GENERATIVE SPATIAL MONTAGE WITH MULTI-LAYERED SCREENS IN *LOST FRAGMENTS OF NIGHT*

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ABSTRACT

Lost Fragments of Night is a poetic documentary film that utilizes an algorithmic generative editing system to preselect shots to be rendered over four screens arranged in layers. The artwork's subject is the chaotic and contradictory sensations found by night in the city of Seoul. In this work, the themes of disconnected and paradoxical images in urban public spaces resonate with the concepts of the multi-layered screens and generative editing system. The fragmented images are distributed over layers of screens to emphasize a chaotic and simultaneous sense of fragility that nevertheless together forms a whole. Designed for large-scale installation in urban public spaces, our artwork has been prototyped via a physical miniature, projecting by rear diffusion onto four layered screens constructed of grey sheer fabric. The audience can appreciate the montage from different angles and positions to produce different layering effects not possible in traditional 2D cinema. The generative editing system uses a dynamic Bayesian network constructed according to clips and timeline tagging. Audience members can actively contribute to the direction of the montage through a web interface, so the artwork creates different experiences by embracing the role of the audience in every screening.

Fig. 1. Photograph of the *Lost Fragments of Night* miniature. (Video of artwork can be viewed at http://www.sojungb.com/work1/).

INTRODUCTION

The contemporary city is a megalopolis full of asynchronous forces and paradoxical multiplicities of separation and coexistence. The process of integrating such disconnected and transitory stimuli in the city may also be likened to the construction of montage in cinema. According to Walter Benjamin, juxtaposing the fragments of city images is a process that by connecting distinct existences breaks down the isolation between them and thus can be considered as a montage technique. [1], [2] Nowadays, we are surrounded by fragmented and simultaneous images of large information densities through digital media, over multiple screens, windows and mobile devices and increasingly required to connect these disjunct images in order to find meaningful relationships between them. The environments of creating and appreciating montage are expanding in spatial dimensions, most notably in urban space. [3]

Lost Fragments of Night is a poetic documentary generative film, in which shots are computationally selected according to author tags and rendered over four layered in physical 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: 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 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.

Lost Fragments of Night grants roles to the audience as a part of the artwork. The audience can appreciate the montage in public space from different angles and positions to produce different layering effects not possible in traditional single-screen cinema. Furthermore, audience members can have a role beyond that of a viewer through actively contributing to the direction of the montage by using the interactive editing system. From these contextual variations, the artwork develops different experiences by incorporating the contribution of the audience in every screening.

RELATED WORK

Public Space and Cinema

Cinema has historically captured and revealed the spatial and social dynamism and complexity of urban spaces, however the relationship between cinema and urban public space goes beyond content. [4] Cinema and urban environments have structural and functional similarities. The modern metropolis mediates and creates relations among people, things, forces and activities – the city itself is a medium.

A city can, for example, be considered as an archive with continual accumulation as well as destruction and subtraction: temporary preservations of the past as constantly reconstituted memory. In other words, urban public space embodies historical memory and

continually generates temporal images and relations. [5] Cinema is also both medium and archive that records and sharing historical memory by containing past existence within moving images.

Walter Benjamin made a connection between the perception of a city and the appreciation of cinema. The modern city is an assemblage of absurdities and remains fragmented and unconnected. Montage is not only an essential technique of film editing for juxtaposing distinct shots but also a conceptual process for linking separated images. [1], [2], [6]

Spatial Montage and Multi-screen Display

Editing in film is the connection of different shots to create a whole and by sequencing events can effectively draw stories. [7] There are editing conventions that are primarily concerned with consistency and maintenance of natural visual sequence and narrative flow such as "continuity editing." However, breaking the conventions of consistency can sometimes intensify emotional rhythm and convey richer nuances of situations; this is called "complexity editing." [8] Editing is thus also considered the choreographic shaping of physical rhythm in film. [9] Montage literally means "setting together" or "assembling.' Sergei Eisenstein showed how the juxtaposition of two shots is qualitatively distinct from the experience of each shot viewed in isolation. He also portrayed montage in terms of counterpoint, coordinating multiple voices over time with parallel structure. [10]

The cinematic notion of montage is expanded though the multiplicity of information-based images of digital technology. For example, Lev Manovich suggests a concept of *spatial montage,* juxtaposing screens of different sizes and proportions that show separate images with simultaneous relationships, as an alternative to the single-screen montage. [3] Of course multiple screens may be employed to convey maximal information in minimal time, however returning to Sergei Eisenstein's metaphor a multi-screen format suggests a music that is boundless, multi-directional yet still simultaneous. [11] There have been many efforts to use multiple screens in cinema, especially in the avant-garde and 'expanded cinema' movements such as the Labyrinth production at Expo'67. [12] Although these types of films did not develop into the mainstream, the characteristics of digital media with multiple windows and database logic present a widely accessible contemporary echo. The borders between avant-garde and mainstream in cinematic experimentation are starting to blur. [13]

Database Cinema and Generative Art

A database is a collection of data structured to make searching and retrieval more effective and efficient. A database can form the center of a creative process that makes unfixed and generative artworks with dynamic fluctuation. For example, Lev Manovich created a "database cinema" using the computer in the *Texas* soft cinema project. Database cinema can be understood as a generative cinema that creates cinematic experiences through the execution of computational algorithms. In *Texas* for example, the database contains video clips each annotated by several parameters. The software uses these parameters to assemble clips together, building montage through parametric similarities. [14] Databases have been used for a variety of open-ended, unfixed and generative art forms, however, there remains great potential for deeper explorations in generative cinema. [15], [16]

Computer generative art is created by computer programs, typically with minimal intervention from humans and an emphasis on processes that can generate multiple outcomes. [17] By adopting autonomous processes and randomness as methods for making artworks, generative art has been said to challenge traditional concepts of authorship and intention. [18] However, the generative approach has been relatively less examined for cinematic applications; the use of computer generative systems for making art have been predominantly directed to computer graphics and music. Prior research in generative video editing has generally emphasized technical editing rather than montage construction and aesthetic effects. [19], [20]

LOST FRAGMENTS OF NIGHT

Overview of the Artwork

Lost Fragments of Night shows fragmented and paradoxical images found by night in Seoul, a capital city full of complex phenomena juxtaposing the contradictory values and dislocated images created through an extremely compressed and uneven modernization. [21] Often called 'the city that never sleeps,' Seoul epitomizes the paradoxical and chaotic coexistence of heterogeneous and fragmented images in contemporary life. [22] The simultaneous relationship between fragmented elements in the city is related to the media requirements of the multi-layered screens and generative editing system. The images, which are presented over four layered screens, emphasize the paradoxical relationship between different elements through collage aesthetic effects. The editing system generates montage while following its own structural logic, revealing the unfixed coexistence and separation in a metropolis caused by modernization.

The source material includes 142 original video clips, 117 of which were shot by the author in Seoul by night, while the remaining 25 are significant historical and political archive clips relating to Seoul. The author annotates these clips with keyword tags and then designs a timeline also in terms of these tags. Between each screening, the generative editing system selects appropriate shots for each of the four screens according to probabilities based on their relevance to the timeline flow, their association with previously displayed clips and any pre-defined system-wide structural constraints.

Lost Fragments of Night is intended to be installed in urban public spaces such as streets, parks or subway stations. The contexts of artwork can be various depending on the space and positioning of the audiences. Furthermore, audiences can change the timeline tags to construct different montages using a simple web interface.

Through these environments and conditions, audiences can be active participants in the artworks.

System Configuration

We made a virtual simulation model for the installation in public space (Figs 2 and 7) and built a physical miniature display system as a prototype model (Figs 1, 3 and 6). In the physical miniature, projectors mounted at the base project by rear diffusion onto four layered translucent screens made of grey sheer fabric.

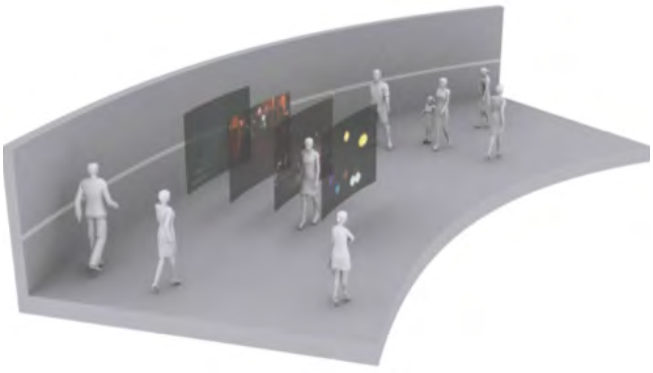

Fig. 2. Rendering of the proposed architecture of the final display.

Fig. 3. Photograph of the display miniature infrastructure used for evaluation purposes.

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 the timeline. Selecting clips according to a dynamic Bayesian network then generates a playlist for each screen. 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 through a mobile device, creating tags for each clip and giving them weighting values between zero and one. Each tag is then added to a tag library for montage construction. There are also 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 author has described each clip with suitable tags they can create a visual timeline to represent the structure of the montage. The author 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 over 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 user. The playback engine uses Max/MSP/Jitter, a commercial audio-visual programming package, to render the clips for each projector. Tagging and timeline data is downloaded from the remote server hosting the web interface and used by the playback computer 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.

Fig. 4. The web interface of the editing system.

The multi-layered screens present various aesthetic effects. The overlapped screens readily lead to connections between images and their unification as collage. However, the screens are layered with depth, so viewers can also perceive each image independently, especially 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. The author proposes that the poetic impact of the documentary film is intensified by layered display. [23] 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; showing the traumatic reality of modernization by shattering and subverting the coherence of images. [24], [25]

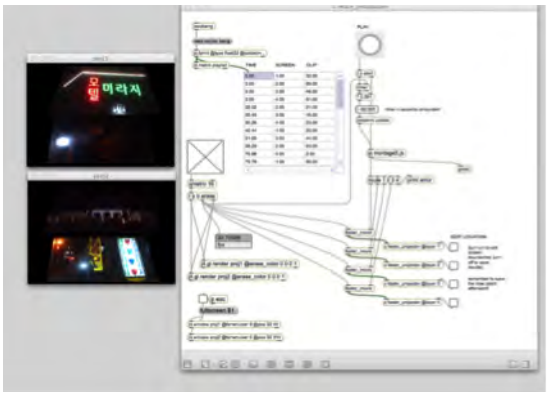

Fig. 5. The playback engine using Max/MSP/Jitter.

Aesthetic Effects

The author's use of multiple screens is also deeply influenced by the Maya Deren's concept of vertical montage. Maya Deren considered poetic effects in film through the metaphoric concept of the vertical, meaning the poetic expression that reveals central emotion and thought implicitly, in contrast to the horizontal, which is the construction of storyline. It is related to the vertical montage of Sergei Eisenstein, which emphasizes harmonization with various senses and images just as with counterpoint. [26], [27]

Fig. 6. Viewing the multi-layered screens from different angles (showing the same clip materials in left and right photographs).

Fig. 7. Screenshots of the virtual simulation.

The generative editing system is operated by tags created by the author and utilizes a programmatic associative network that echoes association by metaphor in human memory. The program '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. Human memory is similarly conformed by unfixed and metaphoric association in a network. In this system, tags provide condensed metaphoric meanings and the process of montage construction is networking metaphors is akin to the process of following mental associations. [28] 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. The occasional appearance of unexpected shots creates conflict montage, intensifying the chaotic or absurd sensations of paradoxical coexistence.

CONCLUSIONS AND DISCUSSION

We created a poetic documentary film and new media artwork *Lost Fragments of Night* about the disconnection and fragmented images of Seoul, utilizing a tag-based generative editing system and multi-layered screens. 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. However, montages are stochastically generated in every screening. Although author can constrain the

montage construction with the tag-based editing system, it is impossible to control every assemblage.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 nocturnal realities in cities such as Seoul. This artwork has not yet been displayed in public space. A miniaturized model has been produced for initial evaluation, however, people's reactions toward the full artwork have not been assessed. Our next steps will include a full size display of the artwork and its evaluation of the audience's response in a public urban space.

ACKNOWLEDGMENTS

We would like to express great appreciations to the participants of the artwork: assistant director Min Suk Do and documentary film supervisor Prof. Dong Won Kim. We also like to extend to our thanks to Prof. Gyu Chan Jeon, Prof. Jin Hee Kim, Won Suk Choi, Hee Won Lee, Young June Bang, Woo Nam Kim, Rooni Lee, Kwan Ho Ko, Joong Hee Soh, Seounghun Kim, Seri Sun, Sung A Jang, Mattie Elisa who provided insights and improvement for this research.

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