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혜성의 특성을 모티브로 한 인터랙티브 미디어 아트 제작

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Production of an Interactive Media Artwork with motif of Characteristics of comets

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[요 약]

혜성은 그 특유의 조형성과 신비로움으로 인하여 다양한 창작 분야에 영감을 주는 주요한 모티브로서 작용하고 있다. 현대 과학 기술의 발전과 그 맥락을 함께하며 계속해서 변화, 확장되는 미디어 아트는 테크놀로지의 활용을 통해 혜성의 구조와 같은 고유 특성까지 작품 내에 모티브로서 표현하는 형태를 보이고 있다. 본 연구는 혜성의 특성을 모티브로 하여 관객이 작품에 근접하면 상호작용이 일어나 관객에게 혜성의 꼬리를 만드는 주체가 되는 경험을 제공하는 거리 인식 기반 인터랙티브 미디어 아트 작품 “Near by”를 제작하는 과정을 기술한 연구이다. 본 작품은 관객이 가까이 다가온 것이 인식되면 혜성의 핵을 표현한 LED 구조물에 색 변화가 일어남과 동시에 구조물의 뒤로 꼬리를 표현한 영상이 프로젝션 되는 구조로 이루어져 있으며, 이러한 상호 작용 과정을 통해 관객들로 하여금 혜성에 대한 인식을 새롭게 하고 작품과 감성적으로 교감할 수 있도록 하고자 하였다. 단순히 혜성의 조형적 특성 뿐 아니라 혜성의 형성 과정까지 작품의 모티브로서 담아내고자 시도하였으며, 이러한 복합적인 모티브 표현 방법을 제안함을 통해 향후 미디어 아트 분야에 있어 자연 현상 모티브의 표현 범위를 확장시킬 수 있는 가능성을 제시하고자 한다.

[Abstract]

Due to its unique formation and mystery phenomena, comets is a major motif that inspires various creative fields. Media art that has been developed and expanded in step with the development of modern scientific technology has expressed the unique characteristics of comets such as their structure in the art as a motif, using technologies. This study describes the process of producing "Near by", an distance-recognition interactive media art. offering the audience a chance to create a tail of a comet as they close to it. changes the color of a LED structure representing the nucleus of a comet as the audience approaches it. At the same time, a video of a comet's tail is projected. Through this interaction, the audience will renew their perception on comets and emotionally interact with the art. This work capturing not only the formative characteristics of a comet, but also its forming process as a motif. Such composite way of expressing a motif could be presented as a possibility of extending the expression of the natural phenomenon in the future media art field.

색인어 : 혜성, 모티브, 인터랙티브 아트, 미디어 아트, 표현 방법
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Ⅰ. Introduction

There is an old saying “it appeared like a comet”. This phrase is often said to indicate the sudden appearance of something new, like a comet which beautifully embodies the night sky but changes into something extraordinary when it appears out of nowhere. The comet is one of the celestial bodies in the solar system, moving in an elliptical orbit due to the gravitational force of the sun forming a beautiful tail as it moves closer. Due to its unique and abrupt appearance, comets were regarded as inauspicious omens both in the Eastern and Western culture. However, after Edmund Halley discovered that the comet was a celestial body of the solar system returning in a certain period of time which was found through precise calculations. This awareness led to the gradual disappearance of the fascination of the comets mysteriousness and, when the comet did appear, it became a mere pleasant sight in the night sky. Not just a fascinating spot in the night sky, the comet also serves as a major motif, inspiring many creative fields. The purpose of this research is to produce interactive media art works with the motif of the characteristics of comets. Through the utilization of the characteristics, an interactive media art which emphasizes on the interaction process with the audience is created. I intend to transmit not only the cosmic form of the comet but also the natural process in which the tail is formed as a motif when the work is interacted with the audience. It is believed that this will enable viewers to renew their perception of comets and enable more active and emotional viewing of the works. Also, through this work I would like suggest the possibility to create new expression in media art.

Ⅱ. Characteristics of comets and Related Works

2-1 Characteristics of comets

Fig. 1. Halley's Comet

A comet is a small celestial body/sphere in the solar system, orbiting on an ellipse or a parabolic orbit around the sun. A comet travelling a long distance will form a very long tail due Solar radiation pressure and solar wind when it gets closer to the sun. Once the tail is formed, it can be viewed from earth, and can be seen from several days to months once it appears. One day, a comet emerging suddenly with a long tail on the night sky, was recognized as a broom in the East and a long-haired star in the West, thanks to its distinctive tail. [1] Comet is made up of two parts: a head and a tail. The head consists of a nucleus, which is the center of the comet, and a coma surrounding it. The tail consists of an ion tail and a dust tail. The nucleus of the comet is a round shape consisting of ice, rock, and dust particles. The nucleus is a part of the core of the comet, usually about 1 to 20 kilometers across, and gas and dust from comets are usually emitted through these nucleus. [2] The coma surrounding the nucleus means that as the temperature of the nucleus increases as the comet approaches the sun. The gas and dust that escape from the nucleus surrounds it like a cloud, and the dust tail and tail of ion each with yellow and blue colors are made by dust and gas from the coma driven by the solar radiation pressure and the solar wind. The two tails are usually a little apart from each other because the two forces act slightly different, and the tail always drifts away from the sun due to its force. [3]

2-2 Comet as a motif

Comets, thanks to its distinctive characteristics of sudden appearance and disappearance along with its beautiful patterns has always served as a major motif that inspired various creative fields such as paintings and performances. In particular, the shape of the tail of comet is prominently used as a motif in the fields of design. Chanel, the Luxury Jewelry Brand featured a mysterious, futuristic jewelry design a featuring comet. [4] Yu Kuk Il, a designer who made metal speakers and Metal Sound Design(MSD) produced a speaker depicting the shape of a comet that fell onto the ground with a long spark. [5]

Fig. 2. Comète necklace

Fig. 3. Yu Kuk Il, Comet, 2016

2-3 Cases of media art with a comet motif

In the field of media art, which is constantly changing and expanding along with the development of modern scientific technology, there are cases of making a work with a comet motif. They utilize technology to expand not only the formability of comets but also their structures and the atmosphere created around these comets to the expressive elements in the artwork, providing the audience with a new and expanded sense of comet. Fig. 4 is "Comet: God Particle 2011"by Tristin Lowe, an artist based on Philadelphia. This is a huge three-dimensional comet lighting artworks made of red neon tube, glass, and aluminum. This work can easily be interpreted as a comet motif due to its structure that floats in the air and the long tail stretched out of it and its bright neon light makes people feel that they are looking at a comet that is close to the sun. This comet cycle on and off, representing comets state that do not light up except when they run into atmosphere and encountering friction. Through this, the audience could appreciate dormant comets. [6] Fig. 5 shows "Metamorphosis", a installation whose creative strategies were established by David Delgado and Dan Goods from NASA Jet Propulsion Laboratory, and design and fabrication by architect Jason Klimoski of StudioKCA in Brooklyn. This 12-foot long glowing steel structure surrounded by fine mist, represents 67P/Churyumov-Gerasimenko, the target of the comet probe Rosetta. [7]. This sculpture, which appears to be the nucleus of a gigantic comet fallen into the Earth, consists of Folded Steel Plates, 600 watts of LED's, and copper tubes [8] and is designed and provided to provoke curiosity about comets and their behaviors commemorating Rosetta's mission. Light, clouds of mist and water vapor emitted from the inside of the sculpture, remind us of the light and atmosphere of a comet that generates light, gas, and dust by the sun, [9] and through these, the audience could feel like they are in close contact with the nucleus and atmosphere created around a comet.

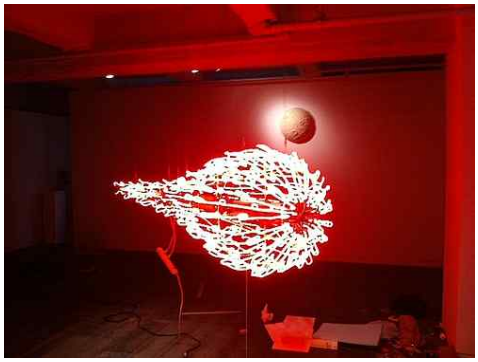

Fig. 4. Tristin Lowe, Comet: God Particle, 2011

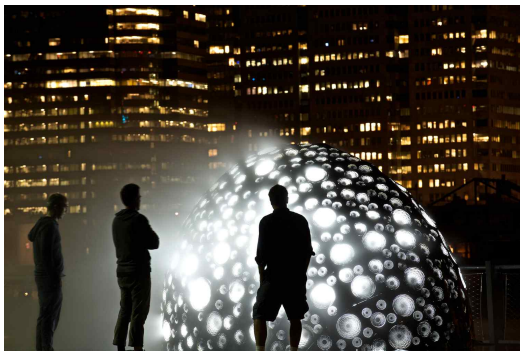

Fig. 5. David Delgado, Dan Goods, Jason Klimoski, Metamorphosis, 2014

Ⅲ. Interactive Media Art

3-1 Characteristics of Interactive Media Art

Interactive media art is the art where the participation and communication of the audience through the interaction is included in the work. It cannot be performed without the audience since it is the most important characteristic that it is completed only when the audience participates. If the existing works of art have unilaterally conveyed the message, then the focus shifts from the importance of the result of the work, to the importance of the process while requiring the participation of the audience in the process of producing the result. [10] The attitudes of the audience who can exchange their response on and participate in the work through its interface change from viewing to experiencing. By participating in and experiencing the artwork, the audience communicates with the artist's way of thinking that is transmitted through the technical medium. [11]

3-2 Structure of Interactive Media Art

As interactive media art is based on communication between the audience and the work, it is necessary to predict the behaviors

and reactions of the audience from the stage of production planning. In order to successfully produce an interactive media art, it is important to decide the type of input system to use and the type of output to produce, i.e. the design of interface. The success of a communication of an artwork could be defined by how systematic the interface is completed. [12] The computer-generated interactive media art works are produced in three stages: input, process, and result. In the first phase, there must be an input device that detects the behavior of the audience and converts it into a digital form so that the computer can accept it. When the data is input by the device, various types of computer processing results are completed through multiple signal processing methods. These results are reproduced in a real space where audiences can perceive them. Also in accordance to various variables such as the movement, the digital processed result can be displayed in the form of sound, image etc. Computer-generated non-materialization works are freed from the principles applied to real space, and are very fluid and exist in numerous variations. [13]

Ⅳ. "Near by" production

4-1 Concept of work

The concept of interactive media art work "Near by" produced in this research is based on the characteristic of a comet whose tail is generated when it approaches the sun. Here the artwork gives the viewers the emotional experience of becoming a subject that creates a beautiful comet by offering them the role of the sun to create the tail of the comet. Originally, the comet approaches towards the sun, but in this case, I wanted to make the viewers more intuitive and be aware of the distance between the work and themselves, and when the audience approaches to the work, the tail is created in the structure of the comet through their participation. This leads to a more active experience, communication, and engagement between the work and the audience. It is assumed that this artwork could deliver meanings more effectively than the prior works that have delivered their messages in a unilateral way without direct interaction with the audience. For the creation of this artwork LEDs, sensor and Arduino, programming language processing was used. LEDs to express the nucleus of the comet, an IR proximity sensor was used to sense the viewer's proximity to the work, a computer to process the signals received from the sensors, Processing program to control the image according to the signals received from the Arduino were respectively used. In the structure of the work, the image representing the coma wrapped around a nucleus structure emitting white light is projected all the time, and when the audience approaches the nucleus structure for a distance or more (in accordance program coded), color change occurs on the LED within the structure, and a tail image is projected behind the structure. The change in the color of LED and tail shapes only appear when the viewer is close to the work and disappears when the viewer is farther away and it reverts back to the original state.

4-2 Production process

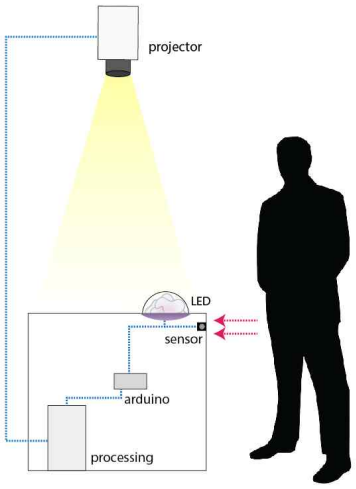

Fig. 6. Installation structure

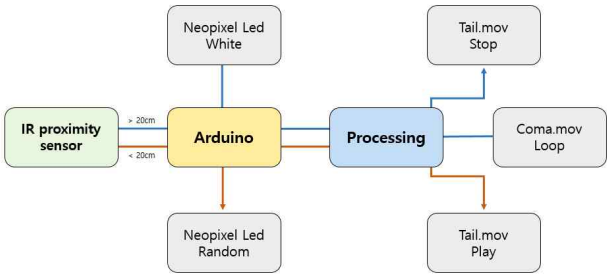

Fig. 7. Operation flow chart

The concrete structure and operation flow of the work are shown in Fig. 6 and Fig. 7. When an infrared proximity sensor is recognized within 20 cm of the proximity of an audience, Arduino will randomly alter the color of the LED in the nucleus structure, and the processing of the images linked to the comet will control the playback and stopping of the images of the comet. The circular dome structure, which represents the nucleus of the comet is always installed, is made by filling the woolen cotton within the transparent and thin plastic material with a diameter of 10cm, to give more of a fun visual. Inside the dome structure, three Neopixel LEDs were placed in between the cots so that the

nucleus was glowing. Originally, this work intended to incorporate three-color RGB LEDs, but due to the nature of the three-color RGB LEDs, which requires three color adjustments to change color via a PWM (Pulse Width Modulation) signals, instead a Neopixel LED was used, to facilitate multiple LEDs that can be easily controlled by connecting them in a chain form. In this case, a diffusion LED was used to express the gentle feeling more effectively. The images to be used in the works were divided into two, one for expressing the coma part and the other for expressing the tail part by using the image production program After Effects. The reason being, the video clip that surrounds the nucleus structure should always be played and the tail images should be freely played and stoped depending on the audience. The image reinterprets the shape of the comet, and the image of the coma section is intended to depict the nucleus structure as a colored band. The tail of the body is composed of dust tail visible in yellow and ion tail visible in blue but here only a single tail was created with use of particles and expressed in a way where it gave the feeling of particles pouring out of the coma part are beautifully. The generated images are projected onto the work through a processing video library [14], which can control the playback and stopping of the images. The coma image that should always be played is positioned at the top, and the tail image is positioned and programmed at the bottom. In this case, since the coma image located at the top should not cover the tail image, it was made using a transparent alpha value except for the portion expressing the coma.

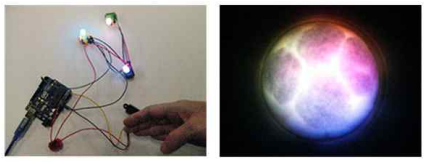

Fig. 8. Nucleus structure production

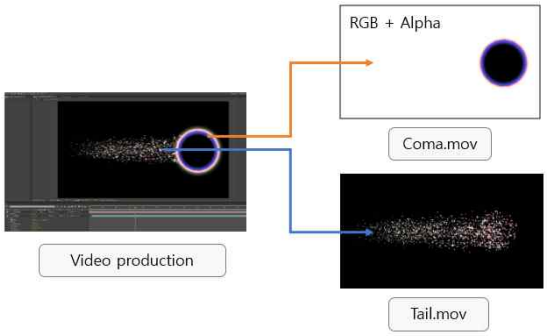

Fig. 9. Video production

4-3 work result

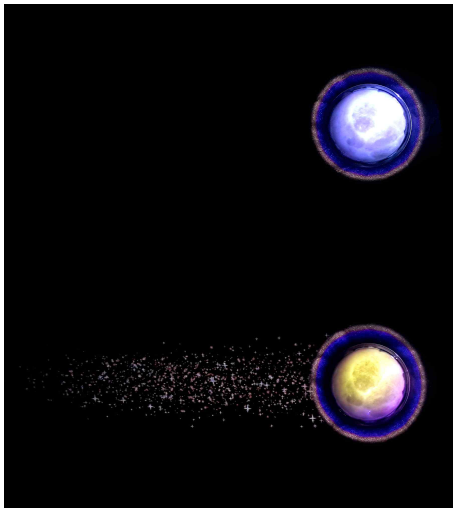

Fig. 10. Completed Works

Near by was exhibited at the 088 exhibition held in the Chung-Ang University Art Center 301 Gallery in 2017. Interactive media art, that recognizes the distance from the audience and causes the interaction to occur according to its proximity, does not have to take any special action in order for the audience to engage as audience can intuitively participate in the work. Near by also has these advantages, The audience easily grasped the structure of the work and showed participation in the work. In addition, when the interaction occurs, it is not difficult to recognize that it is a work with a comet motif through the process of creating the tail and its appearance. and when the tail disappears after a certain period of time, they would step away and then approach the work to appreciate the work or they would actively change the distance between the work and them to see what kind of interaction appears. In the process of production this work, I could identify necessary improvements needed for the development of the work in the future. since the position of the sensor for recognizing the distance of the audience is fixed, the viewer needs to go to the predetermined position and there was a possibility that the audience did not move in the direction in which they were guided, or that a lot of audiences participated in the work, which could cause problems. This can be improved by expanding the recognition range of the audience by using a number of sensors in the future or by producing a work using a depth camera such as Kinect.

Ⅴ. Conclusion

The comet, which produces a long and beautiful tail by the

help of sun, is a major motif that inspires various creative fields due to its unique formation and mystery phenomena. In particular, comet motifs have been used prominently in the field of design, and there are many cases in which comets' shape is used as a motif. There are examples of works with comet motifs in the field of media art. These works utilize technology to expand not only the formability of a comet but also its structure and atmosphere created around the comet, allowing the audience to feel a new and expanded sense of comet. In this study, I produced "Near by", a distance-recognition interactive media art. As the audience approaches the artwork, the color of the LED structure, representing the nucleus of a comet, changes. At the same time, a video expressing the tail of a comet is projected. This interactive structure gives the audience an emotional experience to be the subject of making the comet's tail, the intuitive interaction caused by the distance from the audience allows the audience to renew their perception of comets and communicate emotionally with the work. This work capturing not only the formative characteristics of a comet, but also its forming process as a motif. Such composite way of expressing a motif could be presented as a possibility of extending the expression of the natural phenomenon in the future media art field.

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