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The Utilization of Holograms in Modern Theatrical Productions

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ABSTRACT The production of a theatrical show necessitates the utilization of various materials, artistic elements, and techniques, in addition to the integration of technical and digital advancements. From this perspective, the director, who is responsible for the show's production, endeavors to leverage hologram technology to enhance and advance the show. This is achieved by incorporating fresh perspectives and innovative ideas, enhancing the aesthetic appeal, and captivating the audience with visually stunning elements. To do so, the current study aims to research the potential applications and opportunities for integrating holograms into modern production. Moreover, this study also aims to research three-dimensional holographic images as a modern theatrical technique in contemporary theatre. Additionally, this study explored the potential capabilities of holograms in modern theatrical performances, especially centralizing the theatrical production in the UK (Royal Shakespeare Theater-Stratford) for the preceding year of 2017. For this purpose, the study used the analytical research method and tools to analyze the show "The Strom" directed by Gregory Duran in 2017. A comprehensive set of results was obtained to conclude the study along with particular attention given to holography in the context of theatrical performance.

INDEX TERMS aesthetic, modern, holograms, theatrical production, theatrical performance

I. INTRODUCTION

Laser beams are a significant emerging innovation in the field of light and imagery, and they hold considerable artistic potential as a material for artistic endeavors. Holography technology enables the transmission of three-dimensional scenes and images to the viewer's eye within a theatrical space, utilizing the display's void and the rays it emits. By incorporating and manipulating the theatrical setting, as well as utilizing the reflection of flat images on mirrors, this technique enhances the overall theatrical presentation by infusing it with new energy and a significant potential for creating illusions through theatrical imagery. This results in both direct and

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indirect effects on the artistic production process, necessitating the director and designers to understand and utilize holographic technology. This includes the production of spectacles, scenes, and holographic digital images, as well as comprehending their respective information, materials, stages, scientific and aesthetic characteristics, and their relationship with other production materials and media. By engaging with these elements, the director's intelligence, experience, and abilities in execution, composition, and substitution are heightened.

A. RESEARCH QUESTIONS

The researcher aims to answer the following research question:

- What are the potential applications of holography in modern theatrical productions?

This research aims to underscore the role of hologram technology in enhancing the aesthetic and artistic aspects of theatrical presentations. By staying abreast of technological advancements in the modern world, directors demonstrate their ability to enhance aesthetic and artistic dialogue by effectively incorporating three-dimensional objects and shapes into the theatrical space.

II. THE POWER OF HOLOGRAM TECHNOLOGY

The term "hologram" originated from Greek etymology. "Holos," meaning comprehensive vision, and "Gramma," meaning written, are combined to form the word "hologram." A hologram is a technological innovation that possesses a distinct characteristic enabling it to generate a three-dimensional image of objects in space through the utilization of lasers and the principle of interference [1]. The hologram is defined as a device and technique that is utilized in holographic imaging. The process involves capturing the emitted light from an object and presenting it in a manner that visually represents the object's three-dimensional characteristics. This enables the visualization of laser rays and the illumination of light. This feature enables the view of images from various angles, making them applicable across multiple industries and for diverse objectives.

We must familiarize ourselves with the concept of Laser, which stands for Light Amplification by Stimulated Emission of Radiation [2].

The device utilizes a laser to convert multi-frequency electromagnetic rays into a singular, higher frequency, resulting in the formation of a flat optical

unit [3]. The laser is widely regarded as a highly significant application of light and motion in the arts. It has found particular use in cinema and theater, and its initial simple applications in festivals and celebrations have evolved into the utilization of laser light in advanced holographic imaging techniques. The term "holo" refers to a comprehensive process, which involves the creation and application of graphic drawings and coloring techniques. The two video clips demonstrate the concept of holographic imaging, showcasing a comprehensive representation of objects in three dimensions and their spatial appearance (see Figure 1)

FIGURE 1. Video clips showing the concept of holographic imaging

A hologram is created through the process of holographic photography, which involves the application of photography and display techniques. Essentially, a hologram is a recorded representation of artistic work. The final display showcases the photography and hologram components [4] (see Figure 2)

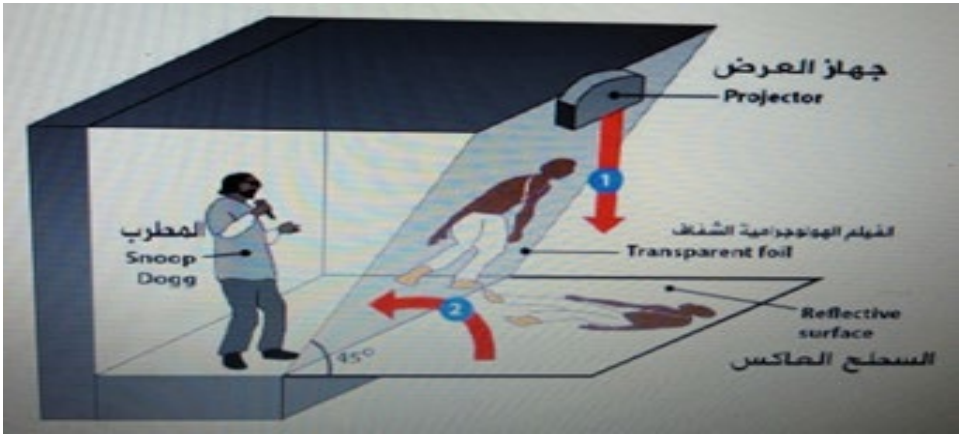

FIGURE 2. Photography and hologram components

The theatrical space was designed utilizing laser beams, employing a state-of-the-art and highly efficient technology known as three-dimensional imaging or hologram technology. (see Figure 3)

FIGURE 3. Three-dimensional imaging or hologram technology

The hologram was captured on a medium known as a hologram plate, which can be either a film or a specialized sheet of glass. When observing a conventional photograph featuring a child positioned behind a car, it is noteworthy that solely the car's image will be visible, while the child's presence will remain undetectable, irrespective of the observer's vantage point. The image in question possesses solely two dimensions. However, if the identical image of the child and the car were captured using laser or holographic technology, the nature of the image would be altered, resulting in a three-dimensional representation. Consequently, by observing the image from a specific angle, either left or right, the child would be readily

discernible. This suggests that the hologram closely resembles the authentic image [5]. (see Figure 4)

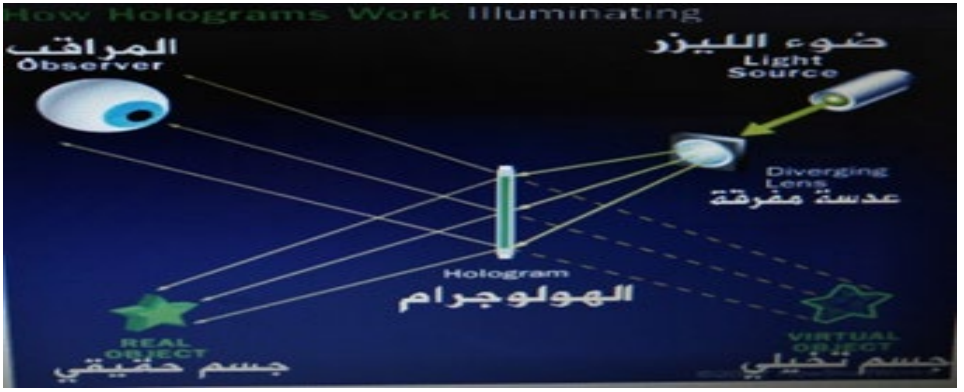

FIGURE 4. Observing the image from a specific angle

A. THE ORIGIN OF THE HOLOGRAM

The origins of holography can be traced back to the pioneering work of Dennis Gabor (1900-1979), a distinguished British (Hungarian) scientist who was a renowned physicist and recipient of the Nobel Prize in Physics. Gabor is widely recognized as the pioneer of Holography and is credited with creating the first three-dimensional image in 1948, predating the invention of the laser [6].

Gabor's approach involves the utilization of a laser beam with a significant level of coherence. This method entails dividing the laser beam into two separate components using the beam streamer Boam Splires. One of these components is projected onto the object that is to be recorded, while the other component serves as a reference. By simultaneously exposing the two beams onto a photographic plate with specific properties, it becomes feasible to acquire a holographic image [7].

The current study posits that hologram technology has effectively generated a virtual environment by projecting a three-dimensional image. This implies that it is possible to create a virtual theater on a screen, complete with a backdrop within the theater and virtual actors that are detached from reality. According to Adam Donen, a renowned director, author, and inventor of 3D drama, the presence of real individuals is no longer necessary due to the creation of a virtual realm where the illusion of human presence is convincingly portrayed. (see Figure 5)

FIGURE 5. Virtual theater on a screen

B. HOLOGRAM EFFECTIVENESS

Hologram technology offers significant potential for enhancing theatrical performances, particularly those that aim to present the three-dimensional images that surpass the limitations of reality. Laser technology holds great potential in the realm of artistic endeavors, particularly in the creation of successful works. By utilizing holographic techniques, lasers can generate a stereoscopic and three-dimensional representation of theatrical scenes through the reflection of their images on mirrors. This innovative approach allows the audience to perceive the theatrical space with depth and realism; thereby, enhancing the overall quality and vitality of the performance [8]. (see Figure 6)

FIGURE 6. The theatrical space with depth and realism

One of the components of holographic displays serves both functional and aesthetic purposes. The concept of incorporating screens on stage is not a novel idea. (see Figure 7).

FIGURE 7. Incorporating screens on stage

Recent advancements in 3D technology have led to the emergence of modern 3D displays. These displays offer viewers the ability to perceive individuals or objects in three dimensions, presenting a holographic representation that can be observed from various angles directly in front of the viewer. Contemporary hologram technology utilizes the cutting-edge Peppers Ghost technology, which represents the forefront of modern display technologies. The utilization of holograms as a technological innovation dates back to 1860 when it was first employed at the Queen Victoria Theatre in London. This pioneering application involved capturing ghost-like images by having actors don ghostly costumes and positioning a sheet of glass at a specific angle. As a result, viewers were able to perceive both the glass and the apparition-like image of the actor. However, the observer's perception is limited as they are unable to witness the actual presence of the actor. Instead, the viewer is presented with a spectral image that is illuminated by a specific light source at a precise angle. Consequently, a ghostly manifestation of the actor is reflected, creating the illusion of a ghostly apparition [9].

This technology, although is previously outdated, but currently it has been utilized through the operation of advanced film devices and techniques. Additionally, a collection of high-quality digital display devices and CGlanmatia effects programs are employed. CGlanmatia refers to the art of creating three-dimensional images using computer technology, specifically within the realm of computer graphics and computer animation. Typically,

these designs are created utilizing three-dimensional graphics technology. However, despite the growing prevalence of such designs, two-dimensional applications continue to offer quicker results and visually appealing outcomes, even on moderately powered computers [5].

During the post-production phase, CGlanmatia technology emerged in the twenty-first century. Instead, of a tangible entity, the visual representation now consists of a high-resolution video or image generated by computer-generated imagery (CGI) software. This digital content is projected onto a specially treated transparent film, designed for optimal display and visibility. The utilization of a premium-grade projector is necessary to achieve a high-caliber holographic image, albeit at a considerable cost [7].

Pepper's Ghost technology is a widely utilized method in contemporary holographic displays. The technology in question is a cutting-edge system that showcases a three-dimensional holographic display on a stage. The theater itself is designed with two distinct sections: the first section remains concealed from the audience, while the second section is visible and accessible to them. The segment in which the hologram materializes is the portion that is observable to the general audience. The theater is divided into two sections by a glass partition positioned at a 45-degree angle. This glass possesses similar optical capabilities as a rearview mirror in a car, allowing for observation of objects or individuals approaching from the rear. To ensure optimal viewing of the holographic image, viewers are required to maintain a designated distance. It is recommended to position a separator at a designated distance to ensure that the audience does not surpass it. This will help establish a specific location for the audience to stand [10]. (see Figure 8)

FIGURE 8. Pepper's Ghost technology

C. HOLOGRAPHIC DISPLAY FEATURES

According to Wilson J. Hawkes, there exist distinct characteristics and notable advantages associated with hologram technology systems. Additionally, Hawkes provided insights regarding the proper methods for displaying holograms [7].

- The capability to observe the human body from multiple perspectives and discern the intricacies of its cavities and apertures.
- The observation of a single perspective obscures the alternative viewpoint. When observing the right side of the face, the left side becomes obscured.
- In the event of hologram destruction, it is possible to restore the image by subjecting any fragment of the hologram to a laser beam. However, it is important to note that the illumination intensity of the hologram is relatively low.
- It is feasible to capture multiple holographic images on a single glass plate without encountering any interference or ambiguity between them.
- It is feasible to store 103 symbols (bits) within each cubic centimeter of an optically active crystal. This implies the capacity to store information equivalent to that contained in 5 million volumes. Each volume consists of 200 pages, and each page contains 1000 words, with each word being considered. The object is composed of seven letters and is contained within a cubic crystal that does not exceed the size of a fingertip.

III. THE UTILIZATION OF HOLOGRAMS IN MODERN THEATRICAL PRODUCTIONS

Holograms and laser beams have been utilized in modern theater, while multimedia and digital scenography have been incorporated into contemporary performances as well. One notable instance showcasing the functionality of a hologram is the theatrical production of "Miss Saigon" in 1991. In the theatrical production, a gaseous substance was employed to generate pressure within pipes situated at the lower section of the stage. This mechanism facilitated the movement of substantial weights, which would otherwise prove challenging to transport or manipulate. The concept of airbags is noteworthy. Additionally, this technology utilizes mobile light devices capable of omnidirectional movement and adjustable angles. These

devices are remotely controlled by a computer system, which governs various aspects, such as the intensity of emitted light and the specific area to be illuminated. The lights are operated and controlled via remote control, utilizing infrared technology for emission. The stirring process necessary for the photocell has been successfully executed [11]. The utilization of laser and hologram technology enhanced the stage production by introducing various concepts and forms. One notable scene involved the projection of a series of overlapping circles, creating the illusion of a divided shape at the center. Additionally, a plane repeatedly descended and ascended on the stage, adding dynamic movement to the performance. (see Figure 9)

FIGURE 9. Miss Saigon in 1991

The theatrical production titled "Titanic" was staged in 1997. This particular show incorporated the use of a holographic ship, by presenting a unique challenge for the designer and director. One of the primary concerns revolved around seamlessly transitioning between various scenes within the virtual optical ship. The dynamic nature of these scenes necessitated a sense of vertical depth, with multiple layers being perceived simultaneously. The primary challenge encountered by the designer pertained to devising a method for submerging the ship in the water in a manner that appeared both credible and acceptable. The designer successfully located a stage that fully meets the requirements for a moving stage, encompassing all its components rather than just specific areas. Additionally, the designer incorporated the inclusion of mechanical devices to enable diagonal ascension from one side. The stage incorporates electric scissors, specifically hydraulic scissors, to bring to life the designer's concept. This

is achieved by strategically positioning a bathtub, which matches the width of the stage opening, on the level beneath the stage at a precise moment. The computer is programmed to calculate the necessary parameters for both the hydraulic scissors, including its height, and the resulting incline. As the large obsidian bathtub ascended, gradually enveloping each section of the vessel, the culmination arrived with a profound darkness that shrouded the entirety of the ship [12]. Incorporating the utilization of light and sound effects to authenticate the sinking and capsizing of the ship, thereby enhancing the portrayal of the primary historical incident within the theatrical production. (Figure 10)

FIGURE 10. Holographic ship "Titanic"

The theatrical production of "Candida" in 1997 incorporated the use of digital technology. Specifically, electric motors controlled by a remote were utilized to facilitate the movement of a carriage carrying fifteen actors. This carriage was operated by two actors, who pulled it along. The inclusion of dynamic movement is a fundamental aspect of this decorative arrangement, which comprises carts affixed to plastic components, all of which are in motion. The product can be easily and conveniently disassembled and assembled to achieve the desired shape, and it can be utilized in multiple forms and applications. The show's scenes also featured a composite hologram. The middle was entered, and a form of light projection was utilized to simulate a boat lighthouse [13] . The implementation of advanced lighting devices successfully conveyed the illusion of the boat sailing on the sea. The utilization of Styrofoam and plastic materials in the scenic design also contributed to the cohesive and harmonious aesthetic of the scene. (see Figure 11)

FIGURE 11. Image from "Candida"

Several directors have undertaken the endeavor of creating virtual theatric al performances using web/cyber theater networks. In this innovative appr oach, virtual characters are employed instead of live ones. The directors ac hieve this by overseeing the movement and actions of each virtual charact er through a designated actor situated in a separate location from the rest o f the cast.
However, he remains connected to the rest of the work team through com munication networks. By monitoring the computer screen, the other team members can observe the virtual (holographic) characters and engage with them. Additionally, there is an extensive online audience that can access a nd follow the shows [14].

The proposed scenography for the upcoming production implies the inclusion of ethereal and non-human performers. The utilization of lighting, auditory cues, visual representations, and dynamic components has the potential to serve as substitutes for human presence. To effectively carry out the diagnostic process, it has been observed that "(Azat - Actress) exhibits dynamic movements characterized by squirming and writhing." It can be stated that the art of acting in traditional theater serves as a notable precursor to the modern-day digital characters that are brought to life.

The concept involves the substitution of live actors with illuminated figures. Digital displays commonly feature a variety of elements, such as human figures, graphic layouts, and representations of ideas, which are increasingly prevalent and widely disseminated.

Yacov Sharir is a distinguished professor of performance and dance at the esteemed University of Texas, College of Fine Arts. He is currently engaged in the study of interactive systems and virtual reality in Austin. He

implemented digital technology to generate three-dimensional environments and facilitate interaction between a group of cyborg dancers and human dancers. The user utilized a combination of live shapes and the Poser program to create visually stunning virtual dances and dancers that defy the force of gravity, gracefully floating and rotating around their axis. Experience the exhilaration of navigating virtual environments adorned with captivating three-dimensional hues. Susan Broadhurst, a distinguished academic holding the position of Professor of Performance and Technology and serving as the Head of the Performance and Production Division at the esteemed Faculty of Arts and Humanities at Brunel University in London, played a pivotal role as one of the founders of the renowned Body and Technological Space research group. In the year 2001, she presented a groundbreaking theatrical production titled "Blue Blood Shot Flowers." This performance featured a live actor engaging with a sophisticated three-dimensional concept of artificial intelligence, embodied in the form of a human head named Mounir. The individual's behaviors and responses are contingent upon the real-time manipulation of any human, rendering them unpredictable due to their continuous learning and evolution from one performance to another. The performance is characterized by its innovative and experimental nature, resulting from a collaborative effort, which was undertaken between the faculties of arts and sciences at Brunel University and the University of Surrey. This collaboration involved the participation of Broadhurst, the performing arts group Elodie, and a systems engineering company. The objective of this collaboration was to create a performance that incorporates direct, real-time interaction between an intelligent virtual performer and a live musician, specifically through the hologram image. The utilization of virtual and live actors [15]. (see Figure 12)

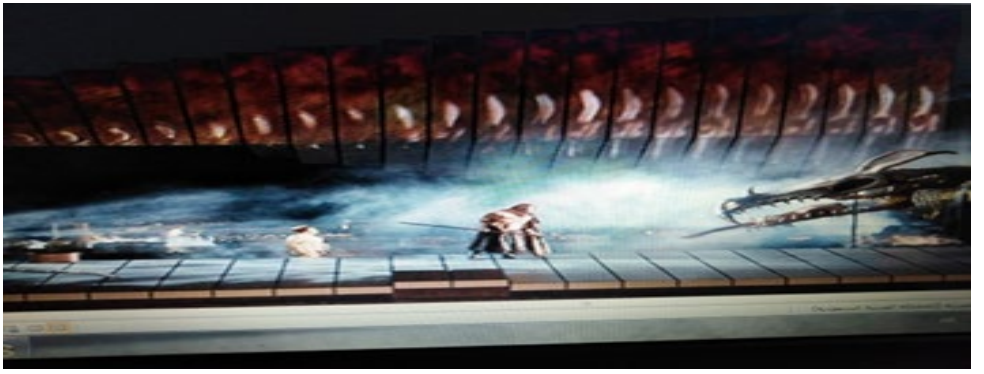

FIGURE 12. Image from the "Blue Blood Shot Flowers."

The contemporary manifestation of an ethereal, non-human performer is the virtual doll. It serves as a self-contained representation, consisting of light and imagery exhibited through a prerecorded video or a three-dimensional inanimate object that has been animated to create the illusion of being present on stage alongside the actor. The actor may be accompanied on stage by inanimate objects that have been infused with life. When presented in a controlled environment or through digital displays, the act of zooming in reveals the distinctiveness and divergence of the subject from traditional meat.

A. ANALYSIS INDICATORS

- Hologram technology serves to seamlessly incorporate and embody virtual and live characters within modern theatrical productions.
- Hologram technology aims to captivate and impress by creating virtual images and scenes that closely resemble reality. This is achieved through the seamless integration and synchronization of visual and audio elements.
- The utilization of the digital medium, specifically computers, has significantly contributed to the development of digital images and sounds. Additionally, the integration of hologram devices and laser beams has enhanced the capacity to create and orchestrate theatrical performances.
- The potential applications of hologram technology in the fields of cinema, television, and theatrical performances involve the creation of virtual environments, shapes, and characters within a virtual studio. These holograms can be captured through photography, and projected onto screens, or utilized within the physical space of a theatrical performance.

IV. METHODOLOGY

The current study utilized the descriptive analytical method to carry out the research. The research community refers to a theatrical production that took place in 2017 in Stratford, Britain, presented by the esteemed Royal Shakespeare Company. This production ran for approximately 83 performances for 10 months. Notably, on January 11, 2017, it was broadcast live to over 500 cinemas worldwide. The selection of the model

for Shakespeare's show, The Tempest, directed by Gregory Doran, was based on the following rationale:

- The strength of the topic.
- The integration of digital technologies in contemporary theatrical performances has contributed to the harmonization of the time.
- The research successfully fulfills the requirements and objectives by encompassing a wide range of diversity, ultimately yielding the desired results.

A. ELEMENTS OF THEATRICAL SHOW

The show: Storm Storm

Written by: Shakespeare

Directed by: Gregory Doran

Produced by: Royal Shakespeare Company

Implemented by: Imaginaries Studios, It was founded by Iraqi actor and director Andy Serkis in 2011, the studio specializes in creating digital characters, using motion capture technology.

Production design: Stephen Brismon

Video: Fine Ross

Lighting: Simon Spencer

Music: Paul Englishby

The Effects, music, and sound: Jeremy Dunne and Andrew Franks

Movement: Lucy Collingford

B. SHOWS ANALYSIS

It is evident from the initial observation that the director, Duran, has dedicated efforts towards the conceptualization of the stage design, which takes the form of a fragmented wooden structure resembling a sizable ship (see Figure 13).

FIGURE 13. Fragmented wooden structure resembling a sizable ship

The wreckage, divided into two distinct sections of significant height and width, serves as a prominent symbol representing the wreckage that accompanied the arrival to... The island, has subsequently transformed into a confinement facility on multiple levels. Once the ensemble of actors emerges from the depths of the stage, a series of thunderous sounds and simulated lightning effects are skillfully employed. The lighting design expertly creates the illusion of lightning streaks, while the stage itself appears to tremble and sway, evoking a disorienting sensation akin to being amidst tumultuous waves. Through the seamless integration of sound and visual elements, the opening scene successfully conjures a harrowing sea storm. The experience is both alarming and highly exhilarating, characterized by a palpable Storm accompanied by vivid flashes of lightning and the resonating sounds of howling winds and crashing waves. Audible pleas for assistance can be heard emanating from both sides of the stage. The intensity of the voices increases as heated exchanges occur between the chief sailor and two members of the ship's crew positioned on opposite sides of the wreckage of the distressed vessel. Meanwhile, a visual display on the screen portrays the illumination of lightning and the tumultuous waves of a tempestuous sea, with a prominent depiction of a sizable sea vortex descending from above. In the concluding sequence, the lifeless forms of the sailors are depicted succumbing to drowning. (see Figure 14)

FIGURE 14. The lifeless forms of the sailors are depicted succumbing to drowning

The computer's digital medium was instrumental in the creation of the virtual digital image and digital sound. In the subsequent scene, the character Miranda makes an entrance and beseeches Prosper to pacify the turbulent sea. She expresses her distress upon hearing the desperate cries and pleas for assistance emanating from the distressed vessel. In response, Prosper endeavors to assuage her concerns by affirming that the tempestuous fury of the sea shall not encroach upon their safety. He implores her to compose herself, allowing him the opportunity to disclose the events that have transpired and enlighten her regarding matters of which she remains unaware.

The magician Prospero stated, "Indeed, utilizing my vast wisdom and discernment, I issued a command to ensure that the lights would not cause harm to any individual and refrain from even the slightest disturbance to any traveler's well-being..."

Subsequently, he proceeds to disclose the veracity of her circumstances, elucidating the events that led to their arrival on this island a dozen years ago. He reveals that she is the offspring of the Duke of Milan, a capable and esteemed ruler, and expounds upon the treacherous actions of his brother, Antonio, who usurped his authority after receiving support from the King of Naples. Consequently, they were forcibly exiled, callously cast adrift in a small vessel. In the absence of sails while at sea, Gonzalo kindly furnished

him with a selection of his preferred garments, baggage, and literary materials.

He kindly requests that she take some time to rest and get some sleep. The individual summons Ariel, and subsequently, the apparition of Ariel materializes as a digital hologram utilizing motion capture technology. This holographic representation then maneuvers within the designated display area, responding to the commands of Prospero. (see Figure 15)

FIGURE 15. maneuvering holographic representation within the designated display

The spectral entity known as Ariel expresses its presence and willingness to comply with your instructions, possessing the ability to traverse the skies, navigate bodies of water, and even ignite in the fiery embrace of flames, all at your behest.

The hologram, which represents the ghost character of Ariel and serves as the embodiment of virtual characters, has been developed. Subsequently, he proceeds to elucidate the actions he undertook with regard to the vessel, dutifully executing his assigned task of igniting it and instilling fear among its occupants, all while adhering to the specific instructions provided, ensuring their safety. In this scenario, hologram technology is utilized to depict fire locations and incidents across multiple areas. Additionally, the apparition of the ghost, known as Ariel, is observed as it executes these operations, accompanied by the projection of images depicting a spacecraft situated in the depths of outer space. When Prospero, the magician, inquires about the current time, the digital image abruptly vanishes, and Ariel materializes to respond to the query. Please refer to the photograph labeled (Figure 16).

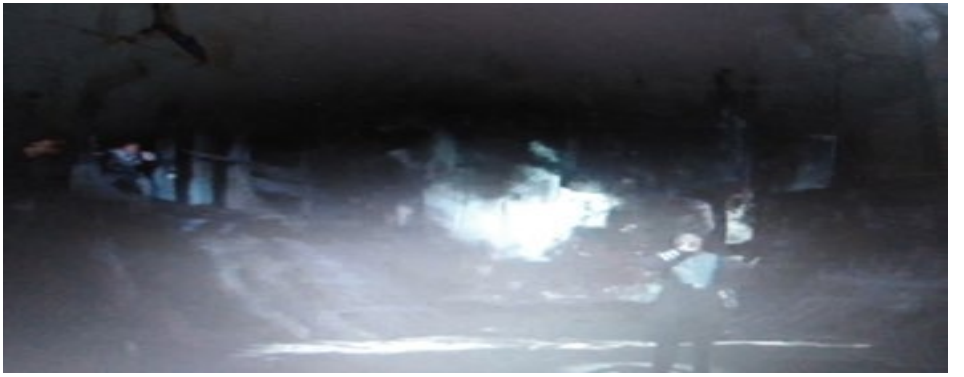

FIGURE 16. The digital hologram image was created using the digital medium of a computer.

Ariel respectfully requests that the esteemed magician Prospero honor the commitment he made to bestow upon him the gift of freedom and release him from his servitude. This provokes a strong emotional response from him, causing the color of the tent to transition to a deep black shade with illuminated cracks emanating from beneath. He reminds him of the fact that he was instrumental in his rescue from Sycorax, the witch who had confined him within the crevice of a pine tree for twelve years. Subsequently, a transparent circular curtain descends, enveloping Ariel within its confines, thereby creating the representation of a sizeable pine tree trunk that is contained within this structure (thus forming the digital depiction of Ariel). The dimensions of the trunk are greater in size, resulting in audible cracking sounds, as the display area transforms into interconnected roots.

Prospero utilizes his magical wand to issue a command, resulting in the disappearance of the pine tree as depicted in (see Figure 17).

FIGURE 17. Depiction of disappearance of the pine tree

Shortly after committing to set him free, Prospero the magician requests Ariel to assume the role of a mermaid. It has been observed that the individual in question demonstrates a lack of concern for others, prioritizing their interests while awaiting further instructions. Following the departure of Ariel, Prospero proceeds to awaken Miranda and instructs her to proceed to Clipan's hole. During this time, Ariel is summoned and makes an appearance, assuming the form of a mermaid as depicted in a visual representation. He informs Prospero that he has executed the given instructions and subsequently departed. Please refer to (see Figure 18).

FIGURE 18. Image of the scenes from the Prospero's magician

The following are the potential applications of holography in generating spatial environments and forms within a performance setting. Ariel makes his entrance accompanied by four female dancers, portraying spirits. As he sings, his image is projected onto a screen, appearing as an indistinct mermaid in the vastness of space. Meanwhile, the stage floor creates the illusion of rippling quicksand. (see Figure 19)

FIGURE 19. The stage floor creates the illusion of rippling quicksand

Ferdinand enters the vicinity and attentively absorbs the auditory compositions and harmonies, prompting him to contemplate their origin: are they derived from terrestrial or celestial realms? Furthermore, he ponders over the captivating allure that has managed to divert his attention from the wrath of nature and the bereavement of his late father, the king. The melodies resound in his ears as the performance space transforms, resembling a serene and transparent body of water, evoking the depths of the sea. Simultaneously, the screen displays a poignant image depicting the father, symbolized as the king, submerged in water, while a troupe of dancers, representing ethereal spirits; gracefully encircle a swirling vortex until his body is eventually restored, fragment by fragment. (see Figure 20), the implementation of hologram technology is showcased.

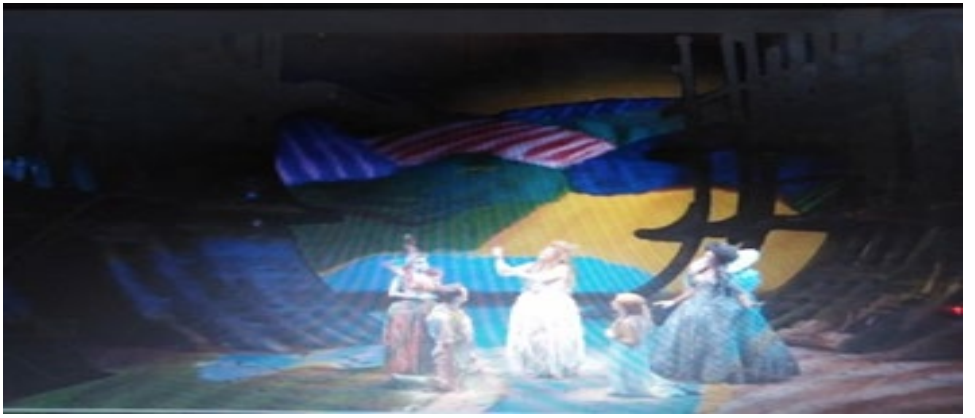

FIGURE 20. The implementation of hologram technology is showcased.

This technology aims to captivate and impress viewers by generating virtual images and scenes that closely resemble reality. It achieves this by effectively coordinating and integrating with various visual elements. Additionally, the individual possesses strong vocal abilities.

In the subsequent scene, the character named (Clipan) makes an entrance while bearing firewood, accompanied by a collective of spirits who engage in a dispute with him regarding his acquisition of firewood. Following the casting of a curse upon the magician Prospero, the character Trinculo enters the scene, with Clipan concealed beneath his robe. Following an extensive, satirical soliloquy characterized by comedic elements, the entire sequence transitions into a farcical display.

In the subsequent scene, King Alonzo and his retinue make their entrance, visibly fatigued from their extensive search for Ferdinand throughout the island. Gonzalo politely request king to pause momentarily to catch their breath. The king, understanding the need for rest, commands everyone to halt and take a break. At this moment, Antonio reappears, and he and Sebastian reaffirm their sinister plot to assassinate the king and his entourage. As musical melodies resonate in the background, four dancers enter the scene, while three others begin to prepare the dining table. The king is requested to approach the table, but just before his hand makes contact, it inexplicably vanishes. Simultaneously, unsettling voices resonate, causing great distress to the king. The entourage accompanying him includes Eriel, who manifests as a majestic avian figure with the physique of an elderly woman, her resonant voice permeating the surroundings.

Facial motion capture technology was exclusively employed in this particular scene, wherein the characters of the king, Antonio, and Sebastian descend to the ground, brandishing their swords in an attempt to apprehend the elusive bird, (see Figure 21).

FIGURE 21. Facial motion capture technology was exclusively employed in this particular scene

The digital technology seamlessly integrated with the screen, extending its reach into the surrounding space and the stage floor.

In a subsequent scene, the rear screen depicts the audio and visual representation of three aggressive canines, while a collective of ethereal entities enters the stage, bearing circular objects that project a mirrored image of the dogs in pursuit of (Clipan), (Stefano), and (Troncolo).

Following this display, the spirits depart from the scene. Prospero, the magician, instructs Ariel to persistently pursue the spirits after they have detained the king and his entourage as captives. Prospero then commands Ariel to fulfill their prior agreement. In response, Ariel promptly departs to retrieve the king and his entourage. This sequence culminates in the final scene. Upon Ariel's departure, the esteemed magician Prospero gracefully assumes a kneeling position, causing the surrounding display space to seamlessly transform into a captivating and intricate forest setting. The individual rises and utilizes their magical wand to create a circle of fire. Subsequently, the wand is intentionally broken, resulting in the arrival of four spirits who are entrusted with the responsibility of executing a specific mission: to retrieve the remaining navigators and the captain of the king's ship, as depicted in (see Figure 22).

FIGURE 22. Concluding the performance

Following this, the individual, referred to as Prospero, summons the king and his accompanying entourage into their dwelling. As the occupants vacate the premises, Prospero proceeds to deliver a concluding speech to the audience, which effectively concluded the performance.

V. CONCLUSION

The digital display system aims to achieve a harmonious integration of visual and audio technical tools, enhancing the overall representational performance. The hologram featured in the production of "The Storm " evoked intellectual and aesthetic stimulation for the audience through its incorporation of visual, formal, sound, and light elements. This innovative approach deviated from traditional norms, embracing creativity and

breaking the monotony. Director Duran skillfully utilized holographic technology to enhance the theatrical setting, incorporating signs and creating harmonious elements that aligned seamlessly with the actors' performances, techniques, and the overall expression of the Shakespearean dramatic text. This innovative approach effectively brought to life the magical and imaginative space of the production. As a result, various advancements in technology have led to the emergence of new possibilities in the fields of holograms, screen operation, photography, and the utilization of vacuum and theatrical space to effectively organize and shape theatrical performances. In the realm of hologram work, the creation of theatrical presentations by the show maker (director) heavily relies on the utilization of visual language and digital technology. Furthermore, hologram operation is a contemporary and expensive technology that is particularly well-suited for large theaters and theatrical projects, such as grand-scale shows. Additionally, this technology is also suitable for displaying outside of theaters, thanks to its impressive artistic and technical capabilities.

This study posited that the utilization of hologram technology, specifically three-dimensional holograms, has the potential to captivate the recipient, enhance aesthetic and intellectual depth, evoke admiration, excitement, and suspense, and push the boundaries of directorial vision.

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