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새로운 비선형적 시네마와 미디어아트

Generative spatial montage with multi-layered screens:
A new non-linear cinema and media art

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ABSTRACT

This study represents practice based research into new non-linear cinema and media art that generatively selects from author-tagged shots in real-time, and renders them over four screens layered in physical space. The aesthetics of ‘multi-layered screen’ and ‘generative spatial montage’ were specified as a conceptual framework, and the main concept of this media is to create poetic and vertical montage. The four-screen architecture enables audiences to experience diverse images with single and simultaneous vision, thus overlapped images on different screens can be used as a new system of montage film composition with collage effects in depth. With multi-layered screens, montage is created within an overlapping space, without sight distraction, and the audience can appreciate the montage from different angles and positions in a real space to produce different layering effects not possible in traditional 2D cinema. Using a tag based generative editing system helps in the construction of montage with diverse variations and metaphoric meaning. The generative editing system uses a dynamic Bayesian network constructed according to clip and timeline tagging. Audience members can actively contribute to the direction of the montage through a web interface, so the artwork creates different meanings by embracing the role of the audience in every screening. Timeline flow and authorial intents are not damaged due to these criteria, yet unexpected montage may arise from the randomized selections. A dance film ‘Poetry of Separation’ and a documentary film ‘Lost Fragments of Night’ were used to test the system and five expert interviews were conducted to evaluate the new media. The aesthetic concepts of the media find resonance with the newly designed display system.

Keywords: Generative montage, non-linear cinema, spatial montage, complexity editing, multi-layered screens, database cinema, new media art.

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I Introduction

Chapter1. Introduction

1.1 Research Background

Cinema is an image of thought, and thought is multi-layered and multidimensional fundamentally, just as poetry speaks with many voices simultaneously. In cinema the complex and multi-layered relationships among images are revealed through editing. It is a way to reconstruct images in a process akin to the selective reconstruction of memory, expressing a multi-layered nature. By selecting and sequencing shots, an editor can establish visual narrative and convey an artist's story [1].

A central aspect of editing is montage, which literally means “setting together”, or assembling; the juxtaposition of separate shots to reveal and intensify events. One of the important properties of montage is the ability to express relations in different elements aesthetically and convey multiple meanings simultaneously [2]. The combination of these themes can be subtle, but produce various and profound results.

Although montage offers techniques to present simultaneous and complex events on screen, the constraints of traditional cinema mean the presentation of shots is typically limited to linear progression. In most cinema montage is arranged in a sequential order with one screen. Although there are many possible constructions of a montage, only a single path can be realized.

Montage that emphasizes the simultaneity and complexity of images have sometimes attempted presentation over multiple screens, going beyond linear sequence montage techniques. The 1960s “expanded cinema” movement notably explored these concepts, but trials in multiple screen and non-linear cinema have typically been in the domain of avant-garde experimental films and have not been studied systemically in a broader context [3]. Films that use multi-screens have not developed as mainstream fictional cinema.

In the digital age, the implications of montage concepts become more complex and multi-dimensional as we become increasingly surrounded by screens and images. Non-linear digital technology with information-dense communication flow allows for various possibilities in narrative path and image assembly. For example, digital

editing techniques enable editors to arrange sequences in non-chronologic order. Editors can also access clips instantly and randomly, so complex events and images that deviate from sequential temporality can be shown. Furthermore, the use of computer databases to structure collections of clips makes it possible to construct various types of montage automatically or generatively [4].

Based on these phenomena, new cinematic trials have been created with nonlinear computer systems and multiple screens. The use of these technologies to create cinema can be labelled as ‘new digital cinema’, of which database cinema and interactive cinema are examples [5]. Works in new digital cinema have mainly focused on specific themes or intentions such as database structure or interactive narrative. Some algorithmic automatic and generative editing techniques have been developed, but have been primarily focused on temporal montage construction with a single screen [6]. Although multi-screen montage technique, communication and installation have been areas of much research, methodological studies on the assembly of images for multi-screens and windows have so far been limited. Both aesthetic and practical approaches are required in the study and construction of montage for multiple screens with digital technology.

1.2 Research Objective

Spatial montage involves the use of extra spatial dimensions beyond the traditional single layer screens of traditional cinema. It emerged as a concept for overcoming the limitations of sequentially linear montage on one screen. It was specified as an aesthetic concept by a new media theorist Manovich in 2001 [5]. Temporal montage can gain spatial dimensions through the implementation of multiple screens that show diverse images simultaneously. Thus, spatial montage can function as an artistic expansion used to juxtapose images in complex and simultaneous ways.

Limitations of human perception can have implications for the effectiveness of spatial montage. Scattering screens through a space may disrupt attentiveness and affective involvement as we can only attend in one direction at once. It may be difficult to capture diverse images concurrently because simultaneity of focus can be lost. Using a multi-layered screen can be an alternative way to intensify simultaneous relationships between images and events. A display architecture based on overlapping images enables audiences to experience diverse images with single and simultaneous vision, thus overlapped images on different screens can be used as a new

system of montage film composition. Within a multilayered screen architecture, montage is created within an overlapping space, such as collage effects in depth, without the need to shift visual attention.

Generative editing can give a fascinating opportunity to re-encounter the possibilities of complex and simultaneous montage for multi-layered screens. Computer generative art uses algorithms and programs to create interaction between chance, iterative procedures and dynamic processes, which can give rise to emergent complexity despite minimal involvement from humans [7]. Generative art has been extensively directed toward computer graphics and music. However, efforts to apply generative techniques to the understanding or making of cinema have until now been limited, often to technological aspects of editing [8]. The introduction of the aesthetics and methodologies of computer generative art enables complex montage construction for multi-layered screens.

Automated generative algorithms for film editing have given rise to emergent complexity with minimal human involvement. Although generative techniques have been used to juxtapose large images for multiple screens such as in database cinema, there have been no generally described generative editing systems for multiple screens, and only few studies regarding montage construction with spatial perspectives [9]. A generalized generative method is required for simultaneous and complex montage construction on multiple screens, and the multi-dimensional arrangement of screen display require further study.

The frames are discussed in this research as *multi-layered screen* and *generative spatial montage* and their focus and scope are defined. Multi-layered screen intensifies near aesthetics to reveal vertically constructed montage and collage in depth for creating new visual perception. Generative spatial montage is an aesthetical method to create unfixed montage with expanded possibilities within an overall internal logic.

The values of new media concepts need to be demonstrated with practical examples and evaluations so the conceptual frames of multi-layered screens and generative montage were examined through practice-based research. A physical multi-layered screen and a generative tag-based editing system were created, and the practical uses and aesthetic meanings were assessed as case studies. The case studies were composed with the construction of two films that incorporate distinct cinematic genres: dance film and documentary film. Moreover, the concepts require evaluation from different perspectives due to the cross disciplinary exploration inherent in new media, so expert interviews in various fields were conducted.

In summary, the objective of this research is to connect spatial montage on a multi-layered screen with the logical structure of computer generative art to create both a new montage technique and new media aesthetic. Further, through basing this technique and aesthetic on a new conceptual framework, a suggestion about new media display can be made which may be utilized for a new form of nonlinear cinema and media art.

1.3 Thesis Overview

This study is structured within seven chapters: Introduction, Related Work, Conceptual Framework, Design and Implementation, Case Study, Expert Evaluation and Conclusion. In Related Work, overall studies about non-linear aesthetics are reviewed and non-linear digital media concepts including database, superimposition and interaction are examined. Eisenstein's conflict montage, Zettl's complexity montage and other montage and film editing theories are considered. Multi-screen cinema and techniques are explained with a basis in montage theory, including avant-garde films and contemporary digital media. Database cinema such as Manovich's soft cinema are overviewed and interpreted with reference to generative aesthetics, and generative art and cinema are presented to introduce the core ideas and methods used in this research.

Based on the literature review, a conceptual framework was developed for the construction of a novel montage system which is supported by and expands on existing research. In Conceptual Framework, the development of the aesthetics of multi-layered screens is discussed, showing its conception as an extension of the real-world progression of digital screens to include extended and fluid characteristics. 'Generative Spatial Montage' is proposed as a term for distinguishing the spatial construction of montage with computer generative processes. The connection between these two concepts is established to form the basis of a new display system designed with the intention maximizing their combined potential.

In Design and Implementation, the development of a multi-layered display both in a virtual space for simulating a large installation and as a physical miniature for testing with actual projectors is detailed. The display is part of a cinema system that includes an editing system, author and audience. A generative tag editing system was made with an accompanying graphical user interface. An author can tag scenes with keywords that describe objects, events, moods or other criteria, and then construct a time chart using the same tags. The system has unique

features and specific constraints that are also presented. There are constraints on usable media contents which are inherited from the system design. Fundamental properties of multi-layered composition and the utilization of randomness in the montage process can produce perceptually ineffective results with some media content.

In Case Study the methodology and findings of a customized study are shown. For the case study, a dance film and poetic documentary film were used to evaluate the media. System configuration depends on authorial intention and the resonance between the film and the display system was examined for aesthetic effect with reference to art history and philosophical theories. For general opinion on the system, beyond authorial intent, five evaluations from experts in different, relevant fields were collected through extensive interviews.

II Related Work

Chapter2. Related Work

2.1 Non-linear Aesthetics in Digital Cinema

In film practice, non-linear generally means an event or situation that deviates from chronological order such as cause and effect [10]. In film editing, linear editing is traditional videotape editing that requires chronological sequential order to cut and assemble shots. On the other hand, digital editing is non-linear as it allows instant access and recall of film clips from different points of a sequence. The editor can explore manipulations of time along non-linear pathways within a montage with greater ease and a variety of effects [4].

Non-linear editing is related to non-linear narrative, which can be interpreted as the decline of conventional linear narrative, such as the ‘beginning, middle, end’ structure of Aristotle’s traditional narrative [11]. Non-linear narrative in film is the rearranging and re-sequencing of time to express the chaotic essence of memory and time itself, or create multiple narrative paths and branches [12]. There are also non-narrative forms of editing that break the logic of cause and effect in more extreme ways such as in poetic or abstract art [13].

Before the growth of digital technologies, there were many trials to adopt non-linear narrative or non-narrative in avant-garde or experimental films. For example, overlapping images including superimposition and collage techniques were used to present complex and chaotic relationships among different images. Loops and repetition were also utilized to reveal the circulation of time. Contingency and improvisation were applied to express unconsciousness and absurdity [14]. Although these experimental filmmaking techniques have different intentions and effects, they all share the characteristic of non-linearity that presents time in non-chronological ways.

Non-linear aesthetics have been radically expanding through digital technologies. The most significant property of digital systems is that information is saved and retrieved in a non-linear way fundamentally. If film clips are digitized and stored in a computer’s memory as a database, all clips can be accessed equally and arbitrarily. Data also can be transformed with different types of database structure such as hierarchical, network and object-oriented [5]. Therefore users or editors can retrieve and arrange clips in more complex and various ways. These

characteristics of digital systems make it possible to create art and film experimentally.

Various kinds of media such as graphics, music and texts can be juxtaposed simultaneously with digital devices, so superimposition and collage effects with different materials can be easily realized. Moreover, improvisational aesthetics can be actualized with the logic of random access through database. Looping is also a fundamental computing concept, so repetition and circulation can be a central characteristic of digital art and cinema [10].

Interactivity can also be considered as a non-linear aesthetic in digital cinema. Through input data from users, the variations in output content are produced. One main form of interactive cinema mirrors the function of hypertext, which is a digital technology that uses text constituted as nodes linked with multiple paths and is thus interpreted as multi-sequential or multi-linear [15] [16]. There are other forms of interactivity such as adopting physical sensors to record human physiological information or exterior environmental factors as input data [17].

The expanded possibilities of digital media for exploring non-linearity resonate with key concepts of avant-garde and experimental film, so the border between avant-garde and mainstream cinematic experimentation are starting to blur [13].

2.2 Montage and Multiscreen

At its core, editing in cinema is the selection and sequencing of shots to reveal events and portray stories most effectively; it is a primarily connective process in order to create a whole. The choices of how to put shots together are influenced by the intents of artists and the requirements of the medium. According to the conventions of natural visual sequence and narrative flow, editing is primarily concerned with the consistency and maintenance of the viewer's mental map, followed by the necessary actions of cause and effect along the vector of running time. Nevertheless, violating these conventions of sequential continuity may intensify emotional rhythm or reveal specific intricacies within events; approaching what has been called *complexity editing* [1] [2]. Editing is also considered as the choreographic shaping of physical rhythm in film [18].

One of the most influential concepts in twentieth-century film is montage, which literally means, "setting

together” or “assembling”. Between 1924 and 1930, several Soviet films exhibited a radically original film style, generally known as the ‘montage style’. The proponents of the ‘montage style’ conceived that filmic meaning is built out of the assemblage of shots to create new syntheses and ideologies. Eisenstein said that montage is the juxtaposition of two separate shots so that the result is qualitatively distinguishable from each component element viewed separately. He also compared montage to the multiple voices and dimensions of musical counterpoint [19] [20].

Montage is used to build narrative, to control rhythm, to create metaphors and to make rhetorical points. There are various types of montage: sequential, sectional, comparative and collisional. Sequential montage presents events in the conventional series of cause and effect along horizontal time. In contrast, sectional montage reveals the complexity of the event, stressing simultaneous and multifaceted points of view. Comparison montage presents two similar themes by juxtaposing images from different events, while collision montage shows two conflicting themes to create a third [21] [22].

Deleuze described montage as the link from one moving image to another, which constitutes the whole (rather than dividing the whole into fragments), giving the image of time as the principal act of cinema [23] [24]. Benjamin made a connection between the perception of a city and the appreciation of montage. For him, montage is not only the technique of film editing for juxtaposing separated shots but also a conceptual process for linking separated images to break isolation [25] [26].

There have been many trials to use multiple screens for cinema, especially in the avant-garde and ‘expanded cinema’ movements such as the Labyrinth production at Expo’67 [3]. These types of films did not develop into mainstream cinema because display environment proved to be inherently distracting. However, the concept of montage is changing and expanding in the digital age with high information densities and multiplicity of images [27].

Manovich suggested the concept of spatial montage, which is the juxtaposition of images of different size and proportions. It shows a simultaneous relationship between separated images, which can be alternatives to traditional montage in a single screen [5]. It is also convenient to use multiple screens to convey a maximal amount of information with minimal time. The form of images in multi-screens can be compared to music that

seems boundless, multi-directional and simultaneous, following Eisenstein's metaphor of counterpoint [28] [29]. Marchessault [3] echoed this and claimed that by creating a simultaneous syntax, the use of multiple screens breaks down the literary form of film. Suzuki [30] also proposed multimedia montage as a structural synthesis of time and space, again comparing it to counterpoint in music.

There have also been attempts to converge cinema with architectural installations that use multiple screens. The concept of geographic narrative of cinema in physical space is that audiences can experience dynamic environments by traversing the spatial montage through walking [31]. It is related to the spatial montage as a conceptual and mental connection among separated images described by Benjamin.

From these contexts, multi-screen spatial montage offers unconventional approaches to the construction of images and creation of stories, side-stepping the linearity of the content. However, it also places the whole at risk of fragmentation. A multi-layered approach to screen display provides a binding element of physical positioning that can aid in retaining the whole while still bringing out the possibilities of spatial montage.

2.3 Database Cinema and Generative Art

Database means a structured collection of data. Computers can search and retrieve data effectively in such structures. A database can be the center of a creative process that makes unfixed and generative artworks with dynamic fluctuation. For example, Manovich created database cinema with computer in the *Texas* soft cinema project. In *Texas*, each video clip in the database is described by some parameters, which are used by the software to assemble clips together; montage is created by similarities between these parameters [32] [33]. There have been many attempts to use databases for open-ended, unfixed and generative effects, thus database cinema can be understood as a generative cinema that creates cinematic experiences through the execution of computational algorithms [8].

Computer generative art is created by computer programs with minimal intervention from humans, and focuses on processes that can generate multiple outcomes. Generative art challenges the traditional concept of

authorship and intention, adopting autonomous processes and randomness as methods for making artworks. Generative systems enfold manifestations of chance and dynamic process, both powerful themes in art. Interactions between stochastic and complex systems in generative art can result in dynamic processes with similarity to those found in nature [34] [35].

Boden [7] defined Generative art (G-art) as generated by some process that is not under the artist's direct control, and Computer generative art (CG-art) as produced by a computer program with minimal interference from humans. However the many attempts to apply computer-generative systems to the understanding and making of artworks have been predominantly directed toward computer graphics and music; computer-generative cinema has been relatively less explored.

Mike [36] described some informal research from the 1970s, a period when he and others explored generative systems using motion picture film. They tried to work with film as a dynamic medium, so that the role of the audience was as an active participant in the production. A 16mm film, Red + Green + Blue, (R+G+B), developed the imaging of landscapes using a generative system based on analogue procedures with color reversal film.

Lobb [8] explained that generative cinema is a field to create cinematic experiences through the execution of computer algorithms. Galatema [37] is a computer generative project for making generative cinematic works. It proposed a framework to generate 2D or 3D films, using formalized network software for the basic architecture of the film. Most prior work in generative cinema has addressed the generation of images rather than editing. Although there has been some research into algorithmic editing, the emphasis appears to be technical more than aesthetic [6] [38] [39].

III Conceptual Framework

Chapter3. Conceptual Framework

3.1 Multi-layered Screen

‘Multi-layered screen’ describes a media display and an aesthetic concept that is specified to explore the effect of montage, which is constructed by physically layered screens. The expanded concept of screen in the digital age and the extension of multiple screens embody the idea of multi-layered screen. Digital screens not only display visual content but also often contain functions to save and record data or images, so the screen is open to infinite possibilities for producing images [40]. In a complex digitalized system the screen can be perceived as a node in a network; the usability and concept of the screen have been changing from a material and fixed object to nonmaterial and unfixed images and frames [41].

Because computers make it possible to create and arrange unlimited amounts of information through heterogeneous media and images, multiple screens and windows could emerge in various forms. Single screens are limited to production and juxtaposition of diverse media and images in a temporal sequence. The temporal screen images that traditional films privileged could gain spatial dimension through computer technology [5]. These extensions of nonmaterial and unfixed multiple screens enable us to propose new methods of montage construction.

Digital images can be manipulated with a computer interface that allows for construction with many layers. In a typical interface layout, time is represented on a horizontal plane and the spatial order of various images is displayed on a vertical plane. Film layers can be added, removed and edited in the same way that they are manipulated in photo editing software [5]. In this way multi-layered screens correspond to computer layered interfaces, so a physically installed multi-layered screen can have aesthetic adjustments in line with digital interfaces.

The concept and technique of multi-layered screen can break the isolation among complex and diverse images and intensify simultaneous expressions, which is the expansion of montage construction. Multi-layered screens can express simultaneous overlapped images for each layer and create a 2.5 dimensional spatial effect.

The simultaneity allows for both independent images and relationships among images to be exposed at the same time.

The montage that can be constructed simultaneously on a multi-layered screen is related to avant-garde cinema aesthetics. Many avant-garde artists conducted artistic experiments to juxtapose fragmented and heterogeneous elements for creating a unified form, a concept called 'syncretism'. To illustrate the meaning and value of universal entity and simultaneous existence, mosaic figures were created with overlapped multi-layered images [14]. It can be seen that the traditional concept of montage can be extended to embracing collage effects.

In visual art, the terms 'montage' and 'collage' tend to be used with the same meaning. Both these terms could be defined as an aesthetic concept or a technique to connect the fragments of different images and combine different perspectives for a dialectic and universal form [42]. Montage is mainly interpreted in film as temporal juxtapositions with different shots, while collage is predominantly explained as the combination of different fragmented images in a single frame. The collage aesthetics have been tried in cubistic and surrealist art; in cubism, the different visual perceptions constituting body images are uncovered through harmonized tensions between different elements, and in surrealism, the contradictory images were juxtapose to express unconsciousness [42] [43].

These kinds of montage and collage are not only artistic expressions but also philosophical attitudes and ideas, which are attempts to accept diverse perspectives and isolated elements. It can be also seen as efforts to embrace the reality of separation and build a universal harmonized tension. Montage and collage could be considered as methods to recreate complex realities by reconstructing partial elements metaphorically, a unifying force to re-establish connections in disconnections of the modern world [44].

The concept of vertical layers in film was emphasized from Eisenstein and Maya Deren. Eisenstein described vertical montage, which is synesthetic expression by emphasizing harmonization with various senses and images. It is related to sectional montage that unveils the intensity and complexity of events by creating montage in a vertical dimension [19] [20] [45].

The vertically constructed montage intensifies the poetic expression in film to reveal both fragmented and universe images. Poetic effects in film are considered as the metaphoric concept of the vertical by Maya Deren:

The vertical means the poetic expression to reveal central emotion and thought implicitly, and the horizontal means the construction of storyline. However, the concept of vertical by Maya Deren is metaphoric rather than practical [46] [47].

Multi-layered screens make it possible to express temporal montage and layered collage simultaneously, so it can be seen as a media that can create the vertical juxtaposition of montage. They have the potential as a media that enables the creation of both temporal and spatial montage with collage aesthetic including vertical and poetic effects.

3.2 Generative Spatial Montage

The concept of ‘Generative spatial montage’ is proposed to investigate artistic and practical trials for generating unfixed and unlimited spatial montage. To clarify this study, the theoretical background of spatial montage and generative art aesthetic will be explained, and aesthetical and practical ways for creating spatial montage with a generative editing system will be addressed.

Typically, montage in film is the constitution of connective shots by selecting and arranging separated clips. Traditional film theories mainly focus on temporal elements of montage techniques, while spatial dimensions have received less attention. Multiple screens has enabled the use of additional spatial dimension where diverse images and events can be shown simultaneously on different windows or screens with various sizes, proportions and shapes, which is a new logic of montage that creates various spatial relationships among many images.

However, totally careless and randomized juxtaposition of images cannot be considered spatial montage; it needs to be created for specific meanings or artistic effects through the relevant juxtaposition of separated images. Therefore, it requires building particular intentions or criteria for juxtaposing images, so it is necessary to investigate methods for creating spatial montage effectively without violating aesthetic effects and digital technology provides a powerful means of doing so [32]. Systemic methodologies for juxtaposing images on multiple screens or windows have been not been deeply explored.

Generative art is an artistic trial and genre to use autonomous processes that express incomplete and

undetermined effects in making artwork. The term of generative art is mainly explained as a computer art recently, but the artworks that focus on generative process were already examined even before the advent of digital technology. For example, Dadaistic artists tried to reveal the absurdities of modernity and rationality by juxtaposing heterogeneous images, texts or music accidentally. In surrealistic artworks, automatic process was used to unveil unconscious psychological mechanisms [7] [35].

In computer generative art, however, the artwork is predominantly created by a computer stochastic process rather than by an artists' decision or control. Artists set some restrictions and rules using algorithms, and then a computer randomly generate images or sounds within these variations. These forms of generative art can change the concept of traditional authorship, and create unfixed artworks that can make multiple outcomes [48].

If the trait of generative art is adjusted for montage construction, the new logic of montage aesthetics could be arose. Montage techniques in film fundamentally tend to have fixed and authoritative properties. In soviet films, for example, montage techniques were predominantly used to create and convey political and ideological purposes such as propaganda [21]. However the computer generative art aesthetic presupposes unfixed and opened characteristics, so the montage creation with computer generative system enables to produce unconventional and experimental results. It keeps generating diverse relationships among many images, and expanding montage with unlimited possibilities of construction.

Furthermore, for a human, it might be impossible to consider every variation of montage juxtaposition for both temporal and spatial dimensions. The combination of both of these dimensions increases the scale of possibilities to an uncountable number. Thus, generative aesthetics and methodology can be helpful for practical and effective film editing for multi-layered screens.

Generative spatial montage is the artistic and technical trials to juxtapose different images with a computer generative system for unfixed and opened montage with spatial dimension. It attempts to form an internal logic of montage construction maintain overall flow of the temporal montage but to keep reconstructing endless relationships among images through spatial and temporal interplay. Moreover it is an effective technique to arrange and adjust clips with a large degree of variation for editing content for multi-layered screen.

A purely randomized system of juxtaposing images will not typically reveal the aesthetics and constructional concepts of montage. Therefore practical concepts and techniques for a generative editing system needs to be realized. For these reasons, a tag-based editing system was developed for multi-layered screens.

There are two distinct components in the editing system: the manual editing stage and automatic editing stage. The manual editing stage is primarily concerned with setting limitations such as the timeline arrangement. It is related to putting internal logic and specific rules with computer algorithms in generative art. The automatic editing stage focuses on producing new montage by exploring different possibilities within the limitations set in the manual editing stage. It is a process to express complex and open results through the generative system.

In the manual editing stage, an artist or editor can tag keywords for each clip, and then use the same tags to a construct montage timeline. A playlist for each screen is generated using a dynamic Bayesian network to select clips based on the matching the tags on each clips with the desired tags at that time in the montage. The tag-based network system was used to reflect association by metaphor in human memory. Human memory is similarly conformed by unfixed and metaphoric association in a network. In this system, tags have metaphoric, condensed meanings, and the process of montage construction is the networked connection between metaphors such as with mental association [49]. The program also ‘remembers’ which shots were already shown before and which shots were shown together to build connections between clips that contribute to their probability of future selection.

The tag-based editing system was developed to create generative spatial montage, and was inspired by the metaphoric association of human memory. The system makes it possible to construct montage in more flexible and unfixed ways than using a database divided with predefined categories. It can be considered as a technical method to express the aesthetic effects of generative montage.

The conceptual framework incorporates two distinct concepts: multi-layered screen display and generative spatial montage. There has been extensive research in these areas separately which have exposed their respective philosophical and practical basis. The combination of these concepts, with consideration for their inherent strengths and weaknesses, to form a new media is a novel contribution of this research. The design of the display system, generative algorithm and media contents was based on building an effective connection between these two concepts.

IV Design and Implementation

Chapter4. Design and Implementation

4.1 Multi-layered Display

We authored virtual simulation models, which simulate large scales installations intended to be installed in places such as galleries and public spaces, and created a physical miniature display system as a prototype model. Two projectors are set from the bottom, projecting by rear diffusion onto four layered screens. Grey sheer fabric is used for the translucent screens. The size of the actual screens may vary according to the exhibition environment. Because of the layered spacing, audiences can see each projected image differently through sideways parallax movement.



Figure1. Photograph of the display miniature infrastructure as a prototype model.

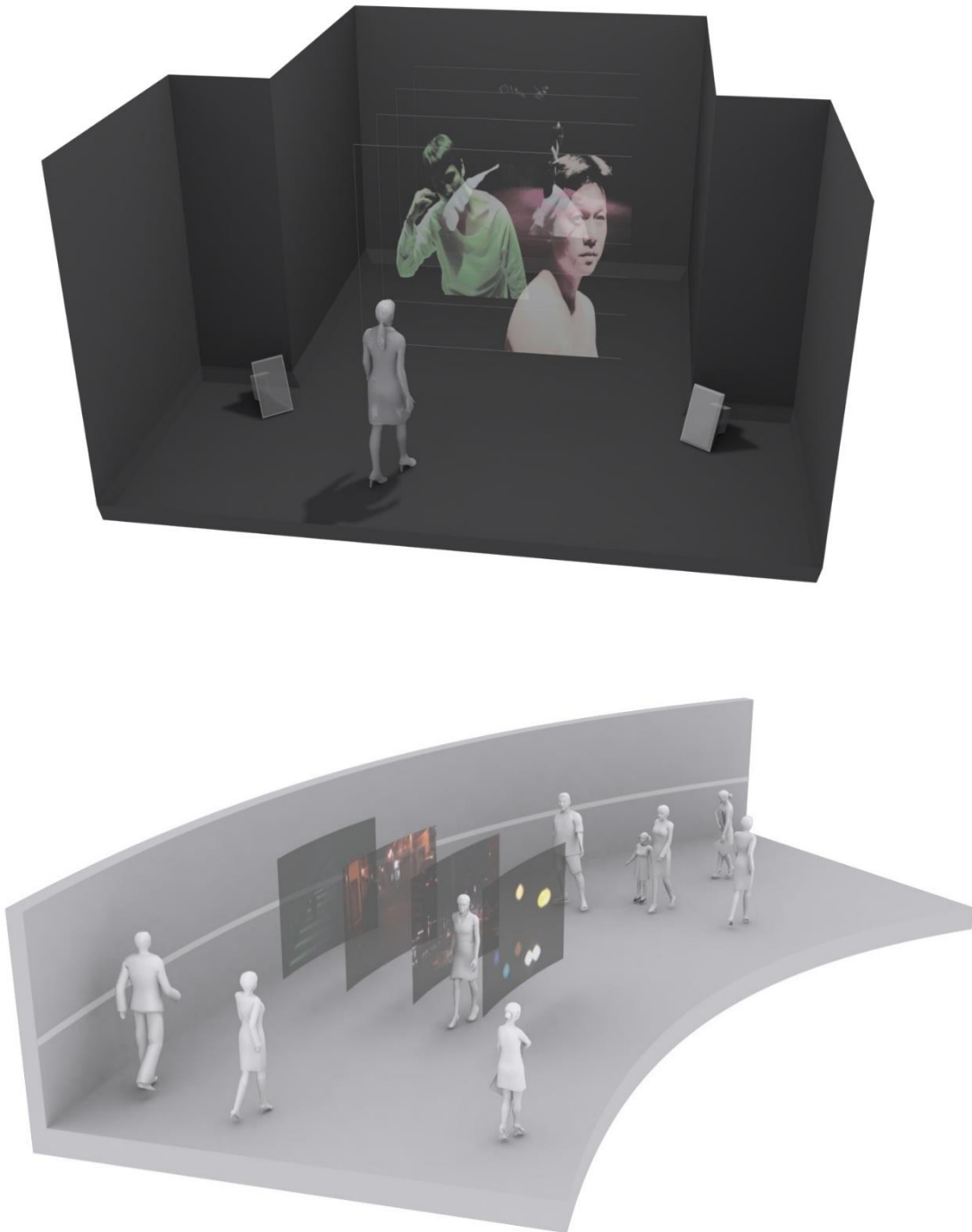


Figure2. Renderings of proposed installation architectures.

4.2 Generative Tag Editing System

We designed a generative editing system that selects clips for each of the four multi-layered screens within timeline, runtime and effect guidelines set by a human editor. Montage construction guidelines are set by a system of manually tagging movie clips and points on a timeline. A playlist for each screen is generated using a dynamic Bayesian network to select clip.

The process is generative because each clip is selected with probability based on their utility for the specific requirements and the selection of each new clip is dependent on previously selected clips. The human editor guides the flow of the montage but the number of possible generated outcomes can be vast. The system is implemented using two computer tools. One is the playback engine that runs on a local computer as part of the installation. The other is a portable interactive editing tool.

A user can access the interactive editing tool with a mobile device, create tags for each clip and give them weighting values between zero and one. Every tag is then added to the Tag Library for the montage construction. There are some predefined montage effects, such as forcing a clip to only play when the other screens are empty, and to be played with an echoing effect across multiple screens. Once the user has described each clip with suitable tags they can create a visual timeline to represent the structure of the montage. The user can set a runtime and use any tag from the Tag Library to set target values at desired keyframe points on the timeline.

To work with interconnected tags, clips, screens and weighted probabilities changing with time, dynamic Bayesian networks were utilized. A time slice is created whenever a new clip is needed for one of the screens and each slice includes tag values for the clips and the target values at that time. Target values at each slice are calculated by linearly interpolating between the target values at the nearest keyframes that were created by the human editor.

For a deeper exploration of the relationship between layers of the montage and temporal placement, the clips being played at the same time as each other should have their newly established relationship to each other considered for future measure of fitness. Clips which have been shown together have increased probability of being played together again. When a clip is selected, its tag values are deducted from the timeline tag values.

Rendering in the playback engine is performed with Max/MSP/Jitter, a commercial audio-visual programming package, to render the clips for each projector. The video clips for use in the installation are stored on the playback engine and on the interactive editing tool server for clip playback within the web interface. The tagging and timeline data is downloaded from the remote server hosting the web interface and used by the playback engine as inputs for the dynamic Bayesian network to create a playlist for the four screens. When a time signaled in the playlist is reached, the appropriate video clip is played and projected onto the multi-screen installation.

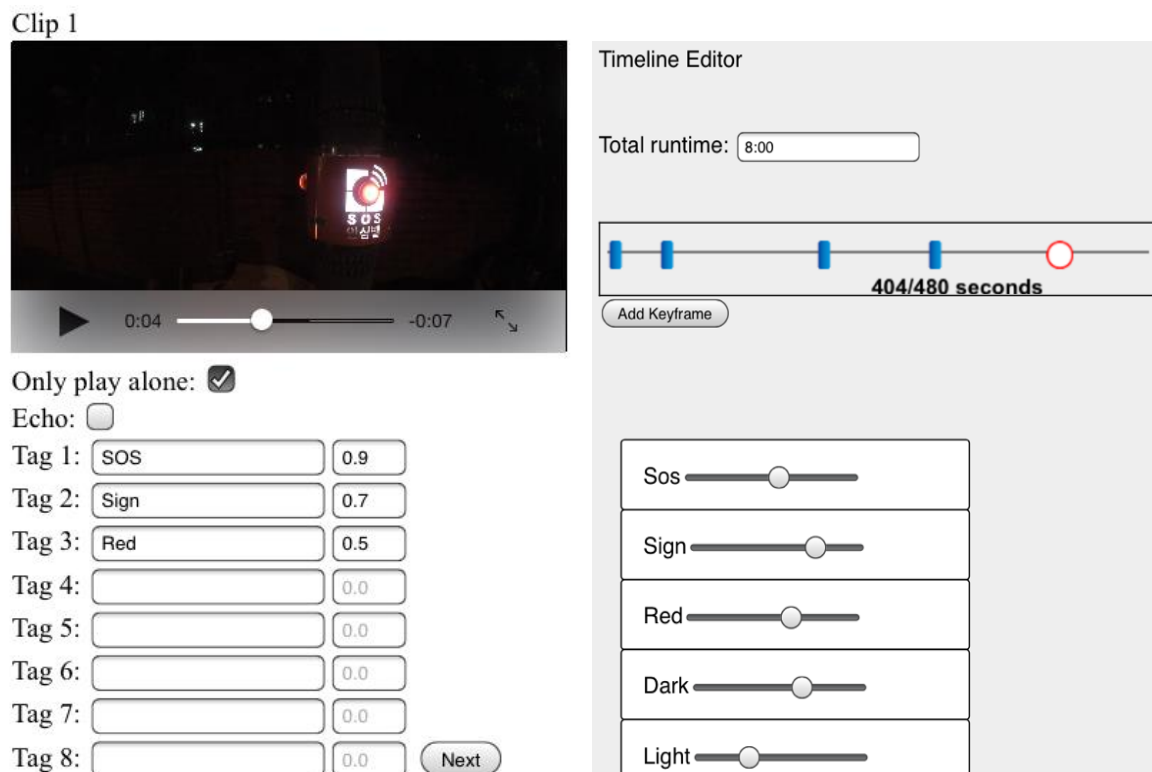


Figure3. The web interface of the editing system.

The usage process outline of the generative editing system is:

1. Users access the web-based interface for editing. (The interface works in all types of devices.)
2. Create tags for each video clip. (Every tag is added to Tag Library.)
3. Tags are assigned weighting values between zero and one.
4. Predefined effects such as 'Only play alone', 'Echo' and 'Sound off' can be activated for each clip.
5. Set the desired running time of the montage to create a visual timeline.

7. Playback engine renders the montage for four screens using Max/Msp/Jitter.

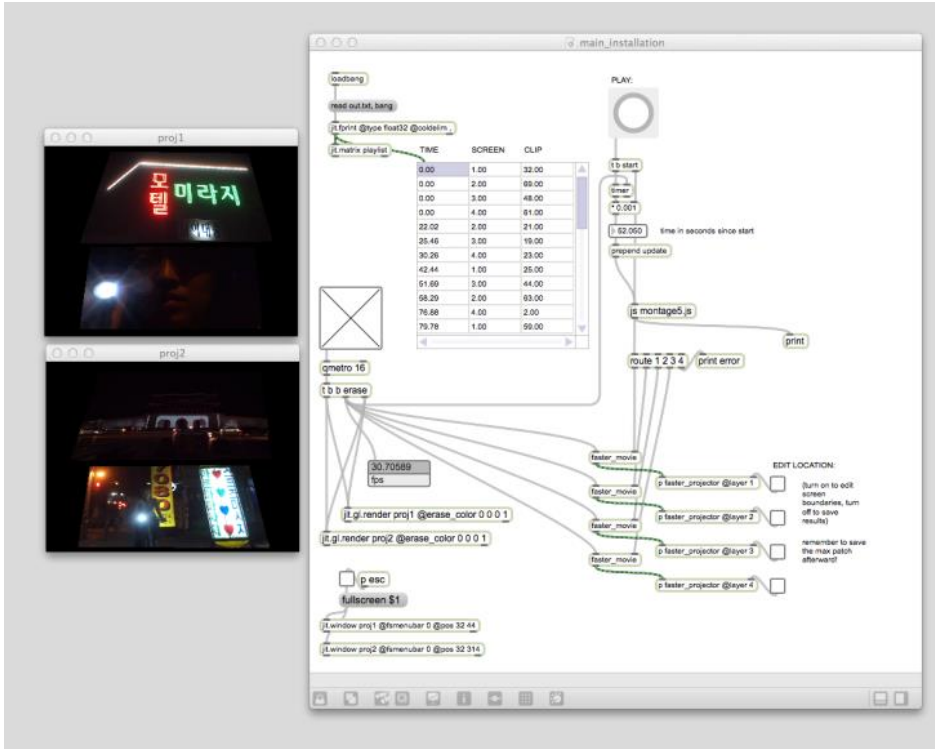


Figure4. The rendering engine using Max/MSP/Jitter.

As well as rendering the clips with Max/MSP/Jitter the playback engine executes a developed program tool that uses a Bayesian network method to control when a new time-slice is created, and selects appropriate clips for each screen which are recorded in a playlist file to be read by the rendering script. As there is no interactive component during playback, the system does not need to run in real-time. To avoid the possible problems of running a real-time system that uses the internet, such as connection dropouts, the system generates a playlist file before the montage starts playing. The playlist file has the time and screen number of each queued clip. This file is typically generated within a few second of starting the automatic editing stage and is stored on playback engine.

The video files that the editor worked with should be copied to the computer performing as the playback engine. It reads the playlist file that has been stored on an internet server by the editing tool. When a time signaled in the playlist is reached after the rendering script begins running, the appropriate video file is played and projected onto the multi-layered screen installation.

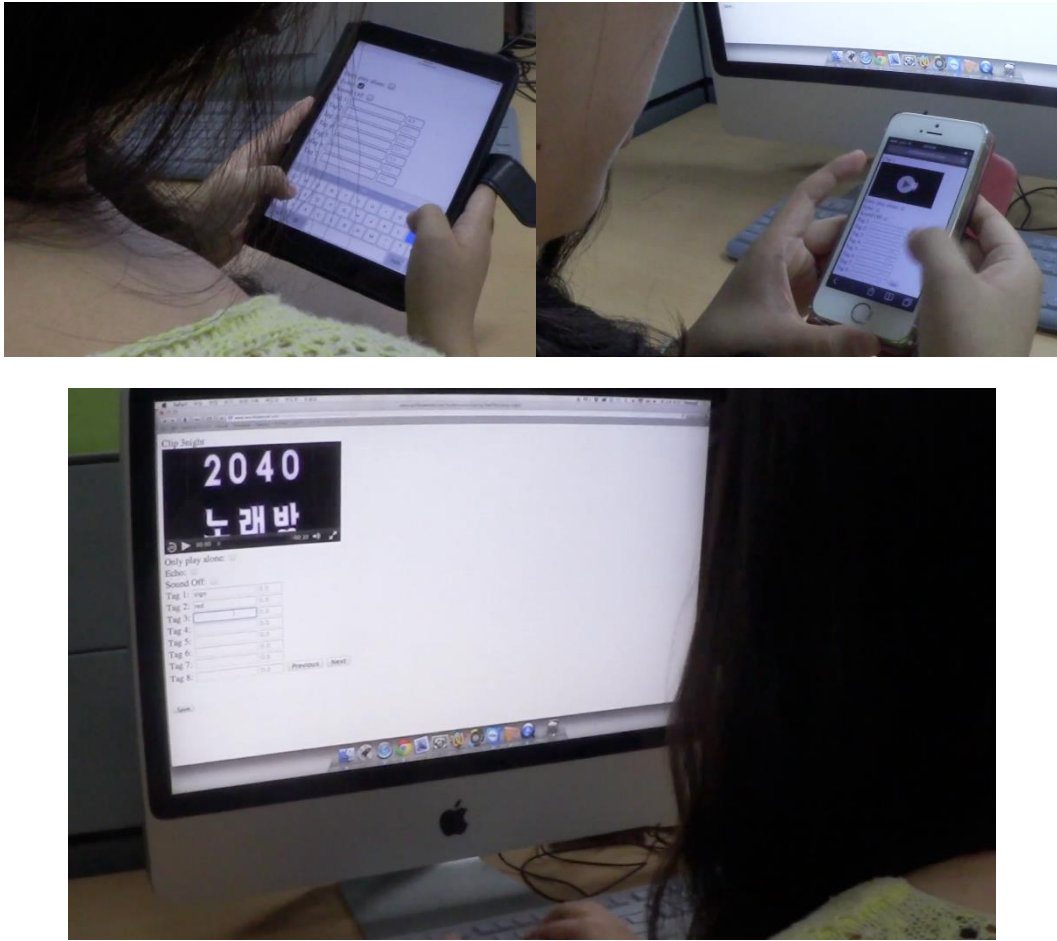


Figure5. Using the interactive editing interface with a tablet, smartphone and PC.

V Case Study

Chapter5. Case study

5.1 Dance Film

5.1.1 Overview of the Artwork

‘Poetry of Separation’ is a short dance film (10-15 minutes) about separation that includes acting, contemporary dance and mime. The theme of this film is the essential pain of separation and the beauty of accepting fragility as a solitary human being. The film uses acting and contemporary dancing to reveal the emotional curves of one couple after separation. A third person, the mime, embodies the universality of love and solitude.

The multi-layer display underlines an authorial intention regarding separation as an essential anxiety and pain of being human. The spatially distinct screens can give voice to isolation, solitude, and the chaotic fragmentation of individuals performing as different genres, but at the same time, the multi-layered whole reveals a simultaneous universality of pain.

The film was made by a process of improvisatory performance to generate unexpected automatic movement. The use of improvisatory performance in production is conceptually aligned to the generative editing system in post-production [50]. Like improvisation, constructing montage by generative technology can elicit indeterminate aesthetic effects. The authorial intent put into the art interacts with, and is transformed by, its internal content and the external attributes of medium.

5.1.2 System Configuration

Virtual simulations were designed to design proposed architecture for the expected installation and to operate systems in case of the absence of physical multi-layered screen.



Figure6. A proposed architecture and a virtual simulation for dance film.



Figure7. Photos of physical miniature for dance film that view from different angles.

The tag-based generative editing system was adopted to control the overall timeline flow but create improvisational aesthetic effects. The original filmed material consists of 68 distinct clips.

The expected story of dance film is:

1. One couple is in painful relationship.
2. After breaking up, the woman expresses her resistance with acting, the man shows his pain with contemporary dance.
3. An observer mimes the story of love and solitude.
4. They accept their suffering and fragility after their tormenting performances.

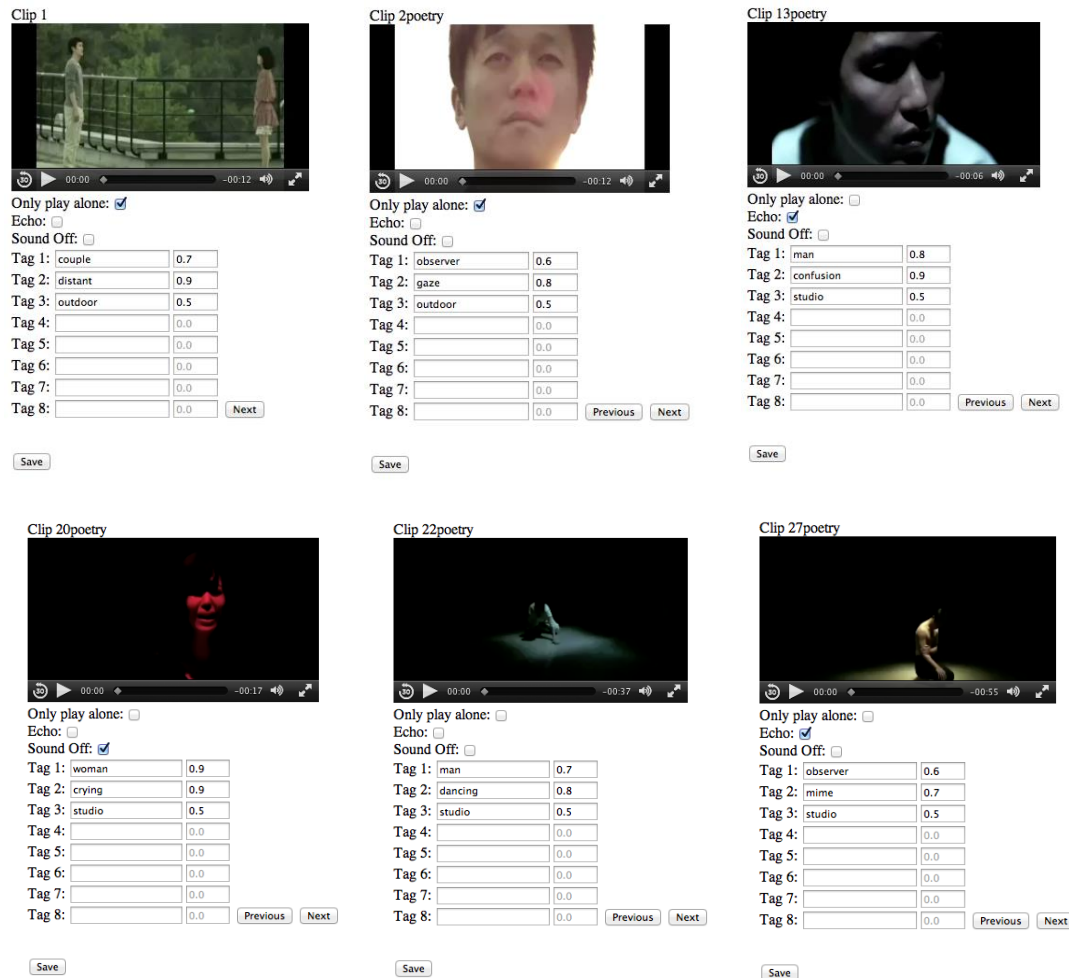


Figure8. Screenshots of tagging with keywords on each clip for dance film.

To realize the overall narrative flow, tags were created with important keywords including character, emotion, status and location, and each tag was given a value. Pre-defined effects were also controlled to intensify the storyline effectively. For example, clip1 and clip2 were adjusted to only play alone. These clips introduce the distant couple and the observer who gazes at them. The various clips that contain performances in a studio were intended to appear sporadically to show chaotic feelings and pain. However, some clips were restricted with pre-defined effects; the echoing effect was adopted to show the man's confused feelings, and the sound was turned off on a clip of the woman crying to juxtapose with other clips naturally. Some clips for mime also used the echoing effect to intensifying visual effects of fragmented images of the body.

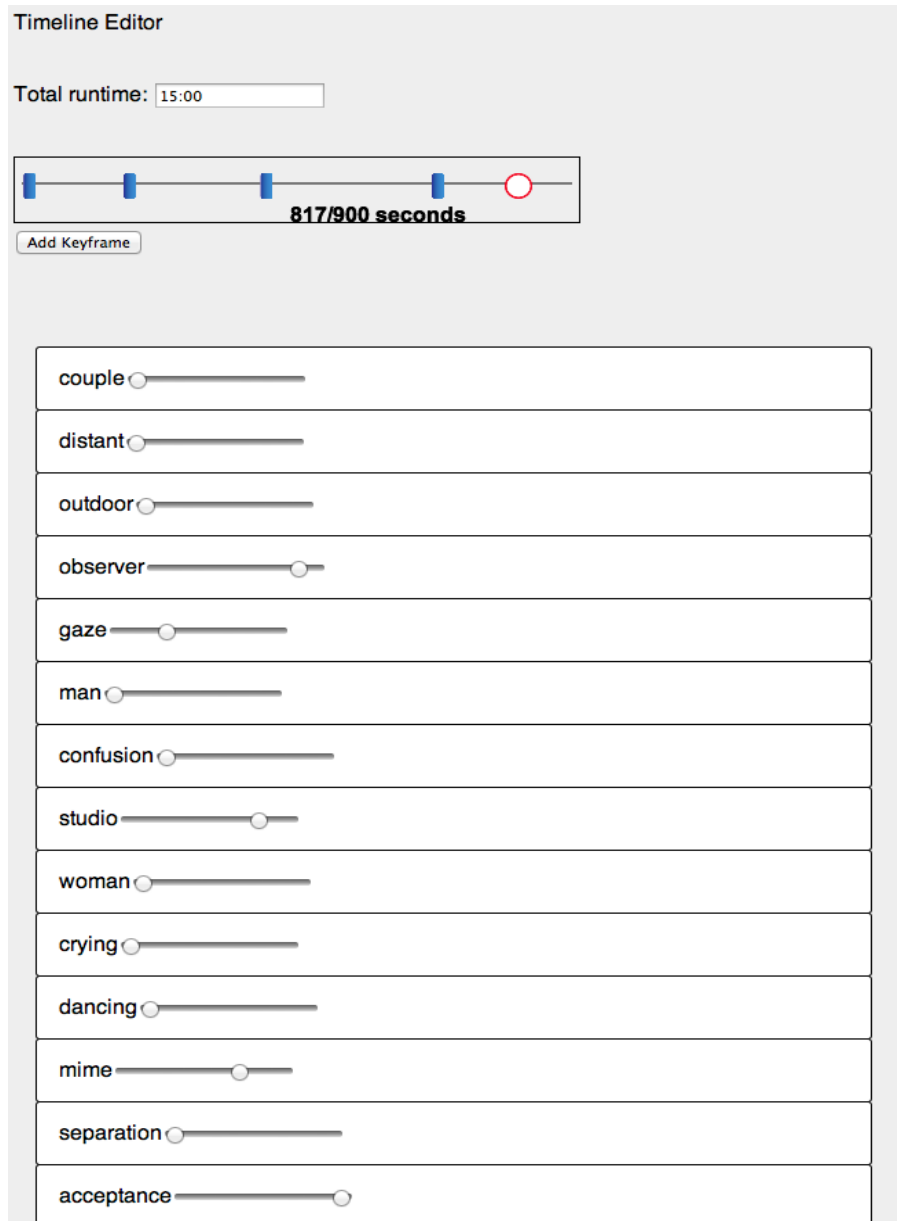


Figure9. A screenshot of timeline construction for dance film.

The running time was set to 15 minutes and the timeline was created; five keyframes were designed to structure the overall storyline. Only clip1 and 2 were used at the first keyframe to introduce characters and situations. The tags of second keyframe were used to show confused and resistant feeling about breaking up and tags about emotions got higher values rather than characters and locations. The clips about improvisational performance were targeted on the third and fourth keyframes. The last keyframe targeted specific clips by using more restrictive tagging so that the observer mimes in the studio to express the acceptance of separation and pain.

5.1.3 Aesthetic Effect

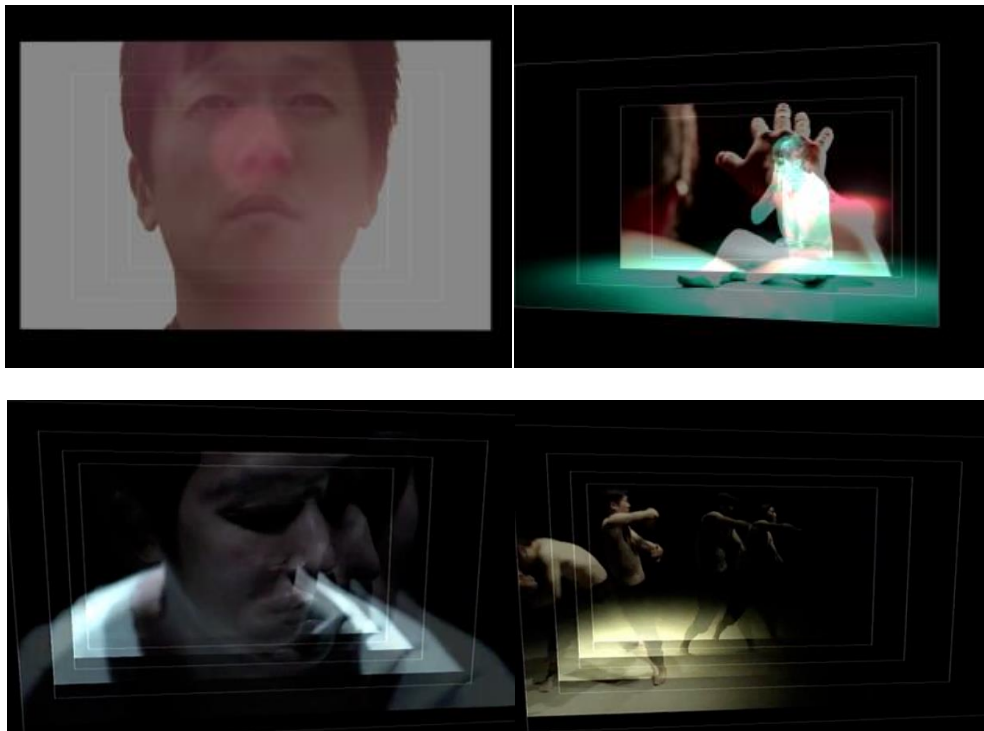


Figure10. Screenshots of the virtual simulation, demonstrating the effects of screen layers for dance film.

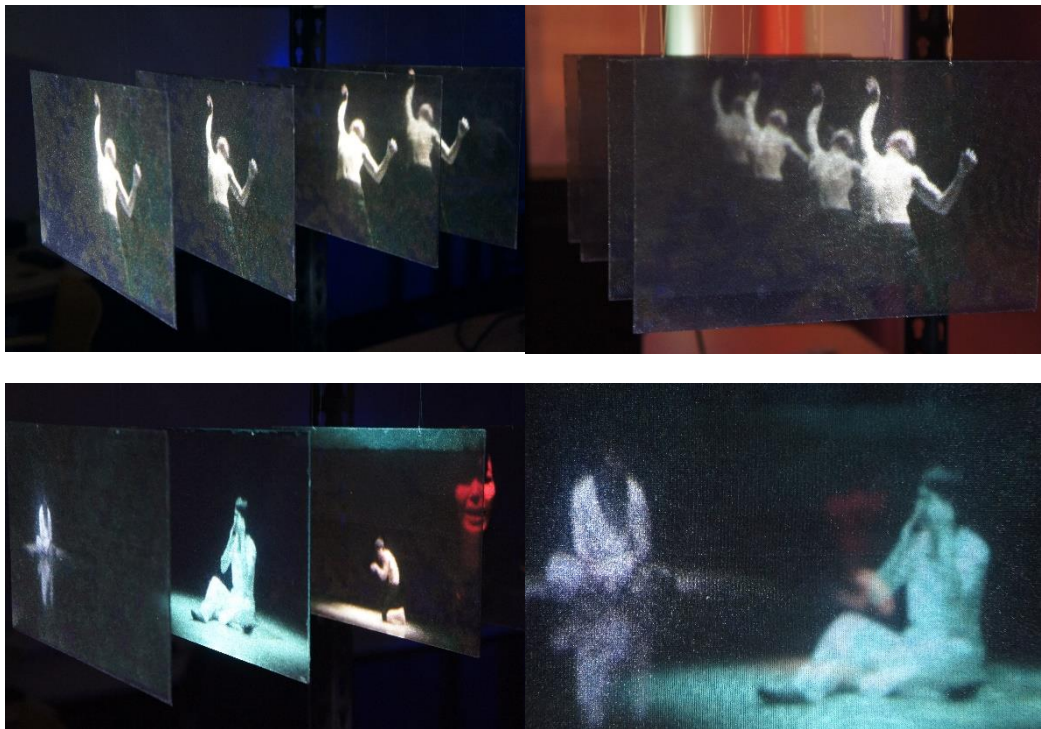


Figure11. Viewing the multi-layered screens from different angles (the same clip materials in left and right).

The multi-layer screens offered abundant aesthetic effects for poetry of separation, such as the construction of simultaneous events and emotion. Overlapping shots on multi-layered screens produced more surrealistic or poetic sensations than a single image displayed on a single screen. It is related to avant-garde film aesthetics that draws cubistic and fragmented body images in different perspectives using superimposition, collage and echoing effects.

However, because multi-layered screen offer a multidimensional perspective between elements and whole, it also adds other aesthetic effects. Separated images on overlapped screens elicit a sense of continuity from fragmented images to their unification; it helps to perceive individuals' pain and fragmented solitude on each screen, and also reveal concurrent suffering and comfort after breaking up on multi-layered unified images. The theme of simultaneous pain about separation could be shown more effectively rather than using a single screen or two-dimensional multiple screens.

The generative editing system helped complexity editing that showed complex and confused relationships among characters and images. The overall narrative flow and authorial intents were not damaged because of the tags and timeline restriction, but unexpected effects arose from the stochastic system. When low-probability shots were shown, it tended to create a conflict montage, intensifying the chaotic feeling of separation. It kept generating various relationships among many clips, which is expressing subtly different story and visual perceptions.

In conclusion, the poetic effects in dance film echoing Maya Deren's theory about verticality were realized with multi-layered screens, which are adding physical depth to previous dance film [45] [46]. Moreover improvisational aesthetics for dance film was recreated with generative editing system that creates not only indeterminate body images but also relationship between characters and situations.

5.2 Documentary Film

5.2.1 Overview of the Artwork

‘Lost Fragments of Night’ is a poetic documentary film that applies a new non-linear digital display that generatively selects from author-tagged shots, and renders them over four layered in physical urban space. The artwork’s material is the fragmented and paradoxical images found by night in the city of Seoul, and its themes of disconnection and heterogeneity in urban public spaces resonate with the concepts of the generative editing system and multi-layered screens [51] [52].

Seoul, a capital city full of complex phenomena, juxtaposing contradictory values and dislocated images created through an extremely compressed and uneven modernization. Often called ‘the city that never sleeps,’ Seoul epitomizes the paradoxical and chaotic coexistence of heterogeneous and fragmented images in contemporary life [53] [54].

The fragmented images of diverse locations, people, and objects in Seoul are distributed over layers of screens to emphasize the chaotic and simultaneous sense of fragility that still forms a whole when composed together. The separated images, which are presented over four layered screens, emphasize the paradoxical relationship between different elements with collage aesthetic effects. The generative editing system has an internal logic, but creates unfixed and constantly differing montage through its database, emphasizing the countless possibilities of coexistence and separation in a major urban complex caused by modernization.

5.2.2 System Configuration

The virtual simulation and a proposed architecture for urban space were designed, and physical miniature model with a multi-layered screen was also utilized.

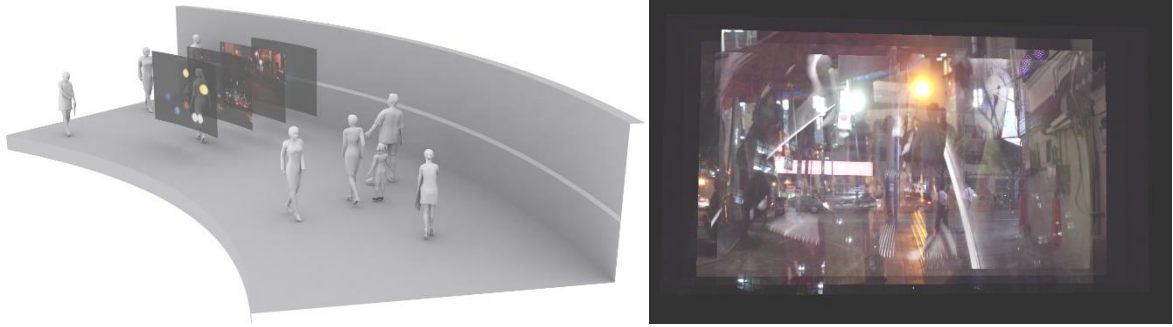


Figure12. A proposed architecture and a virtual simulation for documentary film.



Figure13. Photos of physical miniature for documentary film that view from different angles.

142 original video clips are used as source material. 117 clips were shot by the author in Seoul by night and 25 significant historical and political clips related to Seoul were archived from Youtube.

The expected story of documentary film is:

1. A director woke up at night with illuminating light and go out to street.
2. The fragmented and chaotic images on street are juxtaposed variously.
3. Historical images and people's faces with different generation are shown.
4. The director kept wandering at night

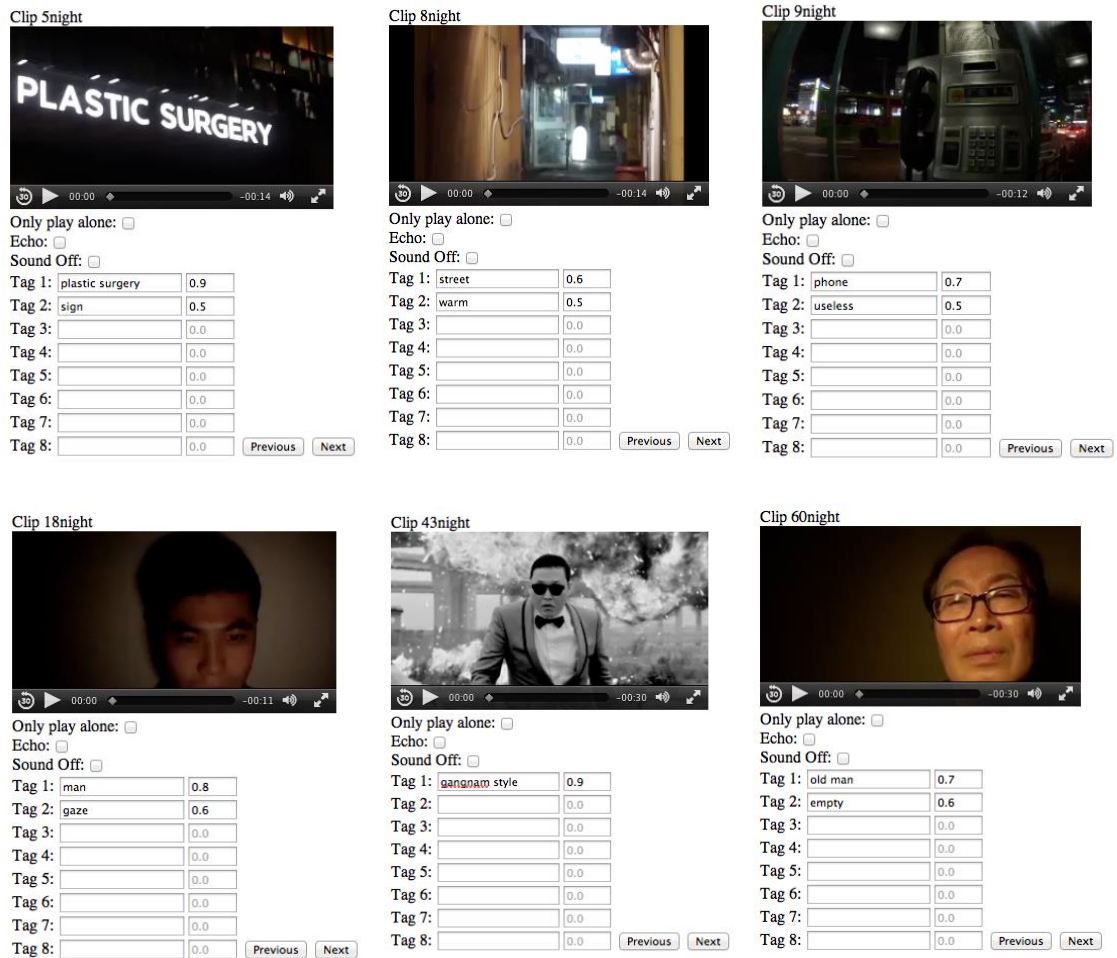


Figure14. Screenshots of tagging with keywords on each clip for documentary film.

This artwork is a poetic documentary film and it does not have a strong storyline to guide central theme. Therefore, not many restrictions such as predefined effects were applied. Tags were also used only one or two words for each clip because 142clips are might be too much to control with many tags. Furthermore, this artwork does not contain main characters and consistent emotions, tagging process can be simpler than the dance film.

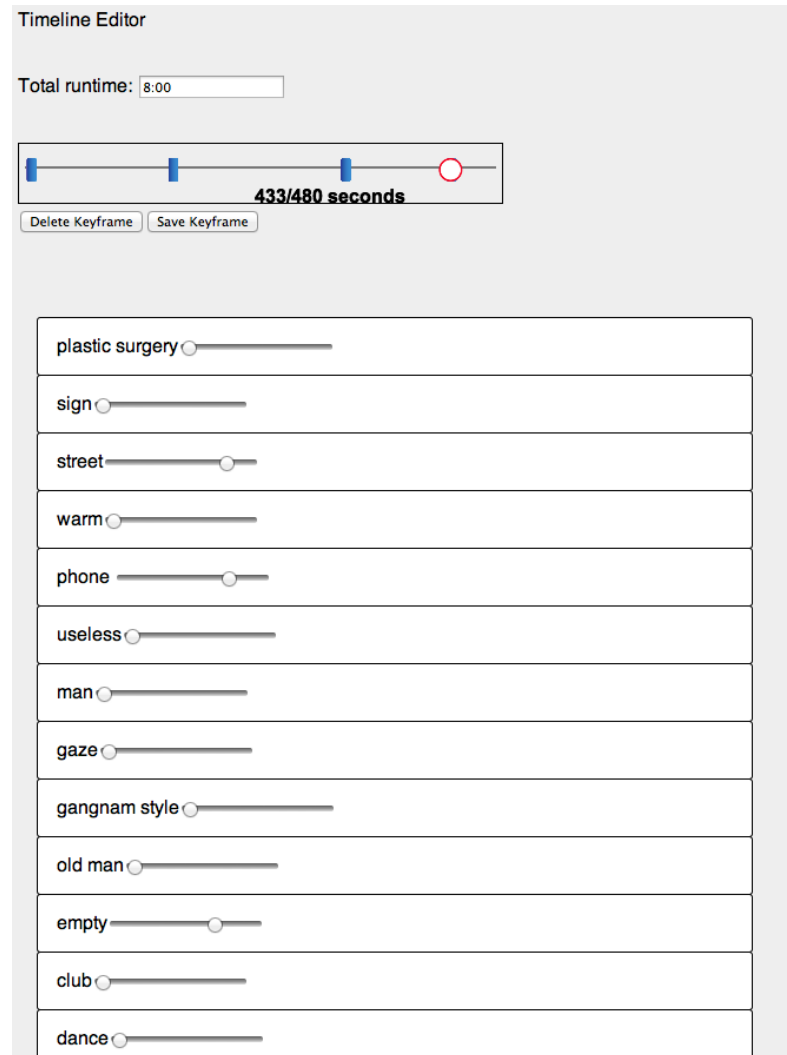


Figure15. A screenshot of timeline construction for documentary film.

5.2.3 Aesthetic Effect

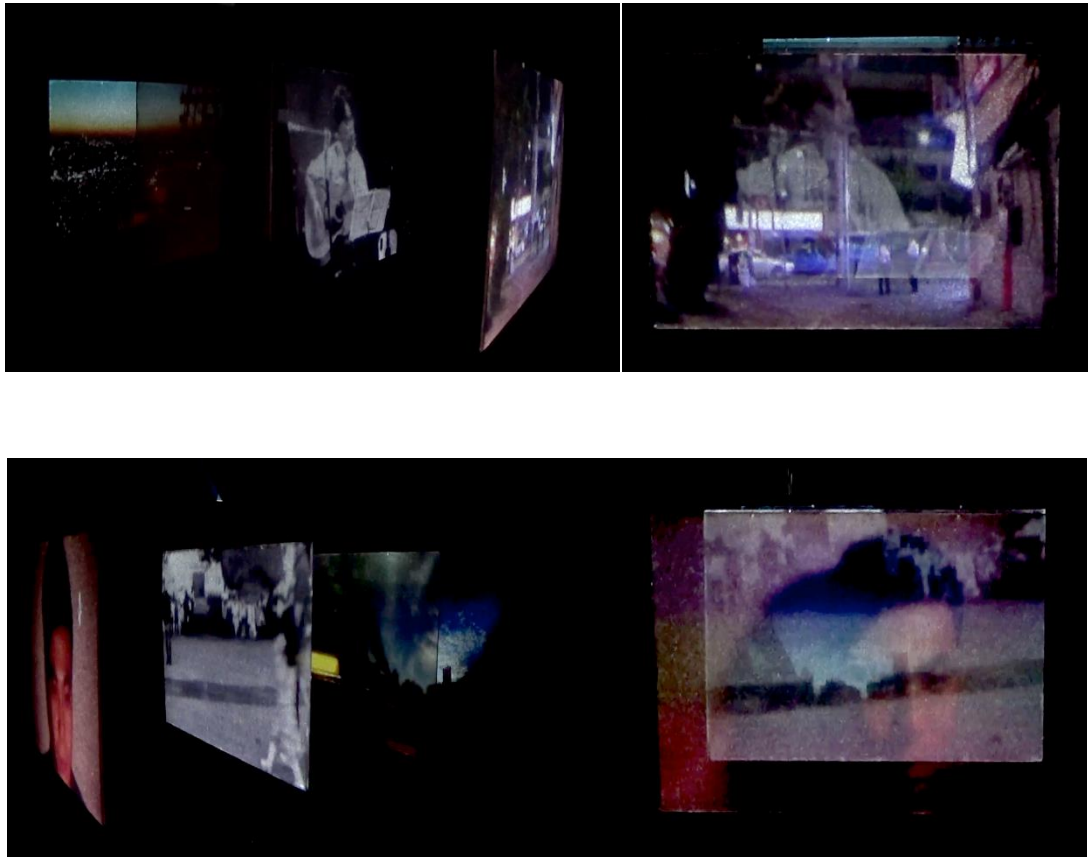


Figure16. Viewing the multi-layered screens from different angles (the same clip materials in left and right).



Figure17. The example screenshot of virtual simulation.

The multi-layered screens present various aesthetic effects such as in the dance film. Separate shots on overlapped screens lead to a sense of connection from fragmented images to their unification such as collage effects. However, the screens are layered with depth, so viewers can also perceive each image independently. Images are seen in various ways depending on the audiences' position and movement. Therefore, multi-layered screens show not only the individual images but also their combination at the same time.

In these contexts, the poetic impact of the documentary film might be intensified by layered display. The poetic mode is a way of documentary filmmaking that breaks traditional narrative form and expresses visual association, patterns and rhythm. These techniques are related to modernist avant-garde documentary making that favored radical juxtaposition of time and space. They shattered and subverted the coherence of images to show the traumatic reality of modernization.

Poetic effects in film, which are considered as the metaphoric concept of the vertical by Maya Deren, also correspond to this poetic mode in documentary film. It is related to the vertical montage of Eisenstein, which emphasizes harmonization with various senses and images just as with counterpoint. Thus, multi-layered screens enable the construction of vertical montage with associated poetic mode in documentary film [55] [56].

The overall flow and authorial intentions are not lost because tagging and timeline construction provides an overall direction, yet unexpected effects may arise from the randomized selections. When unexpected shots are shown, it tends to create a conflict montage, intensifying the chaotic or absurd sensations of paradoxical coexistence in Seoul at night.

The purpose of the artwork is to help viewers feel the disconnected and fragmented aspects of Korean society by showing various images at the same time. It challenges viewers to draw connections between the fragments in order to understand an overall theme: a montage with four surfaces of images containing a theme with a single vision. Because there are not strong and central themes designed by the author, viewers are able to focus purely on the images that are part of the montage and draw connections between them.

The video clips depict images of everyday scenes that we slide by without much attention. Drawing connections between different images is an act of bridging the gap of our isolated and fragmented realities in cities such as Seoul by night. In some unexpected montage, paradoxical meaning can be elicited by absurd assemblages, which may break stereotypes held by viewers. From these contexts, this artwork not only generates visual effects and improvisational aesthetics, it creates new context and meaning to make audience think about society.

VI Expert Evaluation

Chapter6. Expert Evaluation

6.1 Evaluation Objective

Evaluation is needed to explore the aesthetic value and meaning of any new media system, within the context and knowledge base of old media and other new media forms [57]. Expert interviews were conducted to get feedback about the multi-layered screen and generative editing system from people with knowledge of and experience working within these contexts.

This new media covers interdisciplinary areas including film editing, experimental film, documentary film, visual art and new media art so it is necessary to collect various opinions from experts from different backgrounds. Suitable experts should have expertise in an area related to this media but involved in distinct fields from each other which was used as the basis for selecting five experts to interview.

The objective of interviewing was not to find positive or negative elements of the media, but for discovering the possibilities and limitations of the specific characteristics of the display and system. The application of the dance film and documentary film were compared, and it was asked that what types of contents might or might not work well with this media. Unique follow-up questions were asked to each professional based on their particular area of expertise. The interview process and methodology could offer persuasive frames and criteria for evaluating this interdisciplinary media [58] [59].

6.2 Procedure

6.2.1 Pilot Test

A pilot test was conducted with five graduate students to expose the predominately observed features of the media and make relevant and clear questions for the expert interviews. Graduate students that have been studying in areas related to new media were selected so that they could give feedback with a contextual understanding of new media. For the pilot test, the participants were shown the installed physical multi-layered screen, could use

the generative editing system directly and view the dance film and documentary film on the display. Casual and unfixed conversations were conducted, which were primarily focused on the aesthetic effects of the system. This process was used to develop directed questions for the expert interviews.

6.2.2 Selecting Interviewees

Five experts from different disciplinary backgrounds were selected as interviewees. The disciplinary backgrounds included experiment film, visual art, documentary film, film editing, narrative studies and new media art. The expert's backgrounds were all related to the newly developed media. The five interviewees were offered to use a pseudonym, however, all of them chose to use their real name. The experts that were interviewed had been experts in their respective field for a minimum of 8 years, with the most experienced having 26 years of experience. Their ages ranged between thirty-five and sixty.

Ha Joon Su is a professor at an entertainment design department. He specializes in experiment film and document film and has experience in visual art and design.

Kim Dong Won is called the Godfather of the Korean documentary. Kim Dong Won is a professor at a broadcasting department as well as the representative of his own documentary film company.

Kim Jin Hee is a film and TV editing expert. She has published books on film editing and montage theory [60] and has taught film editing at universities for many years.

Kim Yoon Sung is an expert in the area of film directing and advertisement directing. He has been researching the field of mixed reality contents and narrative for many years.

Lim Kok Yoong is a Malaysian artist and media department professor. He specializes in the field of multimedia art and new media aesthetics.

6.2.3 Constructing Questions

The question set was designed to contain four main questions which were asked to all of the participants, and some specific personalized and field focused extension questions. The first question asked the interviewee for their first impression that experts had about the new media we had designed. The second question asked about the limitations and possibilities that the experts saw in the multilayered screen. The third question was related to the

boundaries and opportunities of the generative spatial montage constructed by the generative editing system. The fourth question involved watching the dance film and a documentary film used as the case studies and asking the participants what kind of content might be suitable for this media and what kind of content might not be suitable.

6.2.4 Interview Process

To facilitate a comfortable environment for extended discussion, interviews were conducted in cafes, conference rooms and the interviewees' offices. Interviewees were asked to fill out a form of personal particulars and collected written authorisation for the recording and publication of the interview. The interviews ran for between one and two hours. The interviewees were given financial compensation for their time based on interview length.

Due to the time and physical limitations of conducting an interview the physical model of the multiscreen was not shown directly. Instead videos were used to show the basic structure of the system, including a short introduction and guide on how the multi layered screen and generative editing system function. The dance film and a documentary film were shown as recordings also, demonstrating how the content appears when projected on to the multi layered screen. The introduction procedure took an average of 15 minutes including powerpoint and video materials.

6.3 Results

1. First impressions on the media with the multi-layered screen and the generative editing system

Ha Joon Su replied that normally when viewing a new media display system, it has a very futuristic feeling to it. However, this media system has a nostalgic, surrealistic, dream like feeling to it.

Kim Dong Won said that he found the concept of this media very interesting, which is that the artist does not have complete influence over the output, which creates tensions between the artist and the other influencing factors which can either be the computer or the audience.

Kim Jin Hee's reaction was that the unexpected overlapping images and the scenes that followed this had an interesting effect. She also mentioned that she, just like Kim Dong Won, could feel the tensions between the artists intentions and influence and the generated result by the computer, she emphasized this as a rather noticeable element.

Kim Yoon Sung felt confused about the question itself; whether it was a question about the interface or the content. He also said that he felt irony, even though the system is interactive it is ambiguous to estimate the output which makes it appear indeterminate.

Lim Kok Yoong said that even though the multi layered screen did not seem new the generative system is well designed. He then continued to say that the generative system could not only be used for art, but also for an educative purpose.

The experts turned out to all have different opinions although their views sometimes did overlap. Regardless of whether their reactions were related to their specific academic backgrounds or to their personal appreciations, the fact that all of the interviewee reactions were different was surprising.

2. The aesthetic possibilities and limitations of multi-layered screens

Ha Joon Su replied that the possibilities of this media are connected to the overlapping screens creating a feeling which is rather distant from reality, which he emphasized is one of the reasons why overlapping screens have been used in various types of art before. On the topic of layering, he mentioned that it is a basic tool of the photo editing tool Photoshop when creating images; layering is a universally used and broad tool.

Kim Dong Won said using multi-layered screens is just a way of editing. It dissolves or splits images, creating a rhythm; images can be seen harmonized and smooth, but the multi-layered screen can also give images a cutting and poetic effect. He continued by saying that the multi-layered screen itself does not give any special meaning to the images displayed; meaning is derived from the artistic purpose and images displayed on the screens.

Kim Jin Hee said that she focused on the possibilities of the multi-layered screens from viewing at different physical positions. Through movement the impression the multi-layered screen gives is different, which causes the viewer to participate and discover the various possibilities of the artwork they are viewing. Since the images are overlapping and the artist does not have full control over the order in which the images are being shown it is hard to inform the viewer with clear information about the images. But, if it is the artists' intention to create a chaotic feeling the multi-layered screen is suitable.

Kim Yoon Sung emphasizes that for the multi-layered screens to have the right effect, they should be installed in a public space. He adds that this is because normally films follow a sequential order that causes every viewer to have an overall impression of the film however the multi-layered screen cuts this sequential order, which makes it hard to follow the flow. If the multi-layered screen is installed in a public space it allows people to construct their own order and personal impression because they can personally choose the amount of time they dedicate to the installation and can focus on the images they connect with.

According to Lim Kok Yoong the multi-layered screen itself has many possibilities. The multi-layered screens can be used as a web based media or as a physical installation in an exhibition. Various contents can be displayed on the multi-layered screen, making it free of limitations and an open-ended media. As an example he mentioned that through using the Palmtop Theatre smartphone application, he can create his own multi-layered screen experience in a hand sized screen, implicating the various possibilities to the multi-layered screen.

In summary Ha Joon Su and Kim Dong Won did not really differentiate between possibilities and limitations, instead they said that the effect the multi-layered screen has depends on the artist intentions and how the display is used. Kim Jin Hee and Kim Yoon Sung agreed that the multi-layered screens possibilities are dependent on the architectural environment and public participation. They also observed the limitations of the multi-layered screen in its difficulty to use for displaying a linear story or clear images. Lim Kok Yoong said that the multi-layered screen itself does not have any limitations and he looks for the endless possibilities in new media.

3. The aesthetic possibilities and limitations of generative montage

Ha Joon Su said he saw the possibilities of the generative montage system, because normally art might

be something created by one individual but the generative system causes the displayed art to be created in combination with the computer or as a collective work with the help of the viewers. He added to this that usually the general audience does not pay attention to how the generative system works, which could create a gap between the artist's intention and the audience, however, if the artist would display the generative system with the installation, and in some cases let them be capable of controlling this generative system, this gap would be minimized. This is because the general audience tends to unconsciously appreciate artwork in a linear way, which might be an inherent restriction caused by linear form of most media which the general public is accustomed to.

Kim Dong Won particularly noted how the generative montage system keeps creating new meaning and understanding. The generative system gives the audience the opportunity to interpret the montage in their own way. Especially when historical or political images are used it can create new understanding and meaning, which could be related to reconstruction of collective memory. He added that the effect of the generative system depends on the contents used. As an example, if the images that are generated are similar, the generative system might not be used to its full potential as it would not constantly create new contexts.

Kim Jin Hee said that the generative montage system creates the aesthetics of contingency. There is no need to speak of limitations and possibilities but instead of the characteristics that allow the images to be projected by chance. She poetically described her feelings about the generative montage system by saying that normally machines are used to try to produce an artificial human-like intelligence, however the generative montage system allows the images to appear by chance causes the machine, ironically, to behave closer to how humans do and at the same time gives people the space to think and create their own meaning and find inspiration.

Kim Yoon Sung started off by saying that the multi-layered screen and generative montage system are strongly engaged with each other, because they have a similar aesthetic implication. In other words they are both fluid and ambiguous. This makes it so that this installation can only be meaningful when displayed under the right circumstances, such as a public space or gallery. The reason why it could only be meaningful when displayed in these locations is because they have similar characteristics to the system. The viewer can select certain images, but there is a possibility that another image would appear, which causes a gap because the system is interactive but at the same time the outcome can be unexpected.

Lim Kok Yoong said that generative montage is a limitation of aesthetics, such as contingency and improvisations. This results in the system to be unsuitable for conveying strong narratives or a strong central theme. However, it can be used quite broadly in the case of artworks that have a generative characteristic, including real time performance, essay film, database cinema and live cinema. Therefore the aesthetics of generative montage is making limitations into possibilities.

All experts viewed the generative montage system as both a limitation and a possibility, which is connected to the contingency and improvisational function of the system. They also all expressed that linear narrative images are not suitable for this system. Ha Joon Su and Kim Yoon Sung emphasized the irony and ambiguity of the generative interactions.

4. The different effects observed between the dance film and documentary film and the possible suitable contents for use with this media.

Ha Joon Su commented that the documentary film was more suitable to the medium than the dance film. The dance film shows a lot of new physical perceptions but does not continue to create different understanding and meaning. Since the documentary film can convey dialectic effects by deviating from continuous image flow, which is related to the montage theory proposed by Eisenstein where juxtaposing two shots create new, third meaning, he followed by saying that he has a personal preference for the documentary film, but different types of contents could also have different aesthetics.

Kim Dong Won had a similar opinion to Ha Joon Su. Since the dance film revolves around one actress and two actors, even if the system is generative, the feeling that it creates remains the same. The documentary film, however, adds a diverse time and space to the images displayed thus creating several different meanings and effects. So, historical, political and social images, which are often concepts that are used in documentary films, appear to be more suitable for this media.

Kim Jin Hee said the type of content displayed through this media could be various, as long as it does not include strong narrative. A possible content to be displayed through this media include images related to memories, for example memorials. Images fade and return, just like memories of people and events. She then

continued by expressing the various ways in which this media could be used besides in the standard gallery. Among the possibilities she mentioned were amusement parks, advertisements and museums.

Kim Yoon Sung said that since the authorial meaning of a documentary film is crucial and in generative montage this authorial meaning is disrupted, documentary film is not suitable to this type of media. However, dance films which revolve around abstract expressions and contain improvisatory aesthetics do not lose meaning and could instead be positively emphasized through this media. He added that since it is hard for the audience to focus on this sort of artwork for a long time, it is better to actively involve them in the process and ask them for physical participation by offering them the possibility to control the generative montage installation.

Lim Kok Yoong thought similarly to Kim Jin Hee, expressing that this media is not restricted to a particular genre but instead is linked to the artist's aesthetic intentions. He continued by saying that the documentary film seemed to convey more messages than the dance film by using this media. Since this media is flexible and has endless possibilities, the way in which it is used is important above all else.

Kim Dong Won and Ha Joon Su said that documentary films, which often include social and historical images, are more suitable to this media. Kim Yoon Sung said the opposite and said that abstract films, such as dance films, are better matched for this media. Kim Jin Hee and Lim Kok Yoong stated that this media is not necessarily restricted by the genre, but instead depends on the artistic intentions and aesthetic purpose.

5. Personalized questions

Experts were asked personally targeted questions according to their expertise.

Ha Joon Su was questioned in relation to experimental film and visual art.

He said that the biggest difference between other types of experimental film and video art and the results coming out of this media is the possibility of audience participation and the experience and usage of space. Depending on the architectural environment the effect of the artwork could be very different.

He described the overall effect of the display system as being more like new media art than experimental film. Although film clips are used in both this media and experimental films, films usually have a sequential flow, whereas this display system breaks that important characteristic of films. Furthermore, inherently digital film is the most abstract media in art, because it is an illusion created by light, however, this media, by the usage of multi-layered screens, combines both abstractness and concreteness.

He continued by saying that when it comes to documentary film, this media can break meaning, but can also generate a new meaning so if the content corresponds well to the media it could have a powerful result.

Kim Dong Won was questioned in relation to documentary film.

When asked whether documentary films could be used more broadly and if this media could be used to transform documentary films into new media he stated that using documentary film in this type of experiment could bring shock and a different impression to both the audience and filmmakers. These sorts of experiments can transform media, which are limited to film, into visual art as a sort of avant-garde experimental film.

He continued by saying that the type of documentary film that is created by this media cannot be a traditional documentary film, however, it can create a poetic documentary film or an essay film. For example, in the avant-garde age Dadaist artists also made poetic documentary films based on visual art. So when used in relation to experimental documentary film this media would be suitable. However, when music is involved, which is often so in experimental film, when using this media complications might show up since the flow of the images might not be capable of harmonizing with the music played.

Kim Jin Hee was asked questions in relation to montage theory and film editing.

Kim Jin Hee started off by comparing multi-screens in two-dimensional space, multi-layered screens and overlapped images on a single screen. When a multi-screen in two-dimensional space is used it is difficult for the viewer to get the overall image simultaneously. When multi-layered screens are used the viewers can get several images simultaneously but it is hard to separate the images. Overlapped images on a single screen make it impossible for the viewer to see various perspectives of the images displayed.

She continued by comparing the editing by humans, automatic computer editing and generative computer editing. When humans edit films, they decide everything: the cutting point and the rhythm of the film. When automatic computer editing is used the artificial intelligence of computers tries to create a cutting point and rhythm similar to that of human editing. The generative editing system, however, does not have this trait where it edits a work, instead since the generative editing system does not try to follow a similar pattern to that of human editing and remains and uses its machine traits, it causes people to think and creates a harmonization between humans and machines.

She then continues by saying that narrative film should have a cause and effect, but, the films using this editing system can not make a narrative and instead make a non-narrative film with a sequential order. It is related to the theory of abstract or associational non- narrative form by Bordwell [61].

Kim Yoon Sung was questioned about narrative story-telling and the possibilities of the usage of the installation.

Like Kim Jin Hee, Kim Yoon Sung said that it is difficult to generate a narrative with this media. But it can create a contextualized environment similar to the way a curator determines the location of images in a gallery and creates an environmental guideline.

Kim Yoon Sung also suggested using this media phenomenon in combination with intuitive physical interfaces such as a joy stick or a ball, which are often used in combination with games. He added that this could lead to more action and reaction from the viewers because the viewers have the possibility of seeing their influence on the media directly in real life. He followed that this media could be well matched to an exhibition for children or advertisements in a public space.

Lim Kok Yoong was questioned about new media art related to database.

Lim Kok Yoong said that the basis for live cinema, database cinema and generative montage is a storage system, for example a database on a computer. These various types of cinema and montage all have modular

contents and all need an interface in order to control them. Inherently, this new generative multi-layered screen media is related to new media art based on database logic.

He continued by saying that his own archiving work involves a collective memory about Malaysia which is created with an archiving system on the computer. He then followed by saying that he thinks archives can be considered similar to database, however archiving is a more fundamental concept than database, partially because it is more directly related to the basis of memory. He mentioned that our generative montage system appears to use the logic of memory associations, which is also related to his archiving work.

The documentary film we showed reminded Lim Kok Yoong of the avant-garde film by Vertov named “Man with a movie camera”, which could somehow be interpreted as a precursor to database cinema. In relation to that he mentioned that therefore our art work could also be seen as the female version of Vetov’s film: “Woman with a movie camera”.

6.4 Summary

In regard to multi-layered screens, Ha Joon Su, Kim Jin Hee and Kim Yoon Sung emphasized the importance of architectural environment and the usage of space and Kim Doong Won said that multi-layered screens could be considered as one editing technique that shows multiple images simultaneously. Lim KoK Yoong said that multi-layered screen can be extended and transformed to various types of media with different kinds of contents, so he stressed the endless possibilities of new media aesthetics.

About the spatial montage created by the generative editing system, all experts agreed that the aesthetic of generative montage is coming from the logic of contingency and improvisation, which is creating tensions between indeterminacy and determinacy, and chaos and order. Because of these characteristics, Kim Yoon Sung and Kim Jin Hee, who are related to the fields of narrative and story-telling, said that it might be difficult to generate narrative or story by using a generative editing system, but it could create poetic, abstract or associative non-narrative aesthetic. Ha Joon Su and Kim Yoon Sung also mentioned the ironical gap between expectation from interaction and generative unexpected outcomes, which can be created by the generative editing system.

There were different perspectives between experts about contents for the new media. Ha Joon Su and Kim Dong Won are both documentary filmmakers and showed interests in using the documentary film clips for this media rather than the dance film clips. They found many possibilities to create the new understandings and meanings of generative montage based on social, political or historical contexts. Kim Yoon Sung, an expert in fictional films and advertising, said that visually abstract contents and commercial advertisement would be much more suitable for this media rather than the documentary film. Preferences for contents may depend on the background and experience of the professional. Kim Jin Hee and Lim Kok Yoong are experts of media form rather than contents, specifically montage theory and new media aesthetics. They seemed more focused on the way to use the media rather than the contents.

Surprisingly, all experts talked about memory although the influence of memory reconstruction in the design process was not revealed to the interviewees. It was impressive that the fundamental and obvious characteristics of this media could be the connection to reconstruction of memory. The experts also all stated that the aesthetics of this media presupposes the aesthetics of contingency and poetry, so the contents need to correspond to this form of media.

VII Conclusion

Chapter7. Conclusion

7.1 Conclusion

We proposed a new aesthetic approach for generative montage in spatial dimensions as a practice-based research, which is creating a non-linear cinema display and media art utilizing a tag-based generative editing system and multi-layered screens. The aesthetic of multi-layered screening and generative spatial montage was presented to clarify the meaning and value of this new display system. The conceptual framework of this new media aesthetics and the newly designed display and system were correspond each other.

The realization of these ideas was presented through the dance film ‘Poetry of Separation’ and the documentary film ‘Lost Fragments of Night’ as case studies.

We found that the multi-layer screens offered abundant aesthetic effects, such as the construction of sectional montage through simultaneous events. Separated images on overlapped screens elicit a sense of continuity from fragmented images to their unification; a multidimensional perspective between elements and whole. When distinct shots are displayed on all four screens simultaneously, the overlapping images add depth. Overlapping the same shots sometimes produced more surrealistic or poetic sensations than a single image displayed on a single screen.

Furthermore, the tag-based generative editing system helped complexity editing in effective and interesting ways. The overall narrative flow and authorial intents were not damaged because of the shot criteria, but nevertheless some unexpected montage arose from the stochastic system. Furthermore, because there are not strong and central themes designed by the author, viewers are able to focus purely on the images that are part of the montage and draw connections between them.

The expert interviews on different backgrounds were also conducted to objectify and clarify about this new media, we found that the main characteristic of this media is the improvisatory or poetic aesthetics, and also related to the reconstruction of memory. However, it could be used for diverse forms of artworks and exhibitions, and the aesthetics of contents will be different depends on how to use this display system.

From these contexts, the new media aesthetics of generative spatial montage and multi-layered screens was clarified and evaluated, which is conveying multiple meaning and images simultaneously such as vertical and poetic concept of film.

7.2 Limitation and Future Work

There are many limitations of this work. First, the display system has been restricted so far to a miniature, not yet having an opportunity to physically install it in real space; the affective experience in an actual exhibition might be quite different. A miniaturized model has been produced for initial evaluation, however, people's reactions toward the full artwork should be assessed. Our next steps will include a full size display of the artwork and its evaluation of the audience's response in real space.

The interface of generative editing system was not designed to be universally useful or applicable to other artworks or audiences, though we expect many ideas to be transferable. We plan to design a generally useful generative editing system with more intuitive and simple interfaces that can be used for real time interaction.

We also need to explore aesthetic irony between interaction and generative process, and it could be fundamentally linked to issue on tension between order and chaos, or expectation and unexpectedness, which are remained in the main aesthetics on contemporary art. Therefore, it would be meaningful to try to find minimized gaps or create dialect effects from irony based on practical research on generative montage.

This research has apparent similarities with human memory, but an exploration of the neurological processes that the developed system mirrors in some way was not undertaken. The connection between these areas, including those found in the network based structure of the system, need to be examined if a connection between the multi-layered screens, generative editing system and human memory can be established with a scientific basis.

New non-linear aesthetics and technology can be developed with architectural cinema and spatial montage can expand with different installation structures and virtual environments. The generative editing system can be adapted for various cinematic environments.

In spite of these limitations, we have taken our first steps creating generative montage on spatial dimension. It can be used not only aesthetics concepts but also practical way to construct montage with digital technology.

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요 약 문

제너레이티브 공간 몽타주와 멀티레이어 스크린:

새로운 비선형적 시네마와 미디어아트

본 논문은 새로운 비선형적 시네마와 뉴미디어 아트에 관한 실기기반 연구로 컴퓨터로 제너레이티브하게 생성되는 몽타주와 네 개로 레이어로 겹쳐진 스크린을 통해 설치된 새로운 뉴미디어의 미학적 효과를 탐구한다. 이를 뒷받침하는 미학적 기준은 ‘멀티레이어 스크린’과 ‘제너레이티브 공간 몽타주’라는 두 가지의 개념적 틀을 통해서 구체화된다. 본 미디어의 주요한 미학적 특징은 시적이고 수직적인 몽타주를 창조하는 것에 있다. 네 개의 레이어로 설치된 스크린은 감상자로 하여금 단일한 시야 내에서, 동시적이지만 다양한 이미지를 경험할 수 있게 한다. 이는 새로운 방식의 영화적 합성을 가능하게 하며 공간적인 깊이를 전제로 한 콜라주 효과를 만들어낸다. 즉 멀티레이어 스크린을 통해 감상자는 여러 각도와 위치에서 다양한 이미지를 보고 전통적인 평면 스크린을 통해서 경험할 수 없었던 새로운 미적 경험을 창조한다. 태그를 기반으로 한 제너레이티브 편집 시스템은 컴퓨터를 통한 효과적인 몽타주 구성을 이미지가 지닌 함축적 의미를 침해하지 않는 범위 내에서 가능하게 한다. 감상자는 웹 인터페이스를 통해서 각각의 이미지에 태그를 달고 그 태그를 이용해 영화적인 타임라인을 구성한다. 컴퓨터 제너레이티브 시스템은 감상자의 제어 내에서 랜덤한 몽타주를 생성해낸다. 따라서 본 미디어로 구현된 예술작품은 감상자의 역할을 수용하면서도 컴퓨터의 생성원리에 의해서 매 순간 새로운 몽타주를 창조하며 풍부한 이미지를 제공한다. 즉 전반적인 타임라인의 흐름은 제한되면서도 우연성에 기반한 몽타주가 컴퓨터의 선택 작용에 의해서 창조되는 것이다. 본 미디어의 효과를 실질적으로 평가하기 위해 ‘분리의 시’라는 무용영화와 ‘밤에 잃어버린 조각들’이라는 시적 다큐멘터리 영화가 사례 연구로 활용되었다. 또한 본 연구가 학제적 영역에 걸쳐있기 때문에 뉴미디어에 관한 폭넓은 견해를 수용하기 위해서 전문 분야가 다른 다섯 명의 미디어 전문가와의 인터뷰를 실시하였다. 이를 통해서 멀티레이어 스크린과 제너레이티브 편집 시스템을 활용한 뉴미디어의 미학적 가치를 입증하였다.

핵심어: 제너레이티브 몽타주, 공간적 몽타주, 멀티레이어 스크린, 데이터베이스 시네마, 제너레이티브 아트

Appendix

-Questionnaire for Expert Interview-

***Generalized question list**

1. What is your first impression of this medium?
(Generative editing system and multi-layered screens)
2. What do you perceive are the aesthetic possibilities and limitations of multi-layered screens?
3. What do you perceive are the aesthetic possibilities and limitations of generative montage?
- 4-1. Did you observe different effects (aesthetically, or otherwise) between the dance film and documentary film in using this medium? If so, what are they?
- 4-2. What kinds of content would work well for this medium? What wouldn't work so well?

***Personalized question list**

1. What is the biggest difference between other types of experimental film and video art and the results coming out of this media?
2. What are the main possibilities and limitations when using this display system to create or appreciate documentary film?
- 3-1. What, in your opinion, differentiates multi-layered screens from 2D multi-screens and overlapped images on a single screen?
- 3-2. What is the difference among human-centered editing, computer automatic editing and computer generative editing?
- 4-1. Do you think this display system can create narrative?
- 4-2. What factors should be considered more in installing this medium?
- 5-1. Is there (in your opinion) a considerable difference that distinguishes this work from previous database cinemas and live cinemas?
- 5-2. Do you see a connection between this work and your own archiving works? If so, what are they?

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