PatternPursuit: A Collaborative Tool for Graphic Pattern Design

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Abstract

This paper presents a co-creative system that starts from the exploration of pre-digital design work to create graphic patterns. The system uses design principles to guide its contributions. Promoting different types of creativity and levels of autonomy, the system adapts to users' needs and encourages reflection on the creative process. A study with 13 participants showed that the system effectively supports creativity, encouraging expressiveness, exploration, and improved visual literacy in Graphic Design.

Keywords

Creative Support, Human-computer Interaction, Design Principles, Computational Design, Creative Process

1. Introduction

The digital age has simplified the technical aspects of design, but it has also made creative thinking more complex [1]. References play an important role in this context, as they help structure imagination and, consequently, foster creativity [2]. However, when used uncritically, references can also constrain the creative process, leading to what is known as "design fixation" [2, 3, 4]. Research further shows that setting constraints and goals can help overcome such limitations and enhance creativity [5, 6, 7, 8].

At the same time, the growing role of digital tools in creative tasks has driven the development of systems that stimulate human creativity more effectively. However, these systems still face challenges related to the unpredictable nature of human creativity and the diversity of strategies used during the creation process [9]. Thus, the development of co-creative tools must consider not only the technical aspects, but also the subjectivity and singularity of these processes [10], especially in design, where the balance between scientific rigour and creative practice is particularly complex [8]. This issue can be approached through the fundamental principles of Graphic Design, which provide a visual vocabulary that helps organise ideas [11] and offer a foundation for creating visually coherent and effective outcomes [12]. Therefore, co-creative systems in this context should not only support users in exploring diverse design solutions but also promote reflection on the design principles applied.

2. Related Work

Visual exploration and collaboration can be considered important aspects in fostering creativity, as they promote the exploration of conceptual space and a change of perspective, avoiding design fixation [3, 13]. Human-computer co-creative systems support this process by enabling real-time interaction [8, 14, 10]. Some co-creative tools promote visual exploration with a common goal [15, 16, 14], but others act provocatively to promote conceptual changes [8].

In the domain of graphic pattern design, digital tools can expand visual possibilities [17], with research focusing on both pattern structure [18, 19] and generation [20, 21, 22, 23]. Pattern generation methods

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vary from automated systems [24] to interactive models that let users iteratively evolve designs based on objectives [23].

3. PatternPursuit

PatternPursuit is a collaborative ideation system that allows the creation of innovative graphic patterns through a co-creative process between human and computer [23]. Through the conceptual and visual exploration of pre-digital references, in this case by Sebastião Rodrigues, a Portuguese Graphic Designer [25], the system allows references to be explored to obtain additional layers of information (see Figure 1). This exploration, accompanied by the development and creation phase of the pattern, aims to reflect all phases of graphic design: research, experimentation, and creation of artefacts [23]. These phases are translated into five system modules: (i) text processing, (ii) image selection, (iii) image decomposition, (iv) unit generation, and (v) pattern generation. The system's modularity promotes personalised and iterative collaboration, supporting divergent and convergent thinking [26].

Our approach extends the work of Rovira Martins et al. [23] by exploring new approaches that mitigate the limitations encountered in the pattern creation phases. To investigate how design principles can inform and guide the contributions of the computational agent, we introduce a new approach to the graphic patterns design process (see Figure 2). The system is based on six fundamental design principles—motion, scale, transparency, concentration, colour value, and space—which are used as a basis for communication between the user and the computational partner to develop and refine design solutions throughout the creative process.

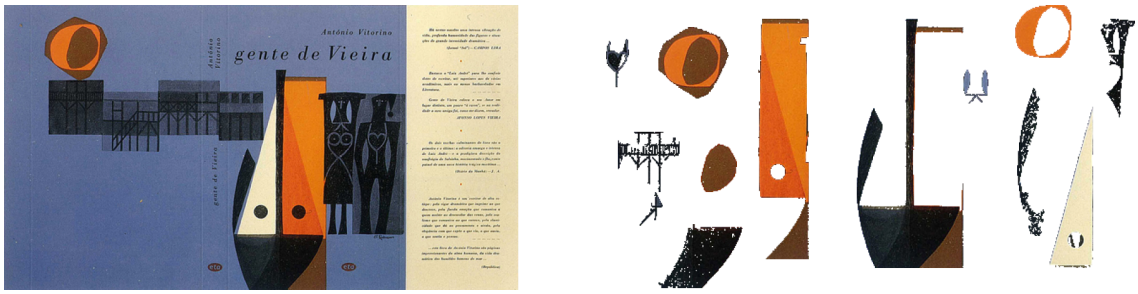

Figure 1: Reference image and its decomposed elements.

4. Conclusions

After testing the developed system with 13 participants, it was possible to conclude that integrating design principles effectively improves the creative process, enabling the generation of innovative patterns and encouraging deeper reflection on visual decisions, considering six different design principles (see Figure 3). Beyond producing finalised graphic patterns (see Figure 4), the system proved useful in real-world contexts for exploring ideas and references. By supporting different types of creativity and

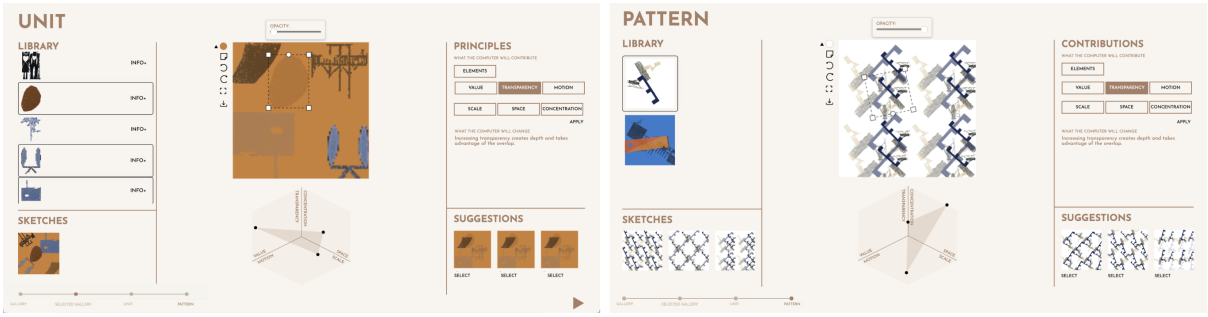

Figure 2: PatternPursuit Interface.

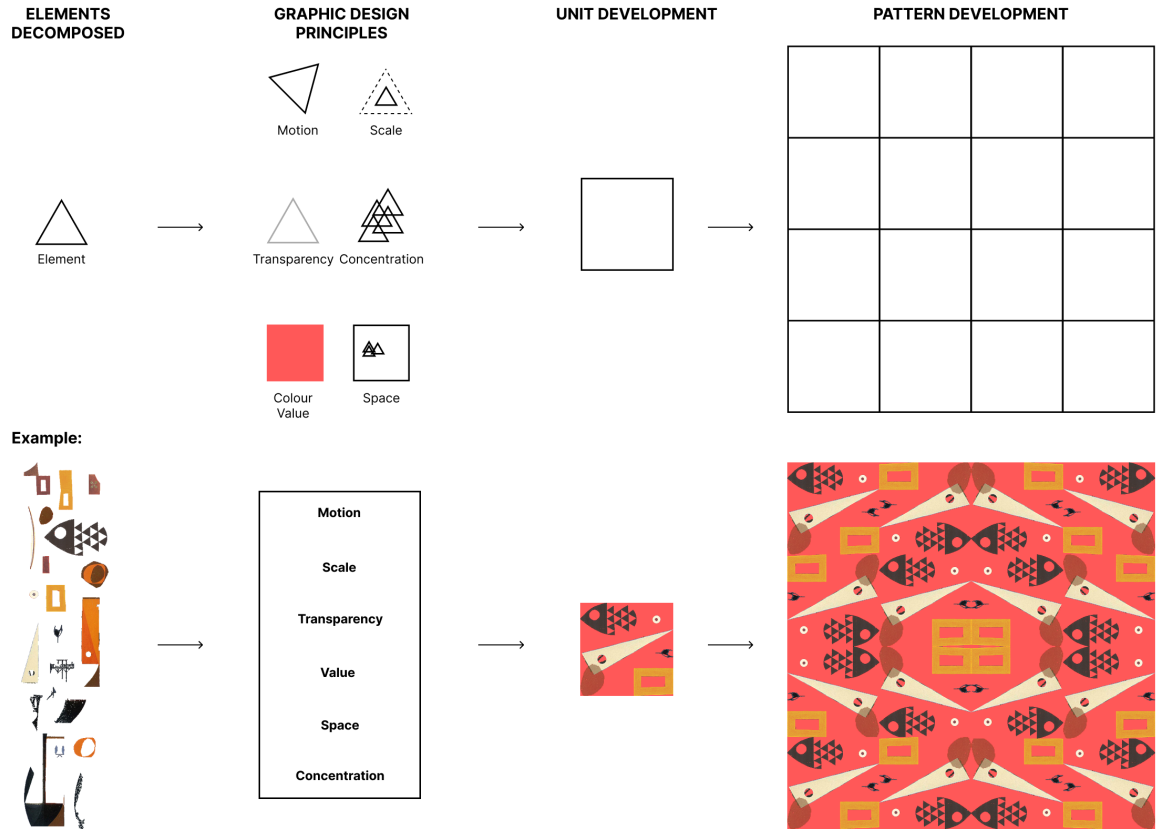

Figure 3: Process of developing graphic patterns using design principles.

levels of autonomy, it adapts to different user profiles, from those who need more guidance to those who prefer an autonomous experience. Overall, the findings demonstrate both the system's effectiveness and the importance of advancing co-creative solutions that balance the technical, collaborative, and creative dimensions of design practice.

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Figure 4: Collaborative human-computer patterns made by our study participants using the system implemented.

Declaration on Generative AI

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