. The prototype shows an analog structure and effects to the first installation.

The first layer, a moveable screen, is set on an appliance which consists of small wheels and a curved stand. The audience can push the screen to change the distance between the first and second layer and therefore change the visual effects: the semi-transparent screen in the front plus the physical distance will blur the image on the second layer when the distance is large, and present the images more clearly when the distance is shortened (see Figure-62 and 63).

For example, when area D on the first layer (see Figure-57 on page 152) is pushed close to the second layer, the image of the author blends into the surroundings showing that she is riding a bicycle heading to school; When the area E is pushed, the silhouette of her father appears, showing that he is following the author on the way. In this way, the story is left to be discovered by the audience.

Figure 62 – A prototype of the cylinder: before the push

Figure 63 – A prototype of the cylinder: when it is pushed

This installation represents the author's reflection of parental love. Deviant from the common understanding, the author believes that the emotions of love and caring are sometimes not easy to be "seen" unless one works hard to find them. The physical distance between the two layers indicates the gap between the emotions of love and caring that parents gave to children and the extent to which it is perceived. The simple action of "pushing" (change of distance) symbolizes the attempt of trying to discover and understand the ubiquitous yet imperceptible parental love.

5.2.2 Parallelization of Space and United Visual Musical Experience

In contrast to the first approach in which objects and events in space were segmented, the second way in which layers and physical distance can enhance Visual Music presentation is through building connections between objects and

events. This approach requires treating the physical space as the major part of the art creation and design around it. One possible way to achieve this is to use physical space to mediate the relationship between music and visual images. That is, music triggers the change of physical distance between layers, which in turn, changes the overall visual effects. As a result, the audiences' focus will be shifted from the objects and events presented, onto the relationship between them, which can take on numerous symbolic meanings. In such a way, auditory and visual experiences are united; static display is transformed into dynamic story-telling.

“Hutong Diary” No.2 – “Gone with the City”

The Post-'80 generation grew up in a special period during which profound transformations were taking place in China. They witnessed the drastic change of the society and their lives have been kept changing in all aspects. Although absent from high-tech products (digital games, mobile phones, tablets, etc.), most of the Post-'80s had a colourful memory of their childhoods (Li & Zheng, 2011). As they grew up, the fast changing technology has filled their life with novelties and surprises. Now, being well-adapted to these new technologies, most of the Post-'80s did not have the emotions related to the feeling of emptiness when looking back to their childhoods. In fact, the childhood life which is featured by monotonous activity and simplicity is often missed by this group of people (Li &

Zheng, 2011). It is interesting to ask that why a generation such as the Post-'80s that is so adaptive, yet miss the past so deeply?

As the capital city of China, Beijing has changed immensely during the past two decades, transformed from historical to modern. Many old buildings such as Hutongs and Sihe Courtyards⁷⁰ in which local people used to live, have been erased from the map for the purpose of development. Modern buildings and skyscrapers have taken their place and become the new signature of Beijing (e.g., the National Sports Studio, CCTV Headquarters, and National Centre for the Performing Arts). Also being erased were the places that were full of treasured memories of the Post-80s: they can no longer imagine themselves playing in the alley, because the building is not there any more. As a result, while the fast changes of Beijing filled the Post-'80's lives with novelties, they also took away the treasures (the places and objects which carry so many recollections) in the memory of their childhoods.

Based on this background, the second installation focuses on using physical space to represent the relationship between the changes that took place in Beijing and the nostalgic appeal of the Post-'80s. Narrative data is extracted from a series of

⁷⁰ Sihe Courtyard (also called Siheyuan or Chinese quadrangles) is a typical residence in China, and most famously in Beijing. The history of Sihe Courtyard can be traced back to over 2,000 years ago.

interviews and surveys of a group of Post-'80s to establish a description of the “old life” and the “new life” in Beijing.

Figure 64 – Plan of installation II

As shown by Figure-64, the structure of the second installation is another cylinder that consists of two layers. The choice of using cylinder as the basic shape of the current installation is based on the traditional Chinese philosophy of “circular thinking” (Yao, 2001). It is believed by the ancient Chinese people that the history repeats itself in an endless circle: what happened in the past will keep happening in the future and it is unstoppable. Applied in the current installation, the circular shape symbolizes a cycle: the city will never stop developing, and more changes will be made. At every point of time, people are missing the “past”, and at the same time, the “current” will also be “missed” in the future.

Different from the first installation in which audiences are observing from the outside of the cylinder, this installation allows audiences to enter the cylinder and observe from the inside. The first layer (Layer A) is the movable semi-transparent screen, which can be pushed close to the second layer (B). On the back of the second layer, a silhouette panorama (see the red circle line C in Figure-64) is attached. The silhouette panorama shows the changing landscape of Beijing. One end of the silhouette panorama shows the old landscape and architectures of the city (e.g., Hutong and Siheyuan Courtyard) which gradually evolved into modern buildings and skyscrapers, which is shown on the other end. In this layer, the changes composed along the panorama is defined by the natural time frame, which is from past to present.

The first layer (layer A) is a movable screen. Animation will be projected onto it by a set of projectors placed outside of the cylinder (projector 1 to 7). The animation shows the changes of the city in a direction that is opposite to the panorama, which is from present to past. Such an arrangement creates a sharp contrast between the two layers: On one end, the audience can see the modern buildings (layer A) through the old city (layer B), while on the other end audiences can observe the old city (layer A) through the lens of modernity (layer B).

Figure 65 – Mechanical system for controlling the movement of screen

Besides observing from the inside, another important feature of the current installation is that the physical distance between the two layers is synchronized with the rhythm of the music. A mechanical system is developed to realize this design. As illustrated by Figure-65, music will first be transformed into digital signals on computer (PC) and then sent to a microchip (MC). The microchip is preprogrammed to decode music signals and use them to control a set of T-Motors⁷¹ (TM). T-Motors is a device that can precisely control the degree as well as the speed of change of the distance between the two screens. A set of arms (AM) will be used to connect the T-Motors and the first screen (A). The entire mechanical

⁷¹ T-Motor is a type of motor that originally used on unmanned-helicopters.

system will be placed outside of the cylinder (see Figure-66). The motors will be powered by rechargeable batteries (PS). As the arm moves, the first layer (A) will be pushed towards the second layer (B) with distance and speed controlled by the music, which in turn, changes the visual effects.

Figure 66 – Mechanical system for controlling the movement of screen 2

The auditory system consists of 5 speakers: speaker 1 is placed in the centre to play the theme music; speakers 2 to 5 are placed outside of the cylinder to play the music of “different times in Beijing”, with rising speed of rhythm to symbolizes the rising pace of life in the city.

This installation is designed to reflect the change of a special era in Beijing through the eyes of the Post-’80s. The first layer (layer A) represents the Post-

'80s' changing wishes: the yearning for modern life and the nostalgia of the old Beijing. The second layer (layer B) represents the "present" — the natural development process of the city. The physical distance between the two layers (A and B) thus symbolizes the conflict between a generations' emotional appeal to the torrent of historical evolution. The automatic action of "push" (i.e., the change of distance) therefore symbolizes that the memory of the old time that keeps coming back. The raising speed of distance change symbolizes the idea that the more the city changes, the more the old life is regarded emotionally, that it is missed. Finally, having the audience observing from inside creates a walk-in experience which symbolizes complex experience of memory and emotion in time, specifically that their life is surrounded by the alternate feelings of "missing" and "longing".

5.2.3 Synchronization of Space and Split Visual Musical Experience

The third approach emphasizes the interaction between artwork and audiences by letting the audiences physically enter the interior of the installation. This is a unique experience that installations involving physical space can offer in comparison to those using 2D media only. Through segmentation and reconstruction, spaces can be divided into several areas each of which provides a different visual-sound experience, and is therefore capable of conveying very different symbolic meanings.

“Hutong Diary” No.3 – “Collisions & Infiltration”

This installation is designed to reflect the emotional state of bewilderment that the Post-'80s experienced when foreign cultures were introduced and intertwined with traditional Chinese thinking to influence their values. During the reform and opening-up period, foreign cultures were formally and massively introduced in various forms (Li & Zheng, 2011). Wandering between traditional thinking and foreign ideology, the post-'80s generation absorbed both to form a synthesis, thus their own unique observation of the world and therefore developed more individualized personalities, values and lifestyles that distinguish them from other generations.

This installation is also a cylinder that consists of two layers. Different from the previous two installations in which the distance between the two layers are changed manually or automatically, the layers in the current installation are in fixed position. As illustrated by Figure-67, the two layers segment the space into three parts: outside space (I), space between the two layers (II), and inside space (III). The top view of the current installation indicates a radiant shape: a set of projectors located in the centre project “Chinese culture” towards outside; the lights go through the two transparent layers as if “Chinese culture” is penetrating into other cultures, spreading its influences. Meanwhile, projectors located outside of the installation project “foreign culture” towards the inside, which

symbolizes the idea that China was influenced by many other cultures at the same time.

Figure 67 – Diagram of installation III

To realize the above design, the material of the layers (i.e., the projection screen in previous installations) is replaced with a thin silk sheet which allows more light to travel through. As mentioned, the animation that presents a “foreign culture” is projected from space I. Music related to this animation will be played by speakers located at area 2, 3, 4, and 5. Another animation, which is designed in the traditional Chinese style, is projected by a set of video projectors (1 to 5) from space III. The sound track for this animation will be played by the speaker located in the centre (speaker 1).

Because the two layers are made of transparent material, images can be projected onto both layers (see Figure-68). The image can be clear and in focus on the layer that is near the projector, and relatively blurred and enlarged on the other layer. Because images are projected from both inside and outside, each layer has two overlapping images: one clear and concentrated as the main subject; another blurred and enlarged one that looks like a misty background.

Figure 68 – Schematic diagram of multi-screen projection effect (one side)

Another significant feature of this installation is that the audience's participation is considered a part of the presentation. The audience is invited to enter three segmented spaces: outside the cylinder (I), between the two layers (II), and inside the cylinder (III). The audience plays the role of the Post-'80s. They perceive

different combinations of visual and sound effects in different positions: the audience in space I perceive sound and images mainly from “outside” (the image on layer A and sound played by speakers 2 to 5); the audience in space III is affected more by the “inside” contents (the image on layer B and sound played by speakers 1); the audience in space II perceives sound and images from both sides simultaneously. The audience has the liberty to choose their positions and thus have different visual music experiences. It also symbolizes the idea that in order to gain a more comprehensive understanding and experience, the audience (i.e., the Post-80s) sometimes needs to “switch sides” (i.e., travel to other countries and see how Chinese culture is interpreted locally). Most importantly, people walking in these three spaces will have shadows projected onto both layers. These shadows also constitute a part of the installation, which can be perceived by the others exploring the piece. In such a way, the audience and their shadows, the two layers, projected animation and sound effects, all together, form the entire installation.

The current installation aims to reflect the multi-cultural impact on the Post-’80s.

The outside layer⁷² represents the impact of foreign culture on traditional

⁷² Geographically, China is surrounded by other nations. So the current study uses the outside layer to represent “foreign culture”.

thinking. The second layer represents the desire to preserve traditional beliefs in the trend of cultural fusion. The two layers and the three spaces created by the layers, provide an opportunity for the audience to feel the collision of different cultures. It symbolizes the Post-80's generation's emotional state of bewilderments and its struggles to make sense out of this chaotic, fast changing world.

5.3 “*Hutong Symphony*” — Spatial Melody of the Old Town Beijing

“*Hutong Symphony*” is a three-dimensional visual score that created based on the author's personal memory and impression of author's personal memory and impression of the neighbourhood (one of the typical Siheyuan and Hutong areas in Beijing, China) of her childhood (Figure-69). It is designed mainly based on the concept of “entitative space” and the multi-spot perspective. It is a paper cut-out flipbook. The cut-out space is an “entitative space”. The focus of this work is using the composed “entitative space” to present the musicality of Hutong area.

Siheyuan and Hutong are special for people who were born before the 1990s. The Hutong neighbourhood has been one of the Beijing's most distinctive features. It provides a glimpse into the old Beijing – the traditional way of life and Beijing local culture. The Hutong neighbourhood also carries the author's memories of her childhood. However, people who were born after that will have little memory

of it since Hutong and Siheyuan began to face the threat of being demolished in the early 1990s. With the economic development that began to take off during this time period, large areas of traditional housing were systematically demolished by authorities and the Hutong neighbourhoods are gradually replaced by modern buildings and skyscrapers in the 2000s and onward. By the time of 2008, virtually all the contiguous historic Hutong neighbourhoods had been bulldozed, leaving only individual islands of Hutongs scattered about the city. (Galloway, 2018) The author would like to create a three-dimensional visual score based on her personal impressions, and in this way commemorate the old appearance of the Hutong neighbourhood in her childhood memories.

Siheyuan and Hutong are similar to the concept of “community” in the west but emphasize family, unity and harmony in the interpersonal relationship more. By that time, China was at the beginning stage of reform and opening up, and the living conditions were far from satisfactory. One typical Siheyuan usually had 4-5 families’ resident in it and facilities such as water, toilet and sometimes even the kitchen were shared. However, life in Siheyuan is generally described by the 1980s generation as joyful rather than miserable as people feel quite “rich” psychologically (life in that period is usually characterized by positive words such as striving, hopeful, supporting and encouragement) and less concerned with materialistic insufficiency. Children living in it, in particular, also had their

own way of entertainment in an era that was free from internet, iPad and video games. All these features contributed to the formation of the 1980's generation's optimistic, collaborative and persevering personality and therefore time spent in Siheyuan and Hutong were often discussed and missed by this group of people.

Figure 69 – Photo of Hutong

According to Johann Wolfgang von Goethe's statement, if architecture can be regarded as fixed music, then the traditional architectures in different culture background must have composed very different pieces of "frozen music" from each other. We can look at a city's landscape and read its dynamic changing shapes (the outlines depicted on y axis) as music, along the x axis (as timeline) of the rectangular coordinate system (Figure-70). We could also walk into a landscape, and read the dynamic changing shapes depicted on both x and y axis, along the z axis (as timeline).

In response to Johann Wolfgang von Goethe's words, "Music is liquid architecture; architecture is frozen music", the author's proposition is that if the body of the constructions carries musicality and can be read as music, then the space in between the constructions can be read as music and can be used to present musicality as well. These two kinds of musicality (the musicality of the body of constructions and the musicality of the empty space in between the buildings) and their carriers have individual features, and cannot be represented or replaced mutually.

Figure 70 – The outline of landscape and the space in between the constructions

The author attempts to extract the spaces in between the constructions from a Hutong area, and uses these extracted empty spaces as compositional material to compose a three-dimensional visual score. This three-dimensional visual score can be considered as one of the examples of a work of Spatial Visual Music.

Based on the concept of “entitative space” and the artistic expression technique of the multi-spot perspective from the Chinese classical art, the author extracted the outlines of the landscape from the Siheyuan and Hutong area (Figure-71), and made each of the single outline into a paper cut-out. This single piece of paper cut-out is one layer in the work. Then the author assembled these “layers of landscape outlines” together along the z-axis to form a three-dimensional “empty space”.

Figure 71 – Slicing up the outlines of landscape, and assembling the layers together along the z-axis to form a three-dimensional “empty space”

A copper bell is placed inside the spindle of the flip-book (Figure-72) to imitate one of the most typical sound in Hutong area, which is the sound of the bells on the bicycle. Putting the cut-out layers onto the spindle is the final step. When the spindle spins, the cut-out layers work together to show the dynamic flow of the “entitative space” of Hutong (Figure-73).

Figure 72 – The spindle of the flip-book

Figure 73 – Photos of “*Hutong Symphony*”

This “entitative space” is intentionally designed to make implications of the people and events in the Hutong area without depicting them directly, and leaving the imagination rooms for the observers to fill up. This work is an example of using the “empty space” to convey more information than depicting things directly, and invite the audience to join the conversation with the author. This is the core concept of “entitative space”.

5.4 Warping the Timeline in Physical Space — Two 3D Visual Scores

The author used a series of experiments to explore the feasibility and benefits of combining physical space with Visual Music. One motive of involving physical space in Visual Music is to associate time with physical space, and warp the rectilinear timeline into three-dimensional curves in space to reorganize the original audio/visual fragments. Following are two exemplar 3D visual scores that developed in an attempt to extend Visual Music from two-dimensional medium to three-dimensional physical space. These two visual scores are designed based on the concept of “mapping ‘time’ to space” and “warping the timeline in physical space”.

5.4.1 “Tagu” — Warp the Timeline and Connect “Now” and “Past”

“*Tagu*” is a 3d visual score of a Chinese music piece in the same title. The motivation of involving physical space in this work is to warp the rectilinear timeline into a three-dimensional “pathway” in space to parallel different sections and reveal the hidden connections. After we warp the 2D plane into a cylinder, the 2D visual score becomes a 3D score. Since the visual score itself is created based on time, this warp is capable of building connections between “time” and “space”.

Figure 74 – Hand-painted 2D visual score – “*Tagu*”

Figure-74 is the hand-painted 2D visual score of the music “*Tagu*” (the first 2’30”). “*Tagu*” is also associated with a special type of ancient dance – the dancers wear special leather shoes, stamp on a set of drums to dance and play music at the same time. The dancers’ dance steps play the basic tempos, and the musicians play other instruments to offer the theme melody, which also correspond with the dancers’ body movements.

The theme tempos start from the very beginning (0’00”) with no other sound accompanied; From 0’06”, a continuous sound enters to furnish an atmosphere or background; At 0’30”, the major melody is played by a traditional Chinese musical instrument called a Pipa, which is similar to Lute.

Figure 75 – Part 1 (0’00” to 1’26”)

Figure 76 – Part 2 (1’26’’ to 2’30’’)

To visualize the theme tempos from 0’00’’ to 1’26’’ (Figure-75), the author used a set of small squares in browns to represent a group of stamps, and repeat the set as the sound of the stamps repeat with the fixed pattern every 2 seconds. The author chose to use browns and square shape because she subjectively interpreted the sounds of the stamps as strong, snappy and firm. The dark browns and squares suggested a strong and firm impression, and the light-brown squares were considered “snappy”. After 1’26’’, the theme tempo changed slightly, but continued to repeat every 2 seconds. Instead of the rapid and intensive 9 stamps before 1’26’’, the beats changed to two major downbeats and two small taps. The timbre also changed in such a way as to be interpreted as less firm but more energetic as marked by the red squares (Figure-76).

To visualize the second “layer” of the music, which is a continuous sound that entered from 0’06’’, the author chose gauzy and half-transparent bright yellow curves to indicate the melody, and even more light and subtle yellows (which

have no fixed shapes like clouds or fog) to indicate the echo and “atmosphere” that the sound created. After 1’26’’, these bright yellow curves were changed to colours considered as more passionate ones. So she added scarlet and yellow red and changed the degree of curvature from graceful and subdued to ardent, to express the emotional state and feelings of passion.

The part considered by the author to be the most exciting is the major melody that is played by Pipa. There is a Chinese poem wrote by Bai Ju-Yi (816 AD) from Tang Dynasty describing an experience of hearing a Pipa performance⁷³, which was translated by Ying Sun (2008) as follows:

“...
The bass strings rumbled like thunderstorms pelting,
the treble strings rustled like lovers whispering.
Rumbling and rustling interleaved at a fast rate,
like large and small pearls falling on a jade plate
...” (line. 23-26)

The timber of the Pipa expresses powerful, vigorous and elastic feelings. Both its sound and shape (and also the body posture of the performer) are thought to provide a beautiful feminine impression. The Pipa is also one of the special musical instruments that are thought to be used by Chinese goddesses in heaven.

⁷³ The title of the poem is *The Pipa Tune*. It was written in 816 AD by Bai Ju-Yi.

There are large numbers of frescoes in the Dunhuang Caves depicting the goddesses playing heavenly music using the Pipa (see Figure-77).

Figure 77 – Photo of the Dunhuang frescoe

Figure 78 – A pattern of Fenghuang

The inspirations of these curved shapes (the green patterns) that the author used to visualize the music played by the Pipa are: 1. The shape of the Pipa itself. 2. The sound of the Pipa (the curved shapes represent the elastic melody, and the individual circles symbolizes that the sound is like pearls dropping into a jade plate). 3. The frescoes of the goddesses who play it. 4. The traditional Chinese decorative patterns of a divine animal called Fenghuang (see Figure-78) (the Fenghuang is a divine bird from ancient Chinese legend, which is commonly

referred to as the phoenix). When Fenghuangs fly in the sky, they will bring divine music and spread happiness to the world.

Figure 79 – Diagram of the 3D cylinder (spiral path)

If one wraps the 2D plane (2D painted score) into a cylinder or spiral, it becomes a 3D score that exists in physical space. Since the score itself is about the relationship between time and melody, this warp is capable of building connections between “time” and “space”. Take the spiral as an example (Figure-79): In this piece of music, there are two related parts, the section A is the theme and section B is its mutated version. If we make it on a transparent material (Figure-80), when the two sections are warped and thus overlapped with each other, the implicit connection between the two sections becomes explicit. This spiral builds connections between different time period. The reshaped timeline gives new order to those originally separated sections.

Figure 80 – 3D Visual Score – *Tagu*

This work also involve a Chinese ideology called “circular thinking”, which believes that the history is fundamentally an endless cyclical process (Yao, 2001). The warped timeline of the 3D visual score symbolizes the transmigration of history: what happened in the past will happen again at some point in the future, though with slightly changes in its “appearance”. These “present” and “past” have impacts on each other as well. As Ratey (2001) mentioned that the past experience and memories come and go every moment with impacts on our present life; and the current situation such as the mood and surroundings also changes our attitude and in turn, influences the memories. Thus, the warped timeline is capable of paralleling different sections that take place in different time period, and reveal the connections between “now” and “past”.

5.4.2 “The Butterfly Lovers” — Warp the Timeline and Present the Power of Music Through Physical Space

In 1944, Gyorgy Kepes associated musical melody with visual path, which he stated in *Language of Vision* as follow:

“The function of the kinetic linear path in plastic organization may be compared with the function of melody in musical composition...” (1944, p. 59)

“Music, theoretically considered, consists altogether of lines of tone. It more nearly resembles a picture or an architectural drawing, than any other art creation; the difference being that in a drawing the lines are visible and constant, while in music they are audible and in motion. The separate tones are the points through which the lines are drawn; and the impression which is intended, and which is apprehended by the intelligent listener, is not that of single tones, but of continuous lines of tones, describing movements, curves and angles, rising, falling, poising—directly analogous to the linear impressions conveyed by a picture or drawing.” (1944, p. 59)

Inspired by the pioneering studies, the author is interested in the spatial features of both visuals and sounds, and the possible combination of 3D physical space and Visual Music performance. The author proposes that besides melody, there are other musical (auditory) attributes that can be associated to “path” as well, such as the volume and the dynamics. Since the auditory attributes like volume and dynamics are capable of providing spatial information (Bulkin & Groh, 2006), the author claims that these auditory attributes can be linked not only to the 2D path, but also the three-dimensional path in physical space. The 3D visual

score “*The Butterfly Lovers*” (Figure-81) is an example of associating dynamics with three-dimensional path.

Figure 81 – 3D visual score – *The butterfly lovers*

The author created this 3D visual score for the violin concerto *The butterfly lovers*. The purpose of designing this score into a three-dimensional sculpture is to better present its dynamic musical feature – the “melody” of forte and piano. In real space, we tend to perceive the strong sound as close to us, and soft sound as far away. In music, as the volume keeps fluctuating, we can feel that the sound is “moving forwards and backwards”. Therefore, the author presents the fluctuating dynamics of music visually using the physical distance — a three-dimensional spiral path⁷⁴ (Figure-82), with its distance to the audience changing

⁷⁴ Gyorgy Kepes (1961) linked the melody with path by claiming that the function of the kinetic linear path in plastic organization may be compared with the function of melody in musical composition.

from time to time. The entire path takes on a circular shape to symbolize the hero and heroine's everlasting love: even death cannot stop them from "being together". They turn into a pair of butterflies so as to never be separated again.

Figure 82 – Diagram of the warped timeline

In addition, in performance, like musicians has their own interpretation towards the music (which know as a bis inditement process that deducts the notes in the text form into emotional music), dynamics and rhythm reflect the musicians' personal emotional expression as well. Therefore, this 3D visual score is capable of indicating the emotional aspects of a musical performance.

6. CONCLUSION AND DISCUSSION

Space is the breath of art.

— Frank Lloyd Wright

As Frank Stella (1986) stated that “the aim of art is to create space... (p. 5)”, physical space as a powerful tool for artistic expression has been utilized by various art forms. Clearly, in the field of Visual Music, we are just in the beginning of exploring the utilization of physical space, and regard spatial attributes as compositional elements. Much work needs to be done in fully developing the function of physical space as influential factors of the audience’s emotional response and interaction, exploring the possible combination of physical space and Visual Music creation, as well as experimenting the possible cooperation between physical and virtual space for enhanced audio-visual experience.

6.1 Conclusion

The most significant contribution of the current research is start building up a concept of “constructing space” in the field of Visual Music. Spatial Visual Music emphasizes the “shaping” and “constructing” of space. The concept of “composing the space” can be compared with the concept of space design in the field of architecture — the final product that aims to be presented to people is the

“space” that being constructed, rather than the materials like bricks, cement, stones, or glasses that being used in the constructing process. Similarly, Spatial Visual Music is designed to present the constructed space and the musicality of this space, rather than the audio/visual content per se. The visual or auditory elements that used in Spatial Visual Music creation are not the main subject. They are just the materials for creating the final product — a “musical space”.

The concept of Spatial Visual Music has its unique and particular point of focus and emphasis, which is using the space to present musicality. The experience that provided to the audience is no longer the feeling of a physical space per se, but an experience of another form of “music”, which can be understood as the “synesthesia”⁷⁵ between music and space, just like the “synesthesia” between music and visuals, which is also consistent with the tradition of Visual Music.

The reason why space is considered such important in the current study is because it has powerful abilities. Space has a number of parameters: the depth, width, volume, location, direction, distance, and etc. The artistic manipulation of any one of these parameters will be able to help enriching the compositional materials and enhancing the artistic expression for Visual Music. For example, the distance,

⁷⁵ In the current thesis, the utilization of the term “synesthesia” is referring to the concept of blending the visual experience with the experience of music in the realm of Visual Music, rather than discussing the studies in the field of psychology.

which is one of the simplest description of space, can contribute a lot for the artworks. For instance, making a mapping between the intangible “time” and the concrete and tangible physical distance will be able to affect the observer’s perception of the “presented time” in various types of temporal art. This is just one spatial parameter. There are more can be used.

In addition to these spatial parameters, there are other aspects of space can be utilized for artistic expression. For example, the occupied space and the empty space. The utilization of the former is the artistic expression method that we most familiar with; while the utilization of the empty space can be even more fascinating, and worth more attention and further studies. The empty space allows the artists to tell more stories within it, and invite the audience to fill in their own imagination. The empty space turns the observers into the co-creator of the artwork, and complete the artwork together with the artist. Influenced by her cultural background, the author is deeply interested in the powerful abilities of empty space, and explores the possibilities of bringing the concept of space in Chinese classical aesthetics and ideology into the Visual Music and new media creation, and by doing so, to bridge the gap between the established new media theories and the Chinese artistic thinking. Just like Ludwig Mies van der Rohe said that “less is more”, the author claims that we should try to explore more

widely and deeply into the utilization of space based on an idea of “empty is infinity”.

To summarize, the utilization of space in Visual Music is a big area of research. There are lots of potential in this field that can be explored. The current study has just started with some simple experiments and the author has already been fascinated by space’s infinite possibilities. Hope by presenting the ideas in the current research, more academic attentions can be aroused, and more studies can be carried out from various angles in this area.

6.1.1 Motivation

The current research started from a question which emerged during the author’s experience of listening to a piece of music. When listening to music, the listener experiences more than just a sequence of sounds. For some of them, music reminds them of a narrative, and for others, it calls up colours or images. Numerous studies from diverse disciplines have investigated the music’s ability of conveying emotional information to the listener, and affecting the listener’s emotional response. The musical elements and parameters (such as musical notes, melody, rhythm, structures, and different tones of various musical instruments) are the carriers of its emotional information. One of the most important criteria for the aesthetic value of music is its ability of making us feel: its ability of using

these musical elements to lead the listeners into the atmosphere it creates, and feeling the mood and emotion it expresses or evokes. The author believes that music is not merely an assembly of musical notes, but a “language of the emotions”, and one of the most important characteristics of music is its ability of expressing and evoking emotion.

As a visual emulation of music, one of the most outstanding features of a Visual Music artwork is the musicality it presents — the musicality that is hosted by visual composition. Regarding Visual Music as the visual form of music, the author believes that the Visual Music artworks should inherit music’s ability of affecting people’s feelings and evoking emotional response, and claims that if music is “a language of emotions”, then Visual Music should be “a visual language of emotions”. Along the history of Visual Music studies, artists and scholars made tremendous efforts on exploring the emotional expression in Visual Music works with diverse approaches. Different kinds of visual attributes (e.g., colour, shape, brightness and etc.), which are considered capable of expressing and affecting emotions, are linked with musical attributes and taken into Visual Music creations as compositional elements.

While listening to a piece of music, obtaining a feeling of being embraced by some “invisible power” (which felt like it was flowing forwards and backwards around the author during the experiencing of the music), the author was curious

to know if there are any other things (in addition to those visual elements like colours and shapes) that can be regarded as compositional elements to compose Visual Music works and affect the people's emotional response. Therefore, the motivation of the current research is to emphasize the Visual Music artwork's ability of influencing people's feeling and emotion, and explore further on the methods and approaches of enhancing the emotional expression and evocation for Visual Music creations.

6.1.2 Proposition

After a period of literature study, the author found that physical space is an effective tool to influence the emotional expression and evocation, which has been utilized in various art forms and fields. For example, architecture and landscape design are the fields in which the utilization of space and manipulation of spatial parameters are widely employed to affect people's experiences, feelings, and emotions. In the performing arts, the design of space is also an important consideration for artists as the factors of the physical space can structure how people move through the performing space and therefore how their senses are engaged.

All in all, when the space in artworks is directly or indirectly perceived by observers, it will be possible to affect the observers' feelings and emotional

responses. This kind of influence is what the author attempts to explore and apply to Visual Music creation.

To figure out a possible way to apply this kind of influence, the author further investigated the characteristics of space. A space can be described by a number of factors and parameters (e.g., the width, height, depth, scale, volume, and etc.), and these parameters can be manipulated and used to deliver information and influence people's feelings. By comparing with the characteristics of musical attributes (e.g., pitch, loudness, volume, timbre, and etc.), it is found that the spatial elements share many similarities with the musical elements.

Therefore, the author asserts that the spatial elements can be linked with musical elements, and can be used like musical notes to compose a music-like composition. Since the spatial elements have the ability to deliver information and affect people's feelings and emotions, the author proposes that this kind of music-like composition has the ability to affect the emotional expression and evocation as well.

Based on above thinking, the author puts forward her idea of "reinforcing the artistic expression of Visual Music through the utilization of physical space", and proposes that "physical space can be involved into Visual Music creation as compositional element to enhance emotional expression and evocation".

6.1.3 Theoretical Method

To achieve this proposition, a theoretical framework needs to be constructed. The author proposes a term called “Spatial Visual Music” as a sub-genre of Visual Music. The concept of Spatial Visual Music serves as the theoretical method for the main proposition.

(1). Spatial Visual Music

The term, Spatial Visual Music, is defined as a particular type of Visual Music, which uses the spatial parameters as compositional elements to compose music-like three-dimensional visual composition in physical space. The final product of Spatial Visual Music creation is a three-dimensional visual score, and the purpose of the creation is to present musicality through this visual score (the composed space). This composed space is the central focus of the overall creation.

The visual/sound (music/spatial music) source used in Spatial Visual Music plays three different roles as: (1) the image/music as itself, which conveys information of its own (the audio/visual composition itself has the ability of affecting the audience member’s emotional response), (2) the “reshaping agent”, which is utilized to reshape/reconstruct the space, and (3) the stimulant in “Digital-Cortex”, which is used to trigger other event/information.

(2). Interactive Mechanism of Spatial Visual Music

Structure of Spatial Visual Music — Nested Structure and “Meta-Score”

Nested structure is a structure that relies on the incorporation of either virtual or physical space. Within a visual score with a nested structure, there are a number of sub-scores embedded inside the main score (a “meta-score”) and which are utilized to compose the main score. These sub-scores are compositions and compositional elements, the artworks and the medium at the same time. They are components of the main theme, but they can also perform a complete sub-theme independently. Within each sub-score, there could be “sub-sub-scores” as well.

Spatial Visual Music is constructed in a multi-level-nested structure. The entire Spatial Visual Music artwork is designed as a three-dimensional visual score that unfolds along different timelines in all directions in this physical space. In addition to this, within the huge overall three-dimensional visual score, there are smaller visual scores nested, and interrelated to each other. The scores and sub-scores are both the compositions and compositional elements; and the performing space is both the content and the container at the same time. This kind of multi-level-nested structure provides the structural basis for the idea of “mapping time to space”.

Time and Space in Spatial Visual Music

Based on the nested structure, the performance space of Spatial Visual Music can be designed as a “time-map”, and the invisible time can be associated with (mapped to) the tangible physical space. The most commonly used single linear timeline is expanded to a number of crisscrossed and intertwined timelines that snake in different directions, and thus form a “timeline-net” that spreads over this entire area. This can be understood as: the physical space is transformed into a three-dimensional “time-map” that unfolds in all directions. This “time-to-space mapping” provides limitless possibilities of the interaction between the artwork and the audience.

“Memoryscape” and “Digital-Cortex”

To provide a more specific and concrete theoretical method for the artistic practice, the author proposes two concepts called “Memoryscape” and “Digital-Cortex”. They are defined as follow:

“Memoryscape” (the landscape of memory) is defined as an artistic abstraction and externalized expression of an individual’s personal memory or impression of a certain time period. It is a dynamic and responsive environment, which consists of two different types of content: (1) the audio-visual events that are created and presented by the artist as fixed and permanent content, and (2) the visitors as mobile and temporary content. A “Memoryscape” can be constructed by artist to

embed the artistically abstracted “memory fragments” and externalize the his/her “memory world”. This environment can be used to communicate with the visitors by presenting information, as well as receiving and responding to the visitors’ action.

In this environment, the spatial parameters, such as location, direction, starting point, pathway, end point, distance and depth, and the occlusion occurring between objects, are incorporated into the Visual Music performance. The incorporation of these spatial parameters involves visitors in the exploration of the site as an “audio-visual landscape”.

It is worth noting that, by definition, there can be no sound or no image in a “Memoryscape”. The sources that are used to create this environment depend on the creator’s choice (the specific memory or impression that he/she attempts to present). For example, a “Memoryscape” could be constructed with auditory events only, which can be experienced by a blind person. But in this case, “Memoryscape” should be regarded as a soundscape⁷⁶ rather than a work of Spatial Visual Music.

⁷⁶ Soundscape, originally coined by Michael Southworth, refers to the acoustic environment which is constructed with a sound or combination of sounds. (Southworth, 1969).

“Digital-Cortex” refers to an interactive complex which consists of a “Memoryscape” and the audience member’s exploratory actions. Rather than a static one-way display, it is a dynamically communicating system, in which a series of simulations take place and contribute to the “communications” between the artist, the “Memoryscape”, and the audience member. Within a “Digital-Cortex”, the “past” and “present” events, the artist’s and the audience member’s “mind world”, and the perceived environment of “Memoryscape”, are taken into continuous comparison, and interact with each individual audience member dynamically. “Digital-Cortex” serves as the interaction and communication mechanism for “Memoryscape”.

The core concept of “Memoryscape” & “Digital-cortex”, is to create an environment and provide the audience audio/visual information, used these audio/visual materials to trigger their memory and experience, and together to form a complete memory-landscape. It is similar to the experience of listening to music, recalling some fragments of memory from the past time, and form a mood or a story at present time.

(3). Benefits of Involving Physical Space

With the incorporation of physical space, the spatial parameters, in addition to visual and auditory parameters, are imported into the Visual Music composition.

The enrichment of compositional elements has the potential of extending the flexibility of the Visual Music creation process and reinforcing the artistic expression of Visual Music.

The intervention of physical space not only expands the single plane into a broader space for artistic expression, but derives multiple possibilities for timelines. It helps to upgrade an artistic performance / environment from fixed to highly dynamic, and from limited pre-programmed patterns and movements, to limitless possibilities.

6.2 Future Research

What are the differences and similarities between the experience of “listening to a piece of music” and “moving through a space”? How can we construct a space which embodies musicality (thereafter, “musical space”) which can be used to imitate a musical piece? What other elements from different sensory systems can be utilized to construct a musical space? How does the intervention of space affect people’s feelings and emotions, and could it generate similar feelings and emotions on par with music? What can the space do to affect people’s perception of “time”, and what can the intervention of space or spatial elements do to influence people’s experience of, and emotional response to, different kinds of temporal art?

These questions have sparked the author's research interest, in how musicality can be presented and expressed through other forms of art (in addition to music), especially the musicality presented by space. Future research will pursue further and deeper investigations of: the connections between space and music (e.g. spatial elements and musical parameters), the musicality of space, the emotional expression relationship between music and space, the interplays between time and space, and the relationships between music, memory and space.

(1). “Walking into Music” and the Construction of “Musical Space”

The concept of “walking into music” is one of the motivations for the author's research. This idea involves many different aspects and subjects of the studies on music and space, which are listed above, and the studies and explorations on interaction and immersive experiences, including those from different fields.

The author will also make further studies on musical structure and the unique characteristics of music to explore if there are any concepts or methods that can be applied to the design and construction of a space, and transform an ordinary space into a “musical space”.

(2). The Emotional Expression and Evocation of “Musical Space”

The author believes that a specially designed and constructed “musical space” should not be merely an imitator of music, which replicates music structurally and superficially. It should be created as “another form of music”, which represents music semantically or symbolically, and can create a similar effect to that of music in terms of emotional expression and evocation.

This direction for further research will involve further and deeper investigations of the areas and subjects such as the philosophy of music, music and emotion, space and emotion, music/musical structure and emotional response, emotional expression in music, emotional expression in space/spatial arts, and related perceptual psychology and neuroscience which have been beyond the scope of this study.

(3). The Musicality of Space in Chinese Classical Architecture

As a special category of space, the space in architecture, especially the space in Chinese classical architecture, has aroused great interest in this author. When looking at a historical building, the author discovered many similarities between music and architectural structure. Some architectural structures reminded the author of several pieces of Chinese classical music. Therefore, the author started

to wonder if it is possible to visually and spatially present musicality through the spaces and structures in Chinese classical architecture.

For example, there is a unique Chinese architectural structure and decoration of the ceiling of temples and palaces called “*zao-jing*” (caisson ceiling, literally “algae well” in Chinese). It is designed to support the roof and provide symbolic protection and the suppression of evil (Figure-83).

Figure 83 – Photos of “*Zao-jing*” (Caisson Ceiling)

The appearance of “*zao-jing*” reminds the author of a famous piece of Chinese classical Pipa (Chinese lute) music titled “*Ambush from All Sides*”, which describes a historical event in 202 BC – The Battle of Gaixia (southeast of today’s Lingbi, Anhui Province). It was the decisive battle between the two armies of Chu and Han, which ended the Chu–Han Contention (206–202 BC) resulting in a total victory for Han. After this battle, the Han leader Liu Bang proclaimed

himself the first emperor of Han dynasty (206 BC–220 AD). This Chinese classical Pipa music, “*Ambush from All Sides*”, gives a vivid “musical depiction” of this battle.

The spatial structure and visual appearance of “*zao-jing*” elicits feelings of encompassing, enveloping and embracing. The geometric shapes in “*zao-jing*” include squares, octagons, hexagons and circles. The three-dimensional structure of “*zao-jing*” appears like an opened umbrella that embraces from the top, the viewers below.

Figure 84 – Graphics design for Spatial Visual Music installation “*Ambush from All Sides*”

In a future practical project, the author would use the “*zao-jing*” as an inspiration to create a series of Spatial Visual Music works to visually and spatially present the music of “*Ambush from All Sides*”. These musical spaces will create an atmosphere of tension, expectation, anxiousness, conflict, and desperation. Figure-84 is the graphic design of the patterns which will be used in these works (see Appendix for large images).

In addition to “*zao-jing*”, there are more varied and diverse spaces and structures in Chinese classical architecture (as well as other architectural constructs from around the world) that can be studied and associated with music, and applied to the creation of Spatial Visual Music.

(4). Multi-Sensory Experience in the Environment of Spatial Visual Music

The Spatial Visual Music artworks that are designed and built in real space have the potential of offering more information than two-dimensional works. They may engage the audience on multiple levels, activating multiple senses in an immersive environment to experience art and music in an entirely new way.

In the current study, the author chooses to use audio and visual elements to compose musical space. In future studies of Spatial Visual Music, more sensory systems such as the sense of touch and smell will also be included into the process of composing and constructing a space, and thus would have a further enrichment

of the compositional materials and expand the possibilities of emotional expression and evocation for Spatial Visual Music creations.

6.3 Retrospection

At the very beginning, the focus of the author's research was on the one-to-one correlation between spatial attributes and musical elements. The purpose of the research was to find a way to "translate" music into space, which can be used to let people with hearing issues experience "listening" to music through other senses. The author attempted to establish a direct connection between space and music, and match each of the musical parameters to spatial elements, which was like translating words into different languages, in order to "literally translate" a piece of music into another modality.

The author subsequently realized that there are many complicating factors affecting people's perception and experience of music, including influencing factors such as people's social background, experiences, and cultural traditions, which affect their perception, understanding, and response to the same piece of music. The connections between space (the perceived space) and music (the perceived music) are not simply fixed correlations. It is less effective and hence inappropriate to make objective, mechanical and emotionless "translations", as it limits the range and possibilities of emotional expression and evocation.

The author, then, changed the focus of this research project from “using the space to make mechanical and emotionless structural imitation and ‘translation’ of music” to the concept of “composing a space to present musicality and enhance the emotional expression and evocation for Spatial Visual Music creation”. The scope of research was expanded, and the abovementioned complicating influencing factors were incorporated into this research project. The author was pleased to discover that the incorporation of these rich and complicating influencing factors unexpectedly became the most fascinating part of the research and its process. The involvement of these influencing factors not only enriched the theoretical and practical methods for the current study, but also provided unlimited possibilities for future research directions.

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APPENDIX

Pattern Scheme of the Performing Area of “*Hutong Impression*”

Pattern Design of the LED Panel on Lantern in "Hutong Impression" (a)

Pattern Design of the LED Panel on Lantern in “Hutong Impression” (b)

Map of the Performing Area of "Hutong Impression"

Pattern Scheme of the Performing Area of “*Hutong Impression*”

Functional Module Structure of "Hutong Impression" (a)

Functional Module Structure of "Hutong Impression" (b)

Region Segmentation Scheme of the Performing Area of “*Hutong Impression*”

Visual Elements in “Hutong Impression”

Diagram of "Memoryscape" and "Digital-Cortex" (a)

Diagram of "Memoryscape" and "Digital-Cortex" (b)

Diagram of A Unit in "Hutong Impression" (a)

Diagram of A Unit in “*Hutong Impression*” (b)

Diagram of A Partner Units in “*Hutong Impression*” (b)

Structure Diagram of the Projection Lantern

Internal Structure of the Projection Lantern

Animated Patterns of the Projection Lantern

Hand Painted Projection Disc on Lantern

Graphics Design for Pipa Music “*Ambush from All Sides*”

3D Models of Installation I (a)

3D Models of Installation I (b)