The Possibilities of Music Expression by Digital Art

—Through composing Music-based Media Art—

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Abstract: Through my experiences with 'Music Theater' in the middle of 1970's, I developed great interests in the music accompanied by visual elements. This music was thought to be in a genre that could break down the rigid confines of 'Contemporary Music'. Moreover, these visual elements altered musical construction and brought new possibilities to music expression.
Through my practice of 'Music Theater', however, the limitations of the performance as visual elements have become an important issue. In order to solve this problem, I utilized the interactive system of computers. From a visual perspective, this could instill the performance with more expressive power. In terms of a visual expression, I think that nothing compares digital video images. That is why I began to compose works that allowed the interactive system to cover not only music but also digital video images. These works have been labeled "Music-based Media Art". Then, with the idea of these works, "Audio-Visual Poems" have been created, which are works maintaining the compact relationship between digital video images and music. The visual elements affect the audio elements. Consequently, that enables us to predict the next sound in atonal music, even though the atonal music is considered difficult to be predicted. Also that makes it possible for the audience to follow the changes of sounds actively.

Keywords: Music-Based Media Art, Audio Elements and Visual Elements, Interactive System.

1. Introduction (purpose, background, method, and premises)

The purpose of this thesis is to clarify the possibilities, which musical expressions possess through the digital art. This thesis covers just a partial analysis of those possibilities, however, it allows people to grasp the growing importance of digital music expressions and shows them how the digital arts can be used for musical expressions. In order to avoid making things too abstract in this thesis, this thesis analyzes my own works with significant "author's voice". This thesis focuses more on the expression than on the technical skills. It is because I am concerned about the fact that the technical skills have been overemphasized in the field of digital art.

Digital art is created with computers in its composition and realization process (I use the term "computer" here, though, most of them are "personal computers"). Because of the computers, the characteristics of this particular art are related to characteristics of computers such as the forms of multi media.

The word 'Multi media' was originally used with commercial oriented purposes to inform the potentiality and efficiency of the computers. However, this word expands our range of expressions and the importance of using the expressional media with due respects. Technically, the term 'multi modal'[1] which put more weight on the receivers' senses, should have been more appropriate in this context instead of 'multi media'. However I dare use the latter term because of its familiarity, by assuming that this term usage does not distort the main points of this thesis.

Although digital art is related to multi media characteristics to some extent, the preset multi media expressions are not yet sufficiently utilized. First of all, the stream of consciousness regarding the expressions is as hierarchical as ever. In other words, a person who mostly works with visual expressions rarely gets involves in audio expression at the same time. Also a person who mostly carries out pictorial expressions rarely gets involves in motion picture expressions. Looking at educational curriculums, the recognition of multi media is overall weak. Even in art department, the musical expressions of multi media are treated as merely window dressing. To make things worse, music department generally pays no attention to multi media expressions. In many cases, artists have interests only in their own specialties and never care about their outside fields. Even if they have subtle interests in their sub-specialties, they are totally indifferent or to leave the matter to other people.

Currently, digital art is referred mainly in the context of art, so its music expressions are hardly understood. Therefore, this thesis emphasizes the music expression point of view. As mentioned earlier, I would like to introduce my own works to demonstrate the actual examples of 'music works with visual elements'. Particularly, by focusing on 'Music-based Media Art', it primarily explains why visual elements and digital methods are necessary and what the visual elements bring to music.

In addition, my premise seeks to confirm the meaning and the range of the word 'music' itself. Today, the phenomenon that the word 'music' refers to is in a vast

array and the rage of that word is continuously expanding. For instance, Musique Concrète[2] constitutes its music by using all the recorded sounds. It is similar to sound track [3]. Music expression of digital art is, in some sense, the sound track expression in digital art. Therefore, this thesis uses the word 'music' including the music such as Musique Concrète. This implies the concept of "silence and sound ruled by time".

2. Music Theater

Music Theater[4] was my first encounter with the visual-elements music before that of digital art. It dates back to the middle of 1970's when I studied in Germany. I mainly learned the works composed by Mauricio Kagel[5] and Dieter Schnebel[6].

Music Theater is one genre of 'Contemporary Music'[7]. It produces musical pieces that adopt the visual elements as theatrical elements. It is thought to be a genre attempting to break the uncommunicative situation of contemporary music because it eventually encourages the audience to use more than one sense and enables to expand the range of the audience.

Theatrical elements as the visual elements are primarily performers' actions and also various effects of stage lightening and/or props. These are, however, used just as elements, and Music Theater is no longer categorized in a play. It has little story and takes its priority in musical construction. Each performer's action, which is precisely instructed on the score, plays a role with musical constructive meaning.

The musical construction meaning can be briefly explained as follows. Imagine, for example, a pianist dramatically raising her/his hand to play C4 on the keyboard but making almost no sound (almost mute). This results in a sound with the new meaning of surprise or unexpectedness. It is because the audience would have expected to hear a big noise by seeing the performer's action but heard the small sound. This perception can be never created just by listening to the sound.

As a matter of course, music has musical constructive meaning only with sounds. Music produces sounds simultaneously or adds meaning to them, such as stability, tension, pressure or openness[8]. Then, by adding visual elements to them, the musical meaning itself could be altered, amplified, reduced, broadened or changed.

After the experiences in Germany, I myself begun to compose and perform Music Theater[9]. Soon after beginning, however, I realized some difficulties related to the performers' actions as visual elements, because those actions are physically linked to musical instruments and those are inherently limited as the visual elements. A pianist cannot play the piano without sitting in front of the piano, nor can a violinist play the violin without having the violin. That is to say, no pianists can play with walking around the stage and no violinists can play the violin on hands and knees.

Therefore, I made an attempt to diversify the actions as visual elements by separating performers from players. This is a system that players translate the performers' movements, which are considered as visual elements. The important point is that, in this system, music proceeds according to the actions, unlike ballet or dance in which the dancers move according to the music.

Picture 1 is a practical example of my Music Theater, "*HAKO (Boxes)*" presented in 1984. In this work, there are different shapes of boxes on the stage, and performers lift those boxes at random. Players then translate their actions into music, according to the certain rules written on their sores. Spontaneously, here comes the musical constructive meaning that cannot be pre-instructed only with sound, nor can be only with the action. For instance, the sound is modified into a continuous rhythm with some tension if the audience would see the visual elements of the performers raising or lowering the boxes, although that sound possibly sounds like a monotonic rhythm set at intervals if the audience would listen to it with closing her/his eyes.

Picture 1: Music Theater "*Hako*"

3. Interactive System by Computers

Indeed, the separation performers and players overcame some of the limitations that are inherent in the use of musical instruments. However, it makes the audience have to follow both performers and players and results in the division of their attentions. Also, it leaves the audience confused, because the relationship between action and sound is arbitrary and is not connected each other directly.

Then, what would be the effective way to make the usual action of playing the musical instruments 'musical action itself'? For this answer, I introduce the interactive system by computers. In this system, for the first hand, sound is stored as a data in computers, and, the interface and some sensor switches are set on a stage or on the players' bodies. The players are supposed to work with

the interface and sensor switches during the live show. The sound information from the interface and sensor switches goes to the computers. Then the stored sound in those computers starts. That sound stimulates the players to work on the interface and sensor switches again.

The interactive system makes it possible that the players' actions on the stage are recognized as musical action, by recording the sound beforehand. That means that a violinist could play the violin on hands and knees if she/he wears a sensor on her/his body with the recorded violin sounds.

The most important point in this interactive system is to store the sound as data in the computers. It implies that not only sounds from musical instruments but also spoken words or noises can be played as a result of musical action if all of those sounds are stored in the computer as data. In other words, the spoken words and noises have the musical constructive meaning within the musical context.

Picture 2 is another example from my practical works. It is titled 'Music Theater - Chatterbox', composed in 1992 by using the interactive system. This work is categorized in a mono-opera and it has a story setting of a woman conversing with her inner-self. In front of her, there are three boxes and her inner-voices are hidden inside those boxes. The boxes are lifted by that woman in order to seek for the inner-voice that would satisfy her.

Picture 2: hyper Music Theater "*Chatterbox*"

The inner-voice is recorded in the computers beforehand. The sensor is set in the each box, and it would be turned on if the woman lifts the box. This information is transmitted to the computers, and then the recorded voice would start to be played. Which recorded sound would be played is sometimes depending on a precise program but sometimes depending on a spontaneity-induced program.

Based on this system, the action of lifting up boxes can be the music playing action itself. Actions and sounds are directly related and the musical construction meaning is also directly related to the audience. In this particular example, relationship between question (expectation) and response (meeting the expectation) is constructed as the musical construction meaning. Sometimes the way of response has another musical construction meaning that tells the audience 'the treachery' of the expectation instead of the meeting the expectation. The possibility of musical playing action as visual elements has certainly being expanding.

After this work, I have continued to compose Music Theater with the computer interactive system. It is named "Hyper Music Theater[10]" in order to differentiate this from Music Theater without the interactive systems.

4. Images as subjects for the Interactive System

Although the possibility of musical playing action as visual elements has expanded greatly, I have begun to be attracted to the power of the 'images' expression while I have been pursuing visual elements. The limitations of musical playing actions have been released as explained in chapter 3, but that action is still fat behind the expression in the digital video images.

The digital video images are released from the confines of time and space. It also promotes the creation of free ideas during its process of shooting, image creating and editing. In addition, the technology of computers with high speed and large storage capacity gives these images an amazing level of plasticity. This makes images creation and alternation on the stage very effective. Also, the modules of monitors or projection screen images extend the possibility of the visual elements expressions. In other words, the monitor or screen can be utilized as an aesthetic object itself.

Then, these projected images are used as subjects for interactive system in my works, which are named 'Music-based Media Art'. I tried to integrate the original media art' which was specialized in art field, into the music field as well.

The primary difference between 'Music-based Media Art' and 'Media Art' is that the former art compositions are constrained by time. That means that there is a beginning and an end in Music-based Media Art. The audience follows events on the stage according to a set time axis. Namely, well-defined time sequence is inevitable for the audience. Usually, Media Art, which is exhibited in museums and galleries, does not have any beginning and ending points. It is the audience who determines how much time to spend for the art, and essentially, appreciating the art for one minute and one hour does not make a big difference. However, if the Music-based Media Art is a work that lasts ten minutes, the audience must spend the entire time with the work, otherwise it cannot be fully appreciated.

Picture 3 is a practical example "*Kagami (Mirror)*" released in 1996. In this piece, there is a synthetic image of the trumpet player and already-prepared video images. It is

displayed on a large screen on the stage. There are three cameras shooting the player and the playing action determines which camera images would be on the screen. The player has many infrared lights around his space and he sometimes block the light with his hand or his trumpet while playing the instrument. Then, according to the action, camera switches from one to another, and the computer sound, which have been recorded, created, edited and stored beforehand, begins to be played.

Picture 3: Music-based Media Art, "*Kagami*"

Through synchronization of the visual elements (the player's action and screen images of the player) and auditory elements (the sound of the musical instrument and the sound of the computer), each of the elements is effectively and independently emphasized. A simple action that might be ignored could call attention to itself through the sound, or conversely, a simple sound that might not stand out alone could stimulate a response through the player's action on the screen. Especially, any kinds of computer-generated sounds constitutes a musical constructive meaning by using its meaning itself or integrating the sound into visual elements. For example, the scurry brake noise by cars is a sound that rapidly increases in volume and then disappears, that means the noise has been cut out with the accent. The brake sound itself creates a powerful musical constructive meaning, but also adds the musical constructive meaning of a rapid and strong 'cut out'.

At the point when I was working on this piece, the computers were not developed enough to handle the live images. That is the reason that I designed an interactive system to operate by switching cameras. However, soon afterwards, computer technology makes it possible to store and output data as elements of an image and motion picture interactive system. So I began to use the computer to work with plasticity data freely. Picture 4 "*Hi no Utsuwa (Object of Mercy)*" is an example piece composed during this period, 1999.

Picture 4:Music-based Media Art, "*Hi no Utsuwa*"

In this piece, the interactive system is prepared for creating and changing computer-generated images and sound according to the player's action. Another various sensors and switches were set on the stage out of the view. Each player pantomimes and simultaneously works on the sensors and switches. Every time she/he makes a movement, and image is generated and a sound is played by the computer. For instance, a bouncing sound that was created as a result of dropping something is generated when the player drops his hands after lifting them high above his head. As a result of the sound, the screen shows something to emphasize the dropping and bouncing sound. This sound gives a sense of fullness and lowers the tension level of the musical constructive meaning according to the player's action. The digital video image stresses not only the musical constructive meaning but also repetitive resonance.

5. Considering the image as the only visual elements

Before long, I started to concentrate on images as the only visual elements, emphasizing its power of expression. Therefore, I eliminated the player's action from the visual element aspects. Players only need to play the musical instruments. No sensors and switches are set on the stage, but sounds from the musical instruments are picked up with the microphones, analyzed in the computer. Then the images are created and changed in the computer and also the sound is played thorough the computer.

I introduce a practical example of "Scar" which was composed for solo cello player, computer sound and digital video image in 2000 (refer to picture 5). The sound of cello solo is picked up with the microphone, and

transferred to the computer. The computer analyzes the pitch, strength and value of the sound and converts it into a MIDI signal. Then the MIDI signal triggers the image creation and changes the sound generation. By limiting the visual element to just the digital video image, both the music and the image gained a stronger tie.

Picture 5: Music-based Media Art, "*Scar*"

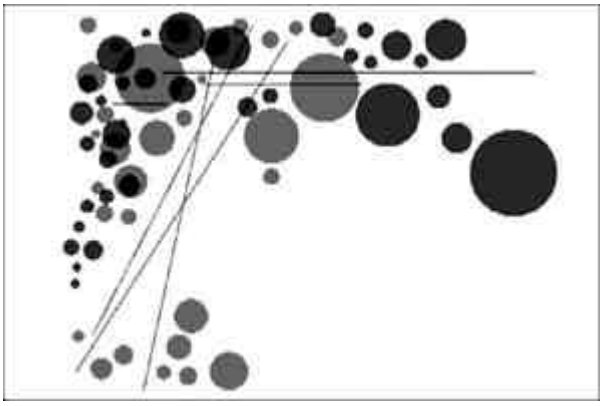
6. Audio-visual Poem

The interactive Music-based Media Art is very exciting at live performances. Various changes during live performances or playing the instruments during the show produce period of tension. There is a continuous expectation what comes to next. At the same time, however, this means that the results will never be the same at each live performance. I have to admit that it is difficult to construct a concise relationship between digital video images and music.

Then, recently I have begun to work on the media forms such as DVD and CD-ROM that effectively records the concise relationship of digital images and music, which Music-based Media Art cannot represent. This kind of work is called 'Audio-Visual Poems[12].

Picture 6 shows one of those works, 'Common Tragedies in Urban Life'(2000), an abstract animation using geometrical figures. This music is created by a Musique Concrète method that utilizes things-sounds. There is a concrete meaning of sounds and its musical constructive meaning in the midst of the musical expression. However, both meanings are not directly related, so there will be a slight lag between indication and interpretation. This lag can be seen as an example of the exquisite beauty of expression. The concrete meaning of sounds adds the meaning and image to abstract image expression. The musical constructive meaning of the sounds adjusts the speed and works on various changes and activities of digital video images and adds new meanings and image qualities to it. For example, the continuous sound of the second hand on a clock will not be only used as it actually occurs but also used with a gradual changed of sound strength and speed. This allows a sense of pressure to build in the audience with the musical addition of crescendo[13] or accelerando[14] giving musical constructive meaning.

In the early stage of creating this Audio-Visual Poems, creation of digital video images and music composition are carried out simultaneously. There are occasional expectations when one or the other becomes a priority due to its work process. However, it is difficult to separate these two elements because I take the creation of digital video images into consideration when developing the process of creating music. 'Composition based on a time axis' is considered as the highest priority in these series of works.



Picture 6: *Audio-Visual Poem, "Common Tragedies in Urban Life"*

7. The Visual Element Effect on Musical Works

In the process of creating a concise relationship between digital video images and sound, I consciously rethink the function of visual elements in musical works. It is related to the idea, "Linking visual and auditory elements together makes visual prediction extended to auditory prediction".

When we listen to music, we feel a unity of sound. This is because, at the very moment of hearing a particular arrangement of music, we will be anticipating the next step of the music and that expectations are usually met. However, if the expectations are always met, the audience will feel the monotonous, so there should be a certain amount of unpredictability in music. This is the inviolable rule of the maintenance of concentration.

Tonality plays a great role in this regard. The dynamics of shifting from dominant to tonic determines the direction of musical time and makes it easy to predict the next sound. It is hard for us to listen to atonality music[15] because of the difficulty to predict the next sound. This difficulty deprives concentration from the audience.

As mentioned previously, we can rely on the visual elements to predict the next sound when we listen to music with the visual elements. For example, a story that reveals itself through movements, size variations, and the

continuous activities of figures creates certain predictions and concentrations. The visual predictions are easier to be occurred than the auditory ones. If the visual elements are linked to auditory elements, visual predictions can reach the auditory predictions. Therefore, the audience will be able to follow the changes of sounds even in atonal music, if digital video images are added to that music, which is usually difficult to anticipate only through hearing it. Conversely, it is also possible to apply auditory prediction for visual prediction. Or, 'difficulty of prediction' itself, which is brought by cutting the linkage of auditory and visual elements, can be used as one of the expressive elements. It is very beneficial to capture this aspect as an analysis through appreciation of the actual work.

8. Summery

I developed a great interest in music accompanied by visual elements when I came across Music Theater in the middle of 1970's. This type of music sounds to be in a genre that can break down the rigid confines of contemporary music. Moreover, the visual elements alter musical construction meaning and bring the new possibilities of musical expression. However, through the practice of Music Theater, I realized the limitation of the playing actions as visual elements.

In order to avoid this problem, I have begun to utilize the interactive systems by computers. This could instill performances with more expressive power as visual elements and translate every sound into music element. Yet, nothing is better than digital video images in terms of visual expression.

Then I have begun to compose works that allow the interactive system to cover not only music but also digital video images. These kinds of works are named "Music-based Media Art". Thereafter, I have eliminated musical performance actions from visual elements and tried to use digital video images instead. This shows stronger ties between music and images.

Further along, I pursued a more concise relationship between digital video images and sound, evolving from the interactive system to concentrating on works called "Audio-Visual Poems". The visual elements affect the audio elements. That makes it possible to predict the next sound even in atonal music. Also, this technique allows the audience to actively follow changes of the sound and fully maintain their concentration.

In this thesis, I did not directly refer to the visual elements of musical expression in digital art but mentioned the visual elements of a musical piece. The three major roles that the visual elements play are;

1. To generate and change musical constructive meaning of sound, and to make more diverse musical expression available.
2. To stimulate musical meaning, to draw its musicality, to produce and change the musical construction meaning, and to increase its possibilities.
3. To influence auditory predictions and to make it easy to capture the music that induces the diversity of musical expression.

These points above allow a significant benefit when we think of digital art with visual elements.

I have mainly explained the process of the interactive system from the beginning to the content of the digital video image production. The interactive system should be a powerful tool when we pursue the new possibilities of multi media expression, which is one of the forms of digital art.

Reference:

1. Multi modals can be understood as an aspect or a character, which distinguishes a sense of one impression from another senses. If there are more than two senses combined such as auditory and visual senses, this situation is called multi modal. *Multi Modal Communication with music and Digital Visual Image*. Iwamiya, S., p i-ii ,Kyushu-University Press, 2002.
2. Musique Concrète is translated as "Gutai Ongaku" in Japanese, which originally means concreteness of music. By recording a sound released to the outside world and modifying or processing it mechanically, anything can be a subject material including a speaking voice and a created sound.
3. This is a record band of visual media. Of course, according to the type of media, the technical recording and playing system vary. All the sound elements that make up a digital video image such as speaking voice, atonal sound, or music are recorded here. It is sometimes called 'Sound Track' with the meaning of sound with visual elements.
4. It is in a Contemporary Music Genre. Music Theater is called Musiktheater in German. It originated from the experimental art activity of 'happening' and 'events' in 1950's and 1960's. It is different from opera and ballet by the point that Music Theater transfers all the events that are happened on the stage into the elements of musical construction.
5. He was a musical composer born in Argentine in 1932 and mainly active in Germany. The range of his activity was very wide, but he became well known due to his collage in Music Theater.
6. He was a musical composer born in Germany in 1930. His priority in Music Theater was mainly in vocalization. He also used Music Theater as a part of his educational activities. He wrote many theoretical music books.
7. Contemporary Music is not referred to preordination here. It is an extension of western art music or classical music. It is called 'Contemporary Music' to indicate music that does not have any tonalities conventionally.
8. For example, C has the role of keynote in C major and it

has the musical constructive meaning of stability or sense of freedom. On the other hand, the same C but in D flat major has the role of a leading note so it reveals a desire for finality or transition to go minor second upward position.

9. Nakamura, Shigenobu. (1984). Music Theater to no tsukiai: How to deal with Music Theater. *Shibakusa/Doshisha Women's College Journal (23).* (pp. 37-41). Kyoto: Doshisha Women's College Press.
10. Nakamura, Shigenobu. (1991) Music Theater by Hyper Music Theater Computer. *Kyoto College of Art Journal (Uryu version 14).* (pp. 165-173). Kyoto: Kyoto College of Art.
11. Nakamura, Shigenobu. (1992). Hyper Music Theater II – Six trial of using voice as a motif -. *Kyoto College of Art Journal (Uryu version 15).* (pp. 88-98). Kyoto: Kyoto College of Art.

12. The "Media" of Media Art means the middle and it is a plural of Medium. It also has the meaning of mediation and transmission, particularly as used in the communication filed. Newspapers and magazines are media, so were beacons and drums in old times. Media Art includes all those things ranging from the old times to televisions, videos, computers, Internet, all other electrical and electronic devices and media from modern times. It is also a part of the Media Art that uses all the new media and requires the new media in creation or surroundings.

13. Nakamura, Shigenobu. (2001). "Audio-Visual Poems 1994-2000". *Kyoto University of Art and Design Bulletin (Genesis version 5).* (pp 230-237). Kyoto: Kyoto University of Art and Design.

14. Music technical term originally in Italian. To increase strength gradually.
15. Musical technical term originally in Italian. To increase speed gradually.
16. In order to avoid tonality, it uses all of 12 chromatic scales in an octave instead of the diatonic scale. The chord is mainly the discord, so that logically there is no direction going from dominant to tonic. Arnold Schoenberg discovered the twelve-tone technique when he was writing atonal music.

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