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A Study on the Aesthetic Representation and Visual Implementation of the Artificial Intelligence Filter Bubble Phenomenon

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Abstract

Recent advancements in AI-based personalization algorithms have served as a decisive catalyst for shifting the information consumption paradigm of modern society from one centered on communication to one centered on isolation. The "filter bubble" phenomenon, situated at the heart of this structural shift, acts as a mechanism that blurs the boundaries between the virtual and the real when combined with the technological opacity of platforms. The recursive loop structure of endlessly circulating information is not merely the result of cognitive bias but is identified as a strategic environment derived from the mutual interplay between the agency of algorithms and human confirmation bias. This study seeks to conceptualize these aspects of technological isolation and alienation through the aesthetic metaphor of the "bubble" and, through the realization of empirical media art works, to demonstrate the ontological crisis in which virtual illusions encroach upon actual reality from a media-aesthetic perspective. Furthermore, by critically illuminating the emptiness of data concealed within the fantasy of technological optimism, this study proposes the reflective function that art must uphold in an algorithm-centered society, as well as the possibility of alternative modes of perception.

Keyword : AI Algorithm, Filter Bubble, Virtuality and Reality, Media Art, Non-human Actor

1. Introduction

In modern society, artificial intelligence has evolved beyond a mere medium for information to become a powerful algorithmic environment that shapes the human perceptual world. Personalization algorithms, which analyze individual user data to provide only optimized information, give rise to the "filter bubble" phenomenon, deepening information isolation by trapping users within the confines of information they have chosen themselves. The filter bubble blurs the boundary between the virtual world curated by algorithms and actual reality, leading users to accept the illusion projected by the algorithm as the sole reality. In this process, the boundary between the virtual and the real gradually breaks down

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and is overturned.

These social and cultural phenomena surrounding artificial intelligence can be expressed through the metaphor of a bubble that repeatedly expands and collapses. The bubble simultaneously implies an optimistic fantasy about technology and the uncertain reality hidden behind it. This symbolizes the disconnect between the dazzling visual outputs produced by AI technology and the data-driven emptiness within them. Recent media art has focused on the non-human agency of these algorithms, discussing whether technology functions not merely as a tool but as a subject that collaborates with artists to create new aesthetic values. However, there remains a lack of research that directly visualizes the closed nature of virtual worlds constructed by algorithms and the aesthetic characteristics of the filter bubbles that arise within them, thereby empirically exploring the inverted relationship between the virtual and the real. Accordingly, this study aims to explore methods for aesthetically conceptualizing the phenomenon of AI filter bubbles and realizing them as visual artworks. Defining the filter bubble as the point where the boundary between the virtual and the real collapses, this study explores how it can be visualized through artistic metaphor. To this end, it theoretically examines the psychological and social mechanisms by which bubbles form and interprets the bubble as a medium for the fragmented self and technological illusions in modern society.

The study begins by reviewing the theoretical background and aesthetic symbolism of the filter bubble. Subsequently, in Chapter 3, the study analyzes case studies of media art involving artificial intelligence and data algorithms to identify the correlation between technical implementation and aesthetic messages. In Chapter 4, based on the preceding theoretical examination and case analysis, the author provides a detailed explanation of the production process of the artwork "Bubble-Reality: The Illusion and Reality of Artificial Intelligence," which was created by the author. Through this work, the study empirically analyzes how images and sounds generated by data algorithms visually demonstrate the boundary between illusion and reality. This research proposes that the bubble created by artificial intelligence is not merely a fantasy but a mirror reflecting the era in which we live, and aims to present an artistic alternative regarding how humans should critically engage with technological illusions and real-world realities in an era shaped by technology.

2. The Mechanisms of Artificial Intelligence Algorithms and Filter Bubbles

Today's information ecosystem has evolved into an algorithmic environment where artificial intelligence proactively predicts users' needs and delivers information even without explicit requests.

Personalization algorithms, the core driving force behind this environment, utilize a combination of collaborative filtering and content-based filtering to meticulously track users' digital behavior [1]. Artificial intelligence converts a user's past clicks, dwell time, search term context, and even mouse cursor movements into training data to map out each user's intimate preferences [2]. In this process, under the guise of maximizing cognitive convenience, the algorithm adopts a strategy of selectively presenting only information that stimulates or reinforces the user's existing values. The formation of a filter bubble goes beyond mere information bias; it takes on the nature of a recursive feedback loop in which data self-replicates and traps the user. The more a user consumes information filtered by the algorithm, the more that consumption data is fed back into the algorithm as training data, contributing to the refinement of the filter. Over time, this cyclical structure narrows the scope of information, placing users in a passive information environment where they see not just what they want to see, but only what the algorithm has decided to show them [3]. This results in the suppression of informational diversity and the technological entrenchment of confirmation bias, functioning as a mechanism that isolates users on vast islands of information. Furthermore, the scalability and robustness of filter bubbles manifest differently depending on individual psychological factors and the nature of social interactions. Research indicates that even among groups with high levels of individual innovation or active social interaction, the collapse of the bubble tends to become more difficult when homogeneous values circulate repeatedly within the network formed by the algorithm. Filter bubbles are not merely technical errors or limitations; they are powerful psycho-technological structures created by the combination of users' psychological mechanisms and the technical capabilities of algorithms [4]. When interactions within social networks degenerate into spaces for sharing values filtered and biased by algorithms rather than ensuring diversity, the bubble maintains its internal pressure firmly and acts as a driving force that blurs the boundaries between the virtual and the real. When we reexamine the role of artificial intelligence algorithms from the perspective of actor-network theory, the filter bubble can be interpreted not as a simple phenomenon but as the manifestation of a worldview proactively constructed by the algorithm, a non-human actor. The algorithm translates the desires of human users into the signifier of data, reconstructs this into layers of filtered information, and presents it to the user. In this process, the algorithm designs the frame through which the user perceives the world and performs acts of power that place specific information at the center of reality or exclude it. Consequently, although the set of information encountered by the user within the filter bubble is a virtually designed environment, it is accepted by the user as the sole and unquestionable actual reality [5]. This demonstrates a form of inverted subjectivity in which technological mediators completely dominate human perception of reality,

rendering the distinction between the virtual and the real meaningless.

Consequently, the filter bubble constructed by artificial intelligence is a new form of digital cave facing modern humans, and the shadows of information cast within it exert a more powerful influence than reality, even though they are virtual illusions created by algorithms. The information circulating within the filter narrows the user's worldview and leads them to regard the broader truths outside the bubble as nonexistent. This mechanism acts as a transparent veil of dazzling illusion brought about by technological advancement, obscuring the complexity of the real world we inhabit and leaving only a simplified algorithmic reality [6]. Therefore, the exploration of AI filter bubbles becomes an essential prerequisite for understanding how technology deconstructs and reassembles human ontological reality, and this, in turn, serves as a crucial basis for exposing the ambiguous boundary between the virtual and the real through artistic expression.

3. The Metaphorical Symbolism and Visual Characteristics of "Bubble"

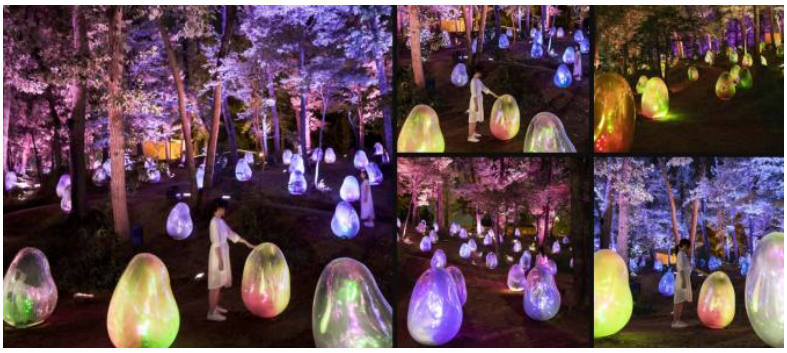
In contemporary art and media art, the "bubble" has been employed as a multi-layered metaphor that transcends the simple form of a physical soap bubble to encompass both the human existential condition and the technological environment. This chapter examines the metaphorical evolution of the bubble, from its classical symbolism in historical artistic contexts to the "filter bubble" of the AI era, and analyzes its formal characteristics that blur the boundaries between the virtual and the real through representative examples of media art that visualize this concept.

In art history, the bubble was a representative icon in the Vanitas genre, symbolizing the transience of life and the inevitability of death. In 17th-century Dutch painting, the image of a child blowing soap bubbles served as a device to reveal the fragility of human life and the futility of fleeting pleasures [7]. This classical metaphor has been reborn in the 21st century as a technological metaphor known as the "filter bubble," formed by artificial intelligence algorithms. Defined by Eli Pariser, this concept refers to the phenomenon where individuals become trapped within their own ideological frames through selective filtering of information. It extends beyond the symbol of transience found in the past to carry social implications of intellectual isolation and distorted reality for modern people.

The metaphor of the bubble embodies a duality of protection and isolation. While the transparent membrane appears to provide a safe space from the outside world, it simultaneously becomes a prison that isolates its inhabitants from external truths [8]. In media art, the bubble serves as a key metaphor for visualizing these invisible barriers, critically projecting a reversed situation where virtual worlds

designed by artificial intelligence replace or obscure actual reality. This symbolizes the ontological crisis of "bubble-reality," in which users, trapped within a bubble of biased information provided by AI, come to believe it as the sole reality. The visual language of the bubble possesses exceptional formal qualities for translating the immaterial properties of AI algorithms into tangible experiences [9]. Although a membrane exists to distinguish the inside from the outside, its transparency causes the observer to forget this barrier. This visually mirrors the way AI filters operate unnoticed, controlling the flow of information. The surface of the bubble reflects its surroundings, but due to the curvature of the sphere, the image is distorted from its original form. This visually and starkly reveals the attribute of algorithms that reflect the user's interests but twist them in a biased direction. The bubble constantly expands due to internal pressure but vanishes instantly at a critical point [10]. This ephemeral nature is well-suited to physically embodying the volatility of data-driven images and the transience of technological illusions.

Through representative examples of media art that aesthetically embody the metaphor and visual characteristics of bubbles, we analyze how the phenomenon of filtering in the age of artificial intelligence is artistically demonstrated. In [Fig. 1], teamLab created a massless sculpture using real soap bubbles, air, and water as mediums [11].



[Fig. 1] teamLab, Resonating Life in the Acorn Forest, Musashino Woods Park, Higashi-Tokorozawa, Saitama, 2020

In this work, bubbles float in the shape of a massive cloud, visualizing the ambiguous boundary between physical substance and immaterial vitality. When viewers step inside the bubbles, the forms collapse and disperse, yet the energy continues to form new masses, drawing the virtual experience into the real space. This is an empirical example demonstrating how the data clusters generated by artificial intelligence, despite being immaterial, possess a powerful presence and have permeated our physical space.

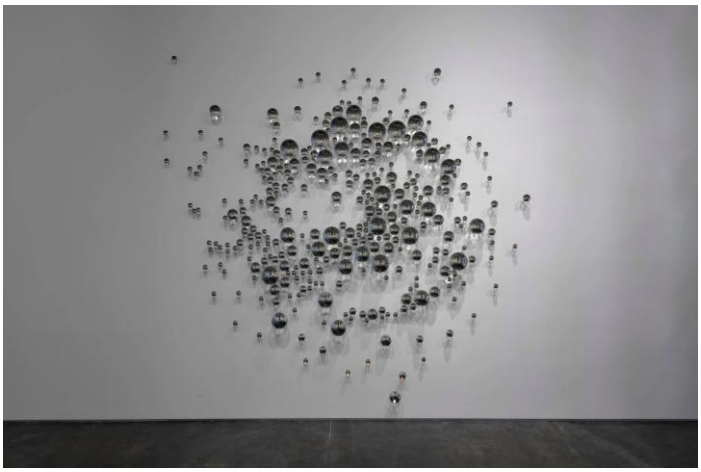
Digital composite photographer Erik Johansson directly visualized this phenomenon in his work [Fig.

2], titled "Filter Bubbles," depicting people wearing transparent soap bubbles over their heads as they filter information [12].

[Fig. 2] Erik Johansson, Filter Bubbles, Nobel Peace Center, Aug 15, 2024

This work visualizes the invisible cognitive barriers created by the background, biases, and algorithmic filters we encounter when processing information, representing them as physical screens called "bubbles." It is a prime example of an exploration, expressed through clear visual language, of how filter bubbles-going beyond mere technological phenomena-interact with human perception systems to distort the window through which we view the world.

Looking at [Fig. 3], Olafur Eliasson's work "Your Solar Nebula" uses hundreds of half-transparent glass spheres to create forms resembling water droplets or nebulae [13].



[Fig. 3] Olafur Eliasson, Your Solar Nebula(2015), Istanbul Museum of Modern Art, Istanbul, Turkey, 2024

Each sphere possesses both reflective and transparent qualities, creating images that constantly shift depending on the viewer's position and angle. By maximizing the reflective quality-a key visual characteristic of bubbles-these spheres allow viewers to become part of the artwork while simultaneously making them realize, through distorted images, just how fragmented the reality we encounter truly is. This aesthetically suggests that the personalized universes provided by artificial intelligence to individual users may ultimately be nothing more than a collection of distorted mirrors.

These examples demonstrate that the sculptural element of the bubble serves as a powerful medium for translating the immaterial algorithms of artificial intelligence into tangible sensory experiences. The aesthetic experiments with bubbles, which dissolve the boundaries between the virtual and the real, form a crucial methodological foundation for this researcher's works, which visually demonstrate the illusions and realities of artificial intelligence. The formal language of the bubble functions as a decisive mediator that translates AI-designed invisible systems into the realm of physical sensation; this process involves the interplay of the metaphorical symbolism and visual characteristics of the filter bubble to demonstrate technological reality. First, transparency-a core visual property of the bubble-symbolically reveals the concealment inherent in the technology through which AI algorithms covertly collect and edit user information. Although a transparent membrane exists, it appears not to visually obstruct the world beyond, causing users to forget that they are trapped within the boundaries set by the algorithm. This visual amnesia combines with the metaphor of invisible disconnection inherent in the filter bubble, acting as an aesthetic mechanism that reinforces the illusion that users are actively selecting information and, consequently, leads them to uncritically accept the virtual world constructed by technology.

Furthermore, the characteristics of reflection and distortion occurring on the bubble's surface elegantly embody the recursive feedback loop in which artificial intelligence mirrors the user's data and presents it back. The bubble projects surrounding images while refracting them due to the curvature of its surface; this aligns with the mechanism of confirmation bias, where algorithms reflect the user's preferences while simultaneously distorting them in a specific direction. This reflective distortion symbolizes the ontological crisis in which the fragmented self within modern society mistakes the virtual image reconstructed by algorithms for its true self, serving as a key driving force that blurs the boundary between the virtual and the real. Ultimately, as the audience confronts the distorted image reflected on the bubble's surface, they intuitively realize that the customized reality designed by artificial intelligence is an algorithmic illusion that obscures the multifaceted complexity of the real world.

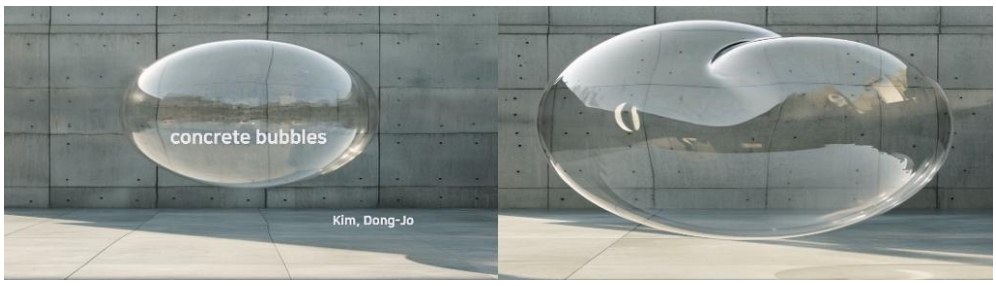
The dynamic physical properties of the bubble's expansion and collapse serve as visual evidence demonstrating the fragility and transience of the dazzling illusions brought about by technological

advancement. Social expectations and optimistic outlooks regarding AI technology form a massive volume, much like the expansion of a bubble; however, its interior is nothing more than an empty collection of data, possessing the property of vanishing the moment it faces even a minor external shock or ethical and technical limitations. This ephemeral volatility captures the immaterial nature of digital images within the flow of physical time, transforming into an aesthetic message that warns of how easily the virtual abundance provided by technology can crumble. It serves as an artistic device that empirically proves the reality we face in this tech-driven era is, in fact, built upon a precarious bubble that could burst at any moment.

The combination of the bubble's metaphorical symbolism and visual characteristics transforms the abstract phenomenon of the AI filter bubble into a concrete event perceivable by human senses. The concealed control guaranteed by transparency, the distorted self revealed by reflectivity, and the technological futility implied by volatility intertwine to powerfully articulate the modern technological environment where the virtual erodes reality and subverts boundaries. This reflection suggests that the AI-generated bubble is both a mirror reflecting the era in which we live and a reality in itself, thereby establishing the foundation for an aesthetic discourse that redefines the relationship between technology and humanity. Such theoretical and visual connections serve as the basis for analyzing how the visual realization of the AI bubble has been artistically demonstrated through the actual creation of artworks.

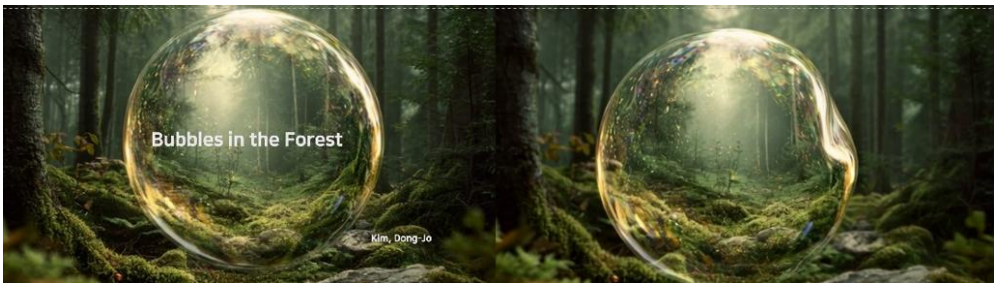
4. A Visual Representation of the AI Bubble

[Fig. 4] shows the artist's work, "Bubble-Reality: The Illusion and Reality of Artificial Intelligence," which combines the mechanisms of the AI algorithms discussed earlier with the aesthetic metaphor of bubbles to demonstrate, through artistic practice, the phenomenon of the dissolution of the boundary between the virtual and the real..



[Fig. 4] Dongjo Kim, Concrete Bubbles, Yeosu Civic Hall Exhibition Gallery, Yeosu, South Korea, 2025

The works analyzed in this study go beyond mere visual outputs generated by artificial intelligence; they empirically demonstrate how algorithms-as non-human agents-intervene in human systems of perception to reconstruct a new reality. The image of a bubble, which permeates the entire exhibition, functions as a key device for visualizing the closed information environment created by AI filters. By allowing viewers to sense the process through which virtual algorithmic illusions encroach upon real physical space, it demonstrates the ontological crisis of the filter bubble. By juxtaposing concrete-symbolizing solid materiality-with the image of an extremely fragile and ephemeral bubble, the work starkly reveals the inverted relationship between the virtual and the real. Here, the concrete wall signifies the foundation of the solid reality we have long believed in, while the bubbles floating or embedded within it symbolize the infiltration of immaterial data generated by algorithms. The distorted images reflected on the surface of the bubbles contain information about the actual environment yet are refracted by the curvature of the algorithm. This serves as visual proof of how artificial intelligence's feedback loops and confirmation bias deconstruct the originality of reality and construct algorithmic illusions. In particular, the presence of bubbles that have penetrated the solid boundary of concrete visualizes how technological illusions are no longer external fantasies but have penetrated deep into our physical reality, empirically capturing the point where the boundary between the virtual and the real collapses. By setting the backdrop against the primal nature of a forest and the utterly mundane space of a sofa, the work eloquently demonstrates that AI bubbles are ubiquitous in all areas of human life. Placed within a space where natural and artificial elements coexist, the bubble visualizes an invisible filter as a physical screen, much like the works of Erik Johansson or TeamLab. In [Fig. 5], the bubble floating among the trees in the forest metaphorically represents the cognitive isolation of modern humans, who view the reality of nature through the filter of algorithms, while the bubble occupying the sofa demonstrates that even the most private space of rest cannot be free from the information bubbles designed by artificial intelligence.



[Fig. 5] Dongjo Kim, Bubbles in the Froest, Yeosu Civic Hall Exhibition Gallery, Yeosu, South Korea, 2025

By simultaneously presenting viewers with images from within the bubble and the background outside it, these works use visual contrast to reveal that the world inside the bubble-which we believe to be the truth-is in fact a fragmented reality selected and transformed by algorithms. This visualization method, which combines sounds and images generated by data and algorithms, serves as an aesthetic tool that demonstrates the transience of technological progress. The light and ephemeral images, resembling the bubbles that appear in the works, reveal the volatility of technological illusions that can collapse at any moment. This empirically leads to a vanitas-like reflection that the dazzling visual abundance offered by artificial intelligence is, in fact, nothing more than a collection of hollow data. The algorithm-generated sound transforms the flow of invisible data into an auditory presence, further amplifying the uncertainty and new possibilities the audience feels when encountering the bubbles. This is a process that demonstrates how AI bubbles are not merely visual illusions but actual forces that interact with the human sensory system to restructure reality. The realization of this artist's work concretizes the abstract social phenomenon of the "filter bubble" into an aesthetic form, resulting in an empirical documentation of the contemporary technological environment where the boundaries between the virtual and the real are dissolving. The covert control revealed by the bubble's transparency, the distortion of the self evidenced by its reflectivity, and the technological futility implied by its volatility are integrated into a cohesive discourse through the work's visual language. This visual realization suggests that the bubbles generated by artificial intelligence serve as another mirror reflecting our era, and it presents an artistic response-through concrete examples-to the question of how we should critically understand and accept the existential uncertainty humans face amid the tide of technological advancement.

5. Conclusion

This study focuses on reinterpreting the invisible information barrier known as the "filter bubble"-created by artificial intelligence algorithms-from an aesthetic perspective, and visualizing it through artistic practice. The key conclusion that runs throughout the entire study is that the filter bubbles generated by artificial intelligence go beyond being mere technical errors that cause information bias; they function as powerful, tangible illusions that fundamentally subvert modern humans' perception of reality and dissolve the boundaries between the virtual and the real. Through theoretical examination, it is revealed that artificial intelligence, as a non-human agent, learns from users' desires and data to form sophisticated information bubbles; the distorted information circulating within these bubbles leads users to accept the virtual frame designed by the algorithm as the sole truth. This phenomenon is

closely linked to the visual characteristics of the bubble-the symbolic metaphor of this study-namely, transparency, reflectivity, and volatility. The transparent membrane demonstrates the concealment of technology-present yet unperceived; the distorted reflections represent fragments of the self reconstructed by data; and the dynamics of collapse prove the finitude of technological illusion. The empirical realization through the creation of the artwork transformed this abstract discourse into a concrete artistic event. The collision between the material concrete and the immaterial bubble depicted in the work visually confirmed that virtual algorithms are deeply penetrating solid physical reality and breaking down boundaries. The forms of the bubbles, placed within the spaces of daily life and nature, exposed the fact that the world we face has already been eroded by the filter of artificial intelligence, allowing the audience to directly experience the ontological tension arising between the illusion within the bubble and the reality outside it. This study aesthetically demonstrated that the bubble of artificial intelligence is not merely a visual amusement or a temporary technological phenomenon, but another mirror reflecting the era in which we live. The virtuality created by artificial intelligence is no longer the antithesis of reality but functions as a new dimension of reality that reconstructs and replaces the real. Amidst these changes, art must expose the emptiness within the dazzling bubbles constructed by technology and maintain a critical, reflective stance that humans must adopt at the ambiguous intersection of the virtual and the real. This study presents a methodology for producing algorithm-based media art while simultaneously examining both the transience of technological advancement and its new possibilities, thereby offering important insights into the social role of art in the post-AI era. Future research should continue to quantitatively analyze the practical influence of such aesthetic reflection on shifts in audience perception, or engage in in-depth discussions on how increasingly advanced generative AI technologies are refining the transparency and disconnection of this "bubble." It is hoped that this study will serve as an aesthetic catalyst, helping modern people living in the age of artificial intelligence to strip away virtual illusions and gaze upon the essence of reality.

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