Artificial Intelligence Approach in Visual Design Ideation Process

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Abstract. This study aims to see the effectiveness of artificial intelligence in reducing the time for the design ideation process. For visual communication designers, the ideation process is a source of innovation and creativity and is typically used in the early stages of the design process. While some works acknowledge the importance of design skills and creative ideas for the designer, sometimes a long process is required in visual design ideation. This study used deep learning with generative art based to support the ideation process. The level of influence of artificial intelligence in the creation of visual designs is assessed using a scale survey method in this study. The effectiveness of AI in the idea process may assist visual communication designers in accelerating the design process. Decreasing the process ideation time without reducing the design quality will enhance designer productivity in graphic design work.

Keywords: Generative arts · Visual generator · Machine learning · Visual ideas

1 Introduction

In visual communication design, the visual concept is essential. Various methods have been developed to stimulate creativity and generate original solutions to problems, and each designer has a unique procedure [1]. However, designers require the ideation process to produce visual concepts to solve problems that sometimes require a lengthy procedure.

Given a set of constraints, the primary objective of a designer is to create or generate the most optimal artifact or prototype. The process of ideation is the primary step in developing the optimum visual design concept [2]. "ideation" refers to the process of generating initial concepts at the outset of conceiving a design solution [3]. Ideation in a collaborative design team necessitates cognitive artifacts customized to different visualization abilities and pre-acquired representational skills to use these artifacts actively and intuitively. However, there is a lack of relevant digital support for generating new ideas in the ideation gap.

Artificial intelligence (AI) has been designed using preprogrammed algorithms and machine learning to repeat most user actions. In this case, the AI works without any design process and does not require any power or inspiration to stimulate creativity, despite the fact that AI loses the invention needed to solve complex design problems.

Computer interaction requests specific data to better support the design process, which frequently comes before the designer's clarity of the novice concept without considering his need for uncertainty and expectations. AI generative art has emerged and is widely discussed in increasing creativity, productivity, and design horizons for design practitioners or visual communication design students [4]. The question that frequently arises is how designers will respond to technological advances such as AI generative art and whether AI will eventually replace designers.

AI-generative arts in design were used in several sectors, including architecture and urban planning, graphic design, game design, fashion design, and 2D and 3D modeling arts [4]. AI, particularly text-to-image generation, generally requires the automatic generation of images that reflect a given the word or phrase in terms of content but potentially other visual aspects. Generating and editing images from open-source text prompts is a challenging task that has previously required expensive and specially trained models. Vector Quantized Generative Adversarial Network (VQGAN) and Contrastive Language–Image Pre-training (CLIP). CLIP guides VQGAN towards an image that best matches a given text [5]. Although AI can perform design production tasks, the designer is the person who supervises the AI throughout the design process, including ideation [6]. Figures 1 and 2 show that the designer can use the text command to manage the results, and the designer can use the AI to trial and error until the designer's ideation requirement is met.

Because of the role of designer supervision in AI use, designers can use AI as an organizing assistant. This study aims to determine how far AI can go in terms of

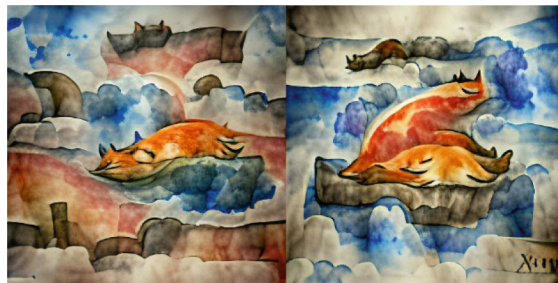**Fig. 1.** The sample of text commands to generate images.

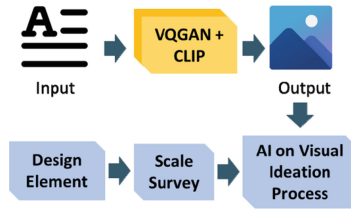**Fig. 2.** The sample of generative arts results from text command.

Fig. 3. Research framework.

generating optimal ideas. When optimal ideas can be generated quickly with the help of AI, the designer's performance can improve, bringing many benefits such as stress reduction, reduced redundant work time, and increased income.

2 Methods

The primary purpose of this research is to explore the effectiveness of AI on the ideation process in visual design creation among visual communication design students. In order to achieve the research aim, a scale survey method will be adopted [7]. The single scale set will consist of four design element items: layout, color, scale or size, and shapes or objects chosen to represent the visual ideation process [8]. Students will be asked to fill in a number for each design element, with 1 not important, 2 somewhat important, 3 important, 4 very important, and 5 extremely important. To assess the influence of AI on the visual design ideation process, the authors will add up the scores on lines 1 to 5.

The generative arts models used in the visual generation experiment were VQCLIP + GAN to convert the text to image design. The original notebook code of VQGAN + CLIP made by Katherine Crowson (https://github.com/crowsonkb) was used in this study. VQGAN + CLIP is a method for generating and manipulating images solely based on human text instructions. VQGAN + CLIP can evoke the artistic style of famous artists and major artistic styles worldwide.

VQGAN + CLIP outperforms previous approaches, such as DALL-E and GLIDE, concerning visual fidelity and textual prompt fidelity in model generation. VQGAN + CLIP continues to produce higher-quality visual images than the only comparable text-based image editing method, particularly when the textual prompt and image content have a low semantic similarity [5].

A total of 22 visual communication students were experimented in the first time using VQGAN + CLIP generative arts with text to images generator based. Students spend about 5–10 min experimenting with AI-generative arts using VQGAN + CLIP networks on the Google Collaboratory notebook. After finishing the AI-generative art experiment, 22 students examine by the scaling survey to describe the AI's effectiveness in the ideation process (Fig. 3).

3 Results

The AI effectiveness scale survey was used to assess the students' visual design ideation process effect during the visual design creation.

Table 1. A.I. effectiveness scale for visual ideation process.

Design Element	Scale				
	1	**2**	**3**	**4**	**5**
Layout	0 (0%)	1 (4.5%)	4 (18.2%)	12 (54.5%)	5 (22.7%)
Color	1 (4.5%)	1 (4.5%)	2 (9.1%)	13 (59.1%)	5 (22.7%)
Scale/Size	0 (0%)	1 (4.5%)	17 (77.3%)	3 (13.6%)	1 (4.5%)
Object/Shape	0 (0%)	3 (13.6%)	5 (22.7%)	11 (50%)	3 (13.6%)

Based on Table 1, for "layout," scale 4 (very important) was the highest scale chosen by 12 students (54.5%). For "color," there were 13 s students (59.1%) who gave a scale of 4 (very important). For "Scale or size," scale 3 (important) was the biggest scale chosen by 17 students (77.3%), and it became the highest one. For "Object or shape," there were 11 students (50.0%) who chose scale 4 (very important). From the results, all design elements have positive feedback from 22 students who used AI for the ideation process based on the design element.

4   Discussion

The results showed that AI based on generative arts positively contributes to assisting layout ideation design, defining the color of the ideation process, and imagining objects and shapes. Based on Table 1. The AI did not much assist the designer in determining the size or scale. The designer still requires designing their identity by the brief [9] or re-designing the AI results to optimize the visual design project because various generated images were unpredictable and sometimes outside the text command. On the other hand, AI may assist the designer in inspiration in the ideation process in layout and color because the CLIP network was trained on millions of image and caption pairs from the internet [10].

According to Zeng et al., 2019. Designer professionals are still responsible for putting forward questions, formulating rules, and supplying the starting point. The AI can then take over some responsibility to generate a more diverse set of typeface forms than would be feasibly possible by a design team [11] or even generate the visual layout [12]. The study also demonstrates how this collaboration between AI and visual communication designers can continue indefinitely to meet design goals.

The graphic design process is sure to gain speed along with the advancement of artificial design. Like the time spent painting for a digital visual design at one time takes no time now with design programs. The time graphic designers spend today on the most time-consuming things will become shorter with this technology. As graphic design requires knowledge, it naturally involves aesthetic and artistic concerns. The designer creates his designs based on his knowledge and experience and adds his creative awareness.

Students spend about 5–10 min experimenting with AI-generative arts using VQGAN + CLIP on a Google Collab notebook. Based on the results of Table 1 and the

AI performance time in generating images from text to visual, it is feasible to conclude that AI assistance in the ideation process is relatively fast. Efficiency in producing visuals that aid in ideation will be highly beneficial to designers in formulating visual concepts and shortening the ideation process time.

5   Conclusion

This study aims to assess the effectiveness of generative art-based AI in the ideation process for visual communication designers. According to the findings of this study, designers can use generative art-based AI in ideation. The designer's task as a design originator is not replaced, but it can be sped up by AI's performance in the idea process, particularly in color selection and visual layout. Since the AI generative arts networks select millions of images and keywords on the internet. It combines them into a single visual based on the text commands entered by the designer, and it can be used to develop ideas. Designers use other text commands or re-design AI's results to enable trial and error in the generative arts until the visual design meets the design goals. This study is the initial research on the AI-assisted ideation process. Furthermore, many other factors and challenges in the ideation process, such as teamwork, visual experience, emotion or perception of the designer, and AI technology, besides generative arts, need to be studied further.

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References

1. Karaata, E.: Usage of artificial intelligence in today's graphic design. Online Journal of Art and Design 6(4), 183-198 (2018).
2. Laing, S., Masoodian, M.: A study of the role of visual information in supporting ideation in graphic design. Journal of the Association for Information Science and Technology 66(6), 1199-1211 (2015).
3. Dorta, T., Perez, E., Lesage, A.: The ideation gap: hybrid tools, design flow and practice. Design studies 29(2), 121-141 (2008).
4. Hughes, R.T., Zhu, L., Bednarz, T.: Generative Adversarial Networks–Enabled Human–Artificial Intelligence Collaborative Applications for Creative and Design Industries: A Systematic Review of Current Approaches and Trends. Frontiers in artificial intelligence 4, 604234 (2021).

5. Crowson, K., Biderman, S., Kornis, D., Stander, D., Hallahan, E., Castricato, L., Raff, E.: Vqgan-clip: Open domain image generation and editing with natural language guidance. In: Computer Vision–ECCV 2022: 17th European Conference, Tel Aviv, Israel, October 23–27, 2022, Proceedings, Part XXXVII. pp. 88–105. Springer (2022).
6. Lee, Y.: Design participation tactics: the challenges and new roles for designers in the co-design process. Co-design. 4, 31–50 (2008).
7. Dawes, J.: Do data characteristics change according to the number of scale points used? An experiment using 5-point, 7-point and 10-point scales. Int. J. Mark. Res. 50, 61–104 (2008).
8. Reyna, J., Hanham, J., Meier, P.: The Internet explosion, digital media principles and implications to communicate effectively in the digital space. E-learning Digit. Media. 15, 36–52 (2018).
9. Purnomo, C.A., Mahanaim, S.A., Loc, F.-Y.R., Ardaniah, V., Ardhiantob, P.: Visual Language of Javanese Script on Shoe Design as Cultural Identity. Gelar J. Seni Budaya. 19, 105–113 (2021).
10. Smith, A., Colton, S.: Clip-guided gan image generation: An artistic exploration. Evo. 2021, 17 (2021).
11. Zeng, Z., Sun, X., Liao, X.: Artificial intelligence augments design creativity: a typeface family design experiment. In: 21st HCI International Conference. 400–411. Springer (2019).
12. Huo, H., Wang, F.: A Study of Artificial Intelligence-Based Poster Layout Design in Visual Communication. Sci. Program., (2022).