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ARTIFICIAL INTELLIGENCE-BASED OUTPAINTING TECHNOLOGY: TIKTOK EFFECT FEATURES IN THE PERSPECTIVE OF ELEGANT DESIGN COMPOSITION

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Abstract

Outpainting is one of art technologies based on artificial intelligence. Feature contained in TikTok application is able to expand uploaded the image. The image expansion system is supported by application of AI technology that is able to fill in empty parts of original image. this benefit can be achieved by identifying work patterns and understanding results of feature. It is necessary to understand concept of applying AI technology to produce images that are wider than the original photo. Therefore, an attempt was made to examine content results of Outpainting from perspective of elegant composition design. The experiment was conducted by uploading two photos that have different compositions, objects, complexity, and details of each image. In addition, the discussion of output results of technology is to find advantages and disadvantages of Outpainting feature found in TikTok application. Research strategies uses a descriptive process with trials and literature sources so as to explore good quality and in-depth data.

Keywords: Aesthetic, AI (Aritician Intelligence), Elegant design, Outpainting, TikTok

INTRODUCTION

Articles in International Conference on Social Design (ICSD) 2024

Technological developments provide convenience to human life (Al Asy ari & Rahman, 2020). Packaging of these advances is realized in application of artificial intelligence to human. Artificial intelligence (AI) technology is increasingly sophisticated and continues to evolve in the midst of transformative social and cultural changes (Tai, 2020). The latest development of AI involves creativity in the field of fine arts (Bani, 2023). These fields include visual arts, architecture, design, music, performing arts, dance, and literature (Oksanen et al., 2023). Learning media tools in education are also starting to incorporate artificial intelligence in their working systems, such as Canva, Midjourney, Deepltranslator, TikToK which are easy to use by its users (Liao & Ji, 2024) (Nurcahyo et al., 2022).

Artificial intelligence (AI) is an innovative technological development in the industrial revolution era (Yusriadi et al., 2023). Technological capabilities of AI are able to think like humans who run with data recorded on robots (Khan et al., 2023). In general, AI uses a certain level of intelligence that acts like humans in perception, knowledge, and creativity (Chong & Yang, 2023). Technology is able to help human life in work, learning,

communication, and so on. The work process leads to capacity of machines/systems that demonstrate capabilities and perform instantaneous tasks (Okagbue et al., 2022).

Application and incorporation of artificial intelligence in the field of fine art shows its potential to strengthen in making an element of fine art into a work or other supporting aspects (Fan & Liang, 2023). The concept of AI helps to realize the user's command into desired visual. The visual realization is composed of a series of words and sentences written by user of technology (Adams, 2019).

The push for technological advancement in art world is inseparable from desire to create other creative values. The impact of inclusion of AI in the scope of fine arts forms a new human relationship and relationship (Jeffry et al., 2015). Connectivity between individuals is created because of the digital connection through AI (Božić, 2023)enable personalized learning, promote digital inclusion, create job opportunities, address social equity issues, and optimize digital infrastructure. However, it is crucial to ensure that AI is developed and deployed responsibly, ethically, and inclusively, with a focus on promoting equitable access to AI technologies and their benefits for all communities, including those that are currently underserved. The topic of the paper is the digital divide (DD. Different views, criticisms, and opinions continue to be expressed by artists as main actors of art (Liu, 2023). General public and technology developers have their own challenges to develop their technology with or without considering these views (Crossley & McNamara, 2016).

The application of artificial intelligence technology in digital fine art features is realized in an image expansion process. Technology is known as Outpainting or Out Painting feature (Yao et al., 2022)which is well studied with Convolution Neural Network (CNN. People's desire to "beautify" image is realized using robot work technology in feature (Petropoulos et al., 2022) (Wang et al., 2022)restoration, and reconstruction in the last few years. Image outpainting, also known as image extrapolation, lacks attention and practical approaches to be fulfilled, owing to difficulties caused by large-scale area loss and less legitimate neighboring information. These difficulties have made outpainted images handled by most of the existing models unrealistic to human eyes and spatially inconsistent. When upsampling through deconvolution to generate fake content, the naive generation methods may lead to results lacking high-frequency details and structural authenticity.

Therefore, as our novelties to handle image outpainting problems, we introduce structural prior as a condition to optimize the generation quality and a new semantic embedding term to enhance perceptual sanity. we propose a deep learning method based on Generative Adversarial Network (GAN. The lack of frames contained in the image can be expanded beyond creativity of human imagination. Working process of system is beyond the control of its creator because it works on a system basis (Mennborg, 2021).

System in Outpainting feature takes data stored in memory and then materializes it into a composition and objects in image expansion area (Singh et al., 2020). There are various accesses that present Outpainting feature, one of which is TikTok social media application (Zeng et al., 2021). The application is a medium for creating videos by utilizing social networks globally. There is a feature that involves artificial intelligence called Outpainting on TikTok. Technology becomes an access that can be used easily and simply by its users. Utilizing expansion of area in uploaded image is an interesting trend (Indrawati et al., 2023).

The purpose of this research is to find out how AI-based Outpainting technology works in TikTok application. Results of artificial intelligence-based area expansion are then studied using the perspective of elegant composition design. The use of these studies can help find the shortcomings and advantages of system results. so that it can be a consideration for use of Outpainting feature. It is expected that research can be a source of literature

to understand patterns and artificial intelligence systems in Outpainting technology. The discussion of shortcomings is expected to be the basis for improving feature defects, so that development of Outpainting technology can work better in next novelty.

METHODOLOGY

Research methods are basis for compiling directed and structured research (Alamri, 2019). It is important to determine method that is in accordance with research concept so that the results obtained can be maximized (Babić, 2023). Method used in this research is descriptive qualitative type. Thus, the presentation of data/findings can be more detailed and detailed. The data collection process comes from two techniques, namely observation of analysis and documentation (literacy documents) (Cresswell, 2018). Observation is an activity of analyzing or observing a phenomenon that actually occurs (Zevalkink, 2021). Application in this research is to test Outpainting feature found in TikTok application. The trial process begins by inserting original photo samples into feature. Results of technology will be studied related to composition in perspective of elegant design. Furthermore, the features results will be uploaded/submitted back into same AI feature on TikTok application. Step of inserting one photo into feature is a two-time photo expansion process. Through number of processes, it will be examined how results appear based on theory used. The two images/photos selected have different objects and components. First photo depicts a simple object and second photo has a more complicated level of composition. Both photos are tested to find result of expanding the empty area with AI technology. Trial process was carried out three times by entering different photos with same steps. The number of trials is considered to determine and find maximum results from each trial sample.

The second technique is documentation or literature sources (Cresswell, 2018). Research process requires various references that can support research as a primary data source. Some references and literature sources can come from books, journals, research results or scientific papers that have similar topics (Chanda, 2022). Topics that become keywords used as reference sources are AI (Artificial Intelligence), Outpainting, and aesthetic studies. Process of analyzing works using documentation techniques is supported based on theoretical basis of elegant design by Luca Iandoli and Gieuseppe Zollo (Luca Iandoli, 2022). The theory comes from their book entitled “Elegant Design: A Designer’s Guide to Harnessing Aesthetics”. Sourced from theory put forward by Luca and Zollo, it will be used to examine how aesthetic values of each trial result, so that images displayed are realist or in accordance with real life. There are eight strategies in elegant design theory, namely; 1) Use of center power, 2) Emphasis, 3) Substract details, 4) Symmetry, 5) Group, 6) Split, 7) Remix, 8) Contrast and balance (Luca Iandoli, 2022).

The human brain tends to be fixated on stimuli that become the center or focus (center of interest) in artworks, this is due to the visual stimuli in the human brain that more quickly captures objects that become the main point. The visual center can create a line of strength in the work and can balance each composition. Creating a dominant visual center can play on the use of color, shape, line and visual weight to direct where the center of interest is (Luca Iandoli, 2022). Emphasizing is a step to help artists find novelty and variety when designing by making the work more interesting and original. Emphasizing aims to show/emphasize the message to be

conveyed to the viewer by adding distortion to the artwork. The emphasis on the artwork can be clearly depicted so that the viewer can find directly where the point of emphasis is or made blurred or abstract (Luca Iandoli, 2022).

There are three reasons why the “substract details” strategy can create artworks that do not lose their aesthetic value. Firstly, the reduction of excessive detail in the design can speed up the absorption of the meaning of the artwork to the viewer through information compression. Secondly, the artist can focus more on providing the more important visuals of the work.

Lastly, a simple and less complex design can give a free and suggestive impression to the imagination of the viewer (Luca Iandoli, 2022). The next strategy is develop symmetry in everything in the world including in art and design, this is because symmetry affects the balance, efficiency, effectiveness and stability of the design. Since the neolithic era in creating artifact decorations, it has shown how human ancestors created symmetrical order in the form of abstract visual representations. Paying attention to symmetry will provide the benefits of stability of meaning and become a bridge between different perspectives (Luca Iandoli, 2022).

The group strategy is a step to simplify the design through the method of grouping. In art, grouping is a powerful heuristic. The purpose of grouping is to allocate each element in the design based on clear categories, thus showing a much stronger categorization of the artwork (Luca Iandoli, 2022). The Split component strategy in art and design is very important. Separating components through various levels can help artists to come up with more ideas. Fundamentally, this separation serves to give the artist options for placing the various components created, such as determining whether they are more appropriate in the background or the center (Luca Iandoli, 2022).

Remix is an aspect of searching for a narrative called remixing. Remixing consists of recombining existing ideas and information in a new way by determining which biased or natural narratives are created. The function of remixing is to find a novelty The story in the design must be made honestly in order to further improve human life is also something that must be considered from remixing (Luca Iandoli, 2022).

Contrast and balance in artworks are of utmost importance. The essence of this aspect is to create energy differences in components or elements, this aims to move the configuration of something in the direction desired by the creator of the work of contrast and balance is a part that creates energy tension or information by channeling and paying attention to the use of the direction of creating a dynamic balance (Luca Iandoli, 2022).

RESULT & DISCUSSION

Outpainting Feature in TikTok

The development of technology opens up great potential for artificial intelligence to become a facility that can be accessed by humans. Various tools, features, machines, and applications began to be developed with the use of AI in them. One example of a social application on a device with various AI features is TikTok. TikTok social media platform is a social networking application that presents various

features of creating, editing, and various short video clips equipped with filters and music as support. This Chinese-made application was launched in September 2016 by technology-based company ByteDance (B et al., 2023)Art and Human Development (ICLAHD 2022.

There are various features presented on TikTok that can be accessed for free by its users, such as; 1) Music addition, 2) Filters on videos, 3) Sticker filters and video effects, 4) Voice changer, 5) Beauty filters, 5) Auto captions, 6) Comment and block users, 7) and live features (Meliawati et al., 2023) (Miltsov, 2022).

Sourced from Google Play Store is an application for downloading TikTok that as many as 500,000,000 users have used it. Various features that can be accessed by users become a means of social media and entertainment. One activity that can be done on TikTok is using filters (Yu, 2019). This feature makes photos or videos made by content creators more aesthetic, unique, and interesting.

The application of filters in TikTok application is also supported by the addition of AI-based technology and its derivative products. Artificial intelligence features make it possible to change, add, and create a creation. AI-generated content includes images, videos, and audio that are generated or motivated using a learning process or machine learning. Recent innovations by TikTok make it possible to identify use of artificial intelligence tools.

Artificial intelligence technology installed in TikTok app can be used easily. There are guides or steps shown to use it. One AI-derived feature in this app is AI Outpainting. The effect presented is an advanced image editing technique that is able to expand the boundaries of image beyond other dimensions. Result of this feature makes image in the area around photo larger.

The working system of this feature uses algorithms from artificial intelligence derived products. Content generated by adding an existing image becomes better through filling in missing parts. Concept of AI in Outpainting feature is trained to recognize patterns, textures, and ensure that the expanded region blends well with original content (natural). The expansion part is part of AI working system that is sourced from a collection of image data located on internet. Sourced from TikTok application as much as 12,200,000 content that has been uploaded using feature.

Elegant Design Composition Perspective

The use of artificial intelligence in technology to expand images is one access that can be utilized by its users. An assessment results of Outpainting on TikTok is needed as material to find an elegant (natural) design composition. Process of testing use area expansion feature on a narrow image becomes wider.

Two images were tested. First image was chosen using a camera result with a simple character. The simple concept was used as a comparison of how system expands area of a simple image. First photo was an image focusing on a Marigold flower. The original image was uploaded into artificial intelligence system. Results were studied based on perspective of elegant composition design of expanded photo.

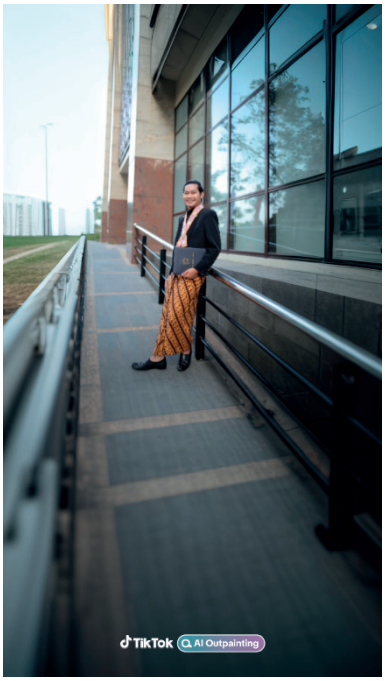
Table 1 Application of Outpainting Feature in the First Photo. (Source: Kholis, 2023)

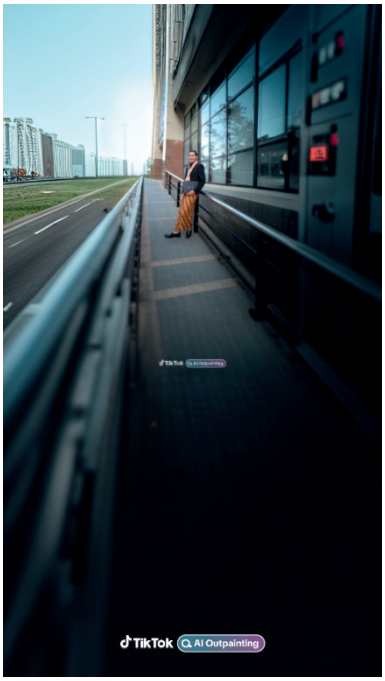
Name	Photo	Description
Original Photo		The original photo uploaded is an image with minimal objects. The photo was captured using camera on device. The photo shows main object, which is a yellow Marigold flower and lush leaves (Dahal et al., 2021). The camera focuses on one flower in the front and background is blurred. Size ratio of original photo is 4:3 with a size of 6.73 MB.
First Image Result		Original photo was uploaded to the outpainting feature on TikTok. First photo results from applying the area-expanding AI feature showed; 1) Number of flowers displayed became larger, 2) Leaf details in original photo that were not so clear became stronger due to the area expansion result of AI, 3) Photo ratio changes to 9:16, 4) Photo size is 844KB. Photo results show good reality or resemblance to original. No strange object parts were found based on the image expansion results. Additional objects such as leaves and flowers are blurred, so there is no detail. Expanded area shows a yellow flower object that is difficult to identify based on its shape whether it resembles a Marigold flower found in original photo. Resulting photo has a watermark indicating that the image was edited using TikTok application with Outpainting feature.

Second Image Result		Upload of first photo shows that image style uses a convex camera feel. The adjacent flowers and leaves become more curved in a fish eye perspective. Result of second photo is not much different from that of first photo. The expanded area of image shows addition of yellow flowers and leaves that are more clearly visible. Resulting marigold flower resembles original object. There is a change in color tone in resulting image to be fainter and darker. The back or background has an additional object resembling an iron fence that extends from far right to the left. The addition of blurred trees behind fence.
Third Image Result		A strong impression of a vintage and elegant photo effect. Tones are dark with dim lighting. Third photo shows a photo taken using a convex camera style. There are parts where the composition tends to be strange because curvature of flowers and plants that resemble a garden does not appear to be in perspective. Result of expanding area is addition of a plant component that is different in type from original object, namely a light purple flower. There is a Champagne Flute-shaped glass filled with an orange-colored drink (like orange juice). On the fruit of glass there is an object that resembles a part / piece of a white drink coupled with a piece of orange. At the bottom left, there is an additional fruit-like object that is only half visible. A yellow flower object adorns the place where glass and fruit are placed. Some of these objects appear to be arranged on a dark brown wooden table. Strange and disturbing part of photo is that wooden table is added to place where a Marigold flower grows. Another oddity is imperfectly shaped top/head of glass. On the bottom of glass there is also a yellow object that is not identified as a flower or an aesthetic ornament that adorns it.

The second experiment of using artificial intelligence-based outpainting feature on TikTok application was conducted using a photo that was different from first image. Difference in photos was chosen based on composition, objects, and themes that emerged from the image. Second photo has more complexity than first image. There are several objects/components such as a model, buildings, infrastructure, and other ornamental details. Here are results of upload process using AI technology to expand photo.

Table 2 Application of Outpainting Feature in the Second Photo (Source: Kholis, 2023)

Name	Photo	Description
Original Photo		Second photo was captured using a camera on a mobile device. There is an object of a male model wearing traditional Javanese clothing. The model is photographed leaning on iron handrail of an uphill road. Background of photo shows a building with a dominant part of square-shaped glass arranged horizontally and vertically. Glass reflects sky and trees. The model is main center of image. All components and objects contained in image are unaltered and are original photos without edits process.
First Image Result		Results of expansion using artificial intelligence-based Outpainting technology on TikTok application features produce images that look further away. Main object, a male model, becomes smaller away from the frame. Expansion part of area has a significant addition on left side of image. Addition of an iron pole that extends from farthest point out of image frame. Addition of land objects that are overgrown with grass and there are multi-storey buildings that can be seen from a distance. Part of road where the model stands area expansion technology is able to bring out the part that hills shape of road. There are yellow and black ceramic parts that form lines. Pattern resembles of street in original image. Focus on glass of building was expanded by adding shadow of buildings. Technology of expanding area is not in harmony with actual shadows in form of trees. This makes image less harmonious and in tune with actual shadows. In the area of multi-storey building that is result of area expansion, there is one strange object. A very tall pole stands near multi-storey building. At first glance, it does not look odd, but if you look closely, height of pole will be too strange. On the roof area expansion process produced a good object. There is nothing strange about that part.

Second Image Result		Results of first experiment were tested again to expand area. The results show that there is a significant change from previous image. On the right side of image showing expansion of glass window area, there is addition of a wall. The wall area has some signs or objects that are not clearly visible because they are blurred. Reflection of shadow on glass window shows an object such as a shop building on opposite side, but if seen, there is no reflection of object. Based on distance between shadow and building object that should be visible, but does not match with reflection. At the bottom of image, street area resulting from expansion has become simpler. The part is made to appear blurred so that it is not so clear. Process resembles way camera captures objects that are out of focus and centered on other parts. Yellow street ceramics disappear and fade away from expanded area. To the left of expanded area, an odd part or object is found. First expansion result brought out grassy area to left of fence, but area turned into an asphalt road. Transition between grassy area and asphalt road is not smooth. The contrast is so obvious that it appears awkward and detracts from reality of image. Multi-storey building section was also expanded by AI system. Expansion result also shows another multi-storey building that appears closer than main object (model). Awkwardness of building shape is unrealistic. Building structure is imprecise and twisted, so it does not resemble shape of real building. At the bottom of multi-storey building, there are colorful objects that cannot be identified and seem messy. The pole object adjacent to building complex has increased to two pieces. The upper content of image is an extension area that is not integrated with original building. Extension part of main building is covered with marble or ceramic tiles. The extension building is more abstract and cluttered. Transition of change is contrasting, resulting in an imperfect expansion of the area building that rises upwards.

Third Image Result		Third image results in a strong expansion of area. The male model object becomes further away from frame. The more upload process causes unrealistic changes as well. In right part of image, building component changes to look like a train car. Change is unrealistic because it transitions from a glass window, to a wall, and then merges as a train car. The area is not very clear because it is realized with addition of a blur impression. The upper part has a change in transition to a darker part of building. Expansion area looks beautiful and good in the sky. Result of sky area expansion looks unified with original image. The changes that stand out are in row of high-rise buildings. Object is getting an unrealistic shape. Visually of building resembles a glass bottle building. Adjacent to object is a neat and natural-looking asphalt road. Transition from the previous image is smoothly expanded to resemble original. Between highway and multi-storey building, there is an area that cannot be identified because it seems clustered. The object resembles a grassy plain, but it does not look realistic either. Lower area of photo does not undergo such significant changes. Composition of object is simpler so the expansion result only shows changes in dark area. Based on lighting concept, it looks strange because the original image has a good light composition. Each expansion result using Outpainting feature has a decrease in tone.

Based on experimental results of two photos or images uploaded to artificial intelligence technology in form of AI Outpainting feature on TikTok application, it shows several advantages and disadvantages. Technology is able to expand the image so that it fills in empty parts that are not in original photo.

There are chances of success and failure displayed from the upload results. These chances cannot be determined or predicted because they are purely result of data reconstruction by technology used in feature. The objects that appear from expansion result have a good level of reality. Addition of various characteristics

has a similar style to the original uploaded image. Weakness of expansion is compatibility and harmony of objects that connect to expansion area.

Failure rate of features cannot be predicated on resulting proportions and composition. Failure gap of technology result is determined by the size or number of aspects; 1) Details, 2) Composition, 3) Object, 4) Ornaments, 5) And other complicated parts. These aspects will be difficult to read or recognize by system, resulting in a strange image. Meaning of a strange image is result of objects or expansions that do not match reality. Suitability of expanded image has a large potential for defects/imperfections. The actual object contained in image may turn out to be another irrelevant object. Expansion concept applied in Outpainting system on TikTok requires more data. Potential for errors is still quite large, so there are strange components of the results. Part that always appears from features image result is change in tone. Result of area expansion tends to have a darker tone or colour saturation than original image. Such changes continue to appear from each experiment conducted. There is a “nonsense” about Outpainting results of resulting system.

Concept of completing missing parts of an image becomes a feature that can enhance photo. This goal can be realized properly and correctly when a photo uploading process uses simple images and tends to have minimal objects, compositions, and ornaments. The use of artificial intelligence technology is one way that can make it easier for humans to complete the missing parts of documentation. The level of similarity between results of image expansion and actual reality is still minimal. This is because the system reads and analyzes data spread across internet. There are limitations, so potential for content results with actual composition is minimal.

CONCLUSSION

The development of technology in artificial intelligence creates a connection to the world of fine art. Application of AI in the process of adding elements of fine art is realized in Outpainting feature. TikTok as a social media-based application provides this feature that can be accessed by its users. The Outpainting that works based on artificial intelligence systems is an example of involvement of fine art elements and AI. Technology is able to make the image wider. System will collect data into objects and components that fill expanded area of the original image. The image produced by the Outpainting feature creates an image that fulfills the components and perspective of the original photo. There are drawbacks resulting from this feature. Larger area makes system work randomly and not in accordance with the components in main image (original). visually makes the resulting image unnatural or not resemble reality. Use with simple objects and minimal detail has great potential for image enhancement. The more detailed, complex, and numerous objects make the system select random parts. Thus, Outpainting technology in TikTok application needs to be continuously developed by adding data and sharpening system in reading patterns derived from sample uploads.

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