International Journal of Advanced Smart Convergence Vol.13 No.3 170-175 (2024)
http://dx.doi.org/10.7236/IJASC.2024.13.3.170

IJASC 24-3-19

Methodology for Visual Communication Design Based on Generative AI

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Abstract

The field of Generative AI(Artificial Intelligence) involves a technology that autonomously comprehends user intentions through commands and learns from provided data to generate new content, such as images or text. This capability, which allows autonomous creativity even with design keywords, is anticipated to play a significant role in the domain of visual communication design. This article delves into the tools of generative AI applicable to visual design and the methodology for design creation using these tools. Furthermore, it discusses how designers can interact visually with AI technology in the era of generative AI.

Keywords: *Artificial Intelligence, Generative AI, Text-to-Image, Visual Communication Design*

1. Introduction

1.1 Research Background

Generative AI is a specialized field of artificial intelligence that learns from data to create outputs based on user needs. Known for its capability to generate diverse types of data such as text, images, audio, and video, recent advancements in this field have enabled the creation of entirely new and original artistic works. In particular, AI systems that generate images from text, such as Midjourney, DALL·E, and Stability AI, are expected to have a significant impact on the graphic design industry. Additionally, in March 2023, Adobe introduced Adobe Firefly, a tool that generates 3D images from textual descriptions, further expanding the possibilities for visual designers into three-dimensional space. This transformation in the design field is driven by generative AI's ability to understand user commands and learn from data to produce new content. Despite these advancements, research on this topic remains limited, and some view automation as a potential threat to the dynamism of graphic design. To address these issues and explore new solutions, it is essential for educators and design researchers to develop new teaching methods that integrate generative AI.

Manuscript Received: July. 22. 2024 / Revised: July. 30. 2024 / Accepted: August. 5. 2024
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1.2 Research Purpose

The aim of the study is to investigate the goals of graphic design education in the era of generative AI, identify potential challenges for students, and discuss the future role of graphic designers.

2. Theoretical Background

2.1 Generative AI Technology and Its Applications

Generative AI is an artificial intelligence technology that learns patterns from large databases and generates outputs based on user requirements. Currently, this technology is primarily developed around large language models (LLM) like ChatGPT and is also practically used in various industries to generate visual content such as images, audio, and videos. In particular, GPT (Generative Pre-trained Transformer) developed by OpenAI leads the field of natural language generation with its superior sentence generation capabilities compared to previous models. ChatGPT is trained using Reinforcement Learning from Human Feedback (RLHF), which involves deep learning through repeated conversations where human AI trainers play both the user and AI assistant roles.

2.2 Development Status of Image-Generating AI

In the past, machine learning aimed at building models that map from inputs to outputs based on the provided data. However, contemporary image generating AI is now being proposed with more robust methods focused on learning highly relevant representations of data distributions. Image generating models can be broadly categorized into GAN (Generative Adversarial Network) models and Diffusion models. While GAN divides the task into a discriminator and a generator, creating images through real/wrong discrimination, Diffusion models function by progressively enhancing noisy images to produce stable and high quality results1. In the Diffusion model, a noise reduction model is employed to generate synthetic samples that closely resemble reality. It takes white noise images and text prompts as inputs, iteratively updating and denoising until it reaches a noise free output. Once the image aligns with the text, the final image is derived through an image decoder 2. (Figure 1)

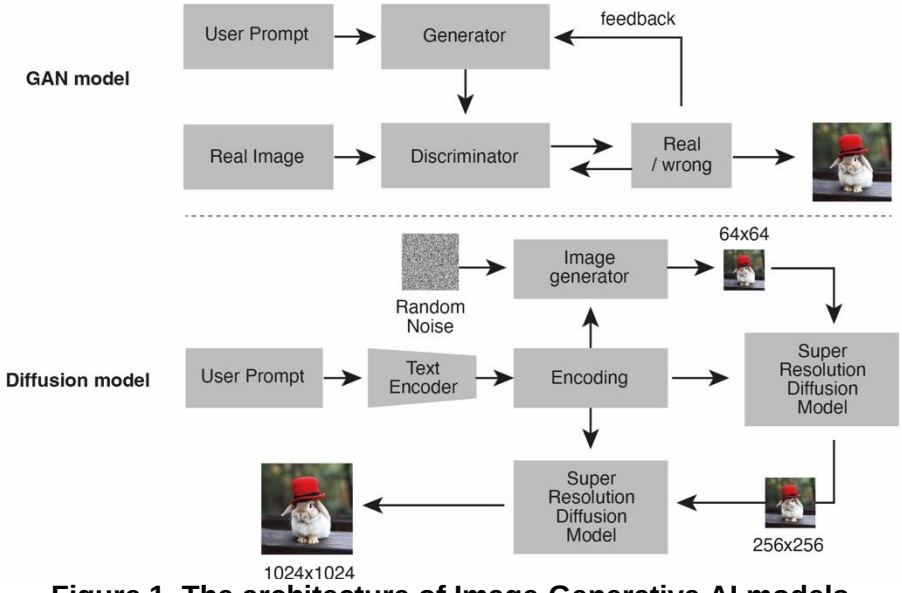


Figure 1. The architecture of Image-Generative AI models

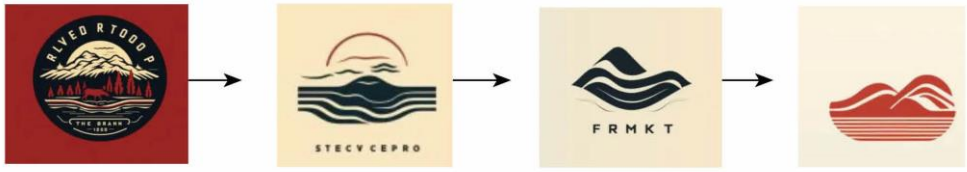
2.3 The platforms of Image-Generating AI

Most popular AI programs in the current landscape of image generation are continuously advancing based on such models. One such program is Midjourney, developed by the eponymous research institute. Midjourney operates exclusively through Discord and allows users to train images by adding desired subjects, descriptions, styles, camera angles, moods, and more to the image prompt. Additionally, DALL·E, a generative image AI developed by OpenAI, employs diffusion-based technology to generate images from natural language inputs. Similar to Midjourney, DALL·E automatically generates images when given inputs of English text or image files. Furthermore, Stable Diffusion, developed with the support of Stability AI and Runway ML, introduces autoencoders at both ends, enabling the creation of relatively high-resolution images even on low-resource computers.

3. Visual Communication Design Methodology Based on Generative AI

3.1 Using Specific Prompts and Idea Sketches

Image-generating AI relies on prompts (keywords) and parameter values to produce images. Therefore, the more specific and precise the keywords, the more efficiently designers can obtain their desired images. To experiment with image results based on such keywords, the authors experimented the "Generative AI and Graphic Logo Design" project with students. This project aimed to observe how closely the Midjourney generative AI, with its prompts and parameter values, could replicate the "Maotai" alcohol logo. For this purpose, the research was divided into four stages: (1) Subject, (2) Subject Description, (3) Style Detail, and (4) Parameter Detail. In the first stage, Subject, a "Maotai" alcohol brand logo was generated using only mountain and river brand-related keywords. Moving to the second stage, Subject Description, the author described the desired image shape more explicitly. Specific alcohol brand image sources were described in detail, such as "a red river in the logo, white background." This led to images closely resembling alcohol graphic elements, but the logo style remained somewhat complex. In the third stage, Style Detail, the desired logo style was described in greater detail. Lastly, in the fourth stage, Parameter Detail was introduced to enhance the image's accuracy. In this manner, it was observed that the graphic style changes with the prompt values in generative AI programs. By inputting specific and precise text descriptions, users can create the desired logo images with greater accuracy. (Figure 2)



(1) Subject	(2) Subject description	(3) Style detail	(4) Parameter detail
prompt			
A logo design for a liquor company called “moutain”	A logo design for a liquor company called “moutain”, a red river in the logo, white background	A logo design for a liquor company called “moutain”, a river in the logo, white background, Simple style, vector logo, flat design, minimalist, Japanese style, geometric logo, 2d style logo design, symmetry image	A logo design for a liquor company called “moutain”, a red river in the logo, white background, Simple style, vector logo, flat design, minimalist, Japanese style, geometric logo, 2d style logo design, symmetry image --ar 1:1 --s 10 --no details

Figure 2. The process of logo generation based on changes in the prompt

3.2 Create draft images by inserting a reference image

Furthermore, designers can efficiently create image drafts that align with their intentions through the insertion of reference images or idea sketches. In generative AI programs, designers can directly upload reference images to the program or provide links to such images, which then generate similar image drafts. Subsequently, designers can achieve even more precise image creations by uploading the selected draft image and adding specific prompts. In a workshop titled "Creating Russian Avant-Garde-style Posters Using Artificial Intelligence" that the author conducted, students created images using AI based on their desired designs through simple rough sketches and the refinement of keywords. In Figure 3, (a) the student sketched a scene depicting a spacecraft liftoff, uploaded it to the generative AI program, generated the desired draft, and further refined the poster by specifying the prompts. And (b) the student uploaded a sketch featuring a clenched fist, derived multiple drafts, and developed the most suitable draft into a complete poster. Particularly in Midjourney, it is possible to set the similarity of sketches based on the image weight (IW) parameter. For instance, when the IW value is set to 2.0, the AI generates images that closely resemble the uploaded image. However, with an IW value of 0.5, the AI has a bit more interpretive flexibility, allowing for images with slight variations in shape and form.

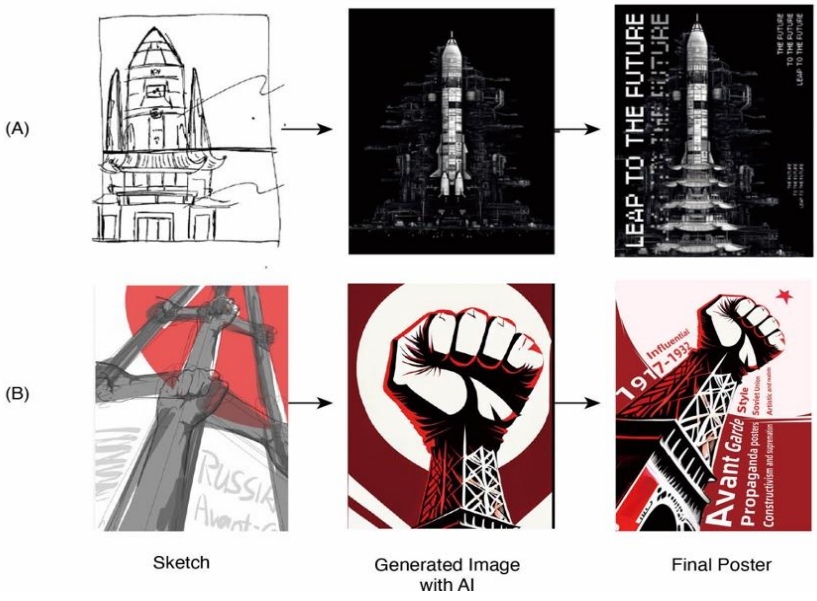


Figure 3. Poster image generation through idea sketch

3.3 Image Selection and Refinement through Curation

Curation is an aesthetic selection process that involves curating artworks based on specific themes, concepts, styles, and presenting them to the audience through exhibitions or presentations8. In this context, designers themselves assume the role of curators in the realm of AI design. Their responsibilities encompass selecting and combining elements that best align with the poster's primary objectives from the AI-generated outputs. This process necessitates fine-tuning various aspects, including layout, color, fonts, and more. To utilize generative artificial intelligence, designers must first select a collection of images to feed into the algorithm (pre-curation) and input relevant prompts into the AI algorithm. In the concluding phase, designers engage in the process of curation, carefully sifting through a multitude of output images to ultimately extract the final

image (post-curation). The designer's role entails image selection (curation), the creation of pertinent prompts, and fine-tuning the images through active engagement with the AI model.

In the workshop "Creating Bauhaus-style Posters with AI," students used various AI programs to generate diverse drafts. Based on their aesthetic sensibilities and an understanding of the Bauhaus style, they selected the most appropriate design. One student (a) chose a Bauhaus-appropriate design, removing unnecessary shapes and introducing white space to meticulously adjust the layout. Another student (b) adopted the concept that the Bauhaus style revolves around primary colors and replaced the predominantly green color scheme in the AI-generated draft with blue and red, aligning it with the Bauhaus principles. This exemplifies the process of selecting an AI-generated draft with suitable design and having designers re-edit and adapt it based on their aesthetic preferences and alignment with the intended message. Furthermore, it's possible to synthesize images generated with different prompts, aligning them with the poster's objectives. In one case, a student (c) used keywords describing a person and a palace to generate separate images, then combined and adjusted the layout to create the final poster image. (Figure 4)

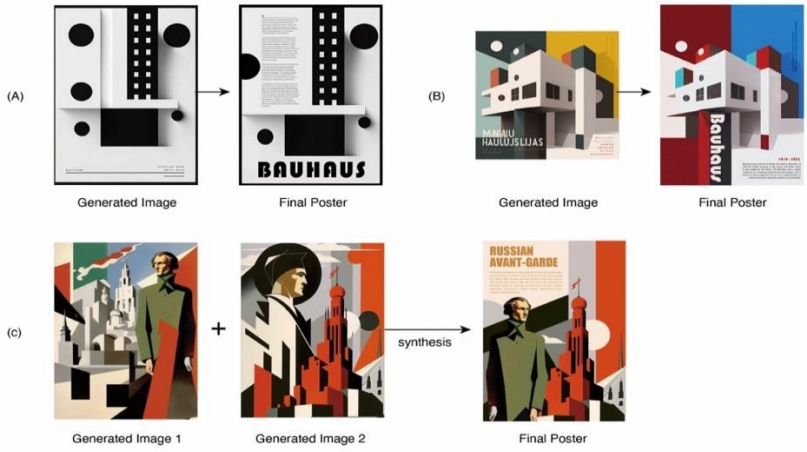


Figure 4. Poster images by curating generated images

4. Conclusion

The advancement of image-generating AI has made it increasingly crucial for visual designers to determine how they will communicate with AI and convey their intentions. Through workshops and projects, the author has recognized the limitations of generative AI in producing designs with creativity and originality.

These limitations manifest in several ways. Firstly, AI struggles to create truly innovative or unprecedented designs as it learns from existing data. Secondly, AI has limitations in fully understanding and integrating subtle aspects of design such as cultural context, emotional nuances, and brand values. Thirdly, AI lacks the ability to make intuitive leaps and creative jumps that are often crucial in the design process.

To address these limitations, the author has proposed roles and design methodologies for human designers. Designers must proactively define visual attributes in advance, using specific prompts and idea sketches to efficiently train AI with these images. The resulting images need to go through a process of selection, rearrangement, editing, and refinement in accordance with the designer's aesthetics and intentions, ultimately producing a finished image.

These methodologies are expected to have significant implications for design education and professional practice. Design education curricula will need to evolve to incorporate effective use of AI tools while strengthening uniquely human skills such as creative thinking, problem-solving, and critical analysis. In professional practice, designers will need to become proficient in using AI tools while maintaining the ability to generate original ideas and critically evaluate AI outputs. Based on these methodologies, the direction for efficient communication between designers and artificial intelligence is expected to be established, significantly enhancing future visual creativity and quality. However, this process will also raise new challenges, including ethical considerations, copyright issues, and potential risks associated with increased AI dependence. Therefore, the design community must engage in ongoing dialogue and research to address these challenges.

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