

THEMATICPLANE: Bridging Tacit User Intent and Latent Spaces for Image Generation

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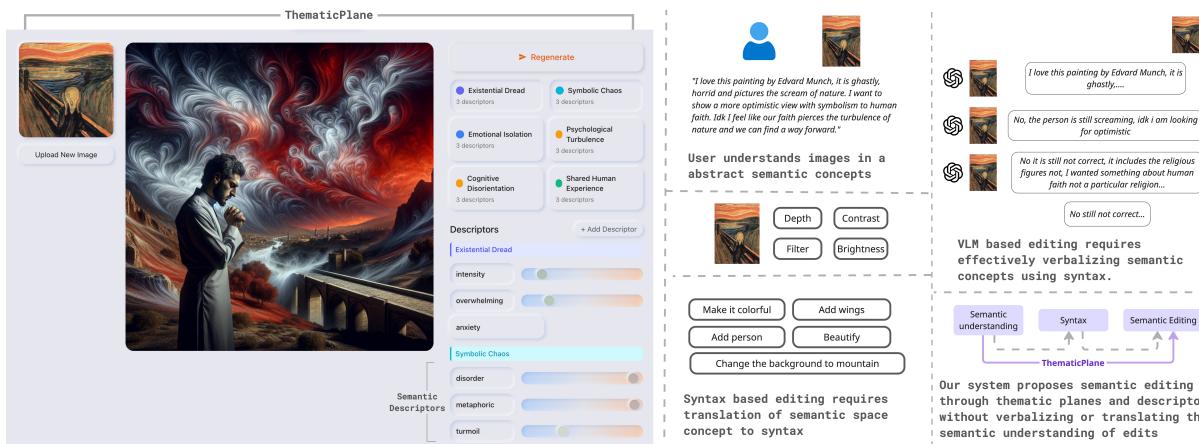


Figure 1: Overview of the THEMATICPLANE system. Unlike conventional prompting, THEMATICPLANE supports the navigation and manipulation of high-level semantic concepts within a thematic plan, allowing for tacit editing of the image aligned with the user’s understanding of the semantic concept of the image.

Abstract

Generative AI has made image creation more accessible, yet aligning outputs with nuanced creative intent remains challenging, particularly for non-experts. Existing tools often require users to externalize ideas through prompts or references, limiting fluid exploration. We introduce THEMATICPLANE, a system that enables users to navigate and manipulate high-level semantic concepts (e.g., mood, style, or narrative tone) within an interactive thematic design plane. This interface bridges the gap between tacit creative intent and system control. In our exploratory study ($N = 6$), participants engaged in divergent and convergent creative modes, often embracing unexpected results as inspiration or iteration cues. While they

grounded their exploration in familiar themes, differing expectations of how themes mapped to outputs revealed a need for more explainable controls. Overall, THEMATICPLANE fosters expressive, iterative workflows and highlights new directions for intuitive, semantics-driven interaction in generative design tools.

Keywords

creativity support tools, visual explorations, text-to-image models, image editing, generative AI

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1 Introduction

The proliferation of generative AI has fundamentally transformed creative expression in various modalities (e.g., text, images, video, code, etc.), enabling users to synthesize artifacts with unprecedented

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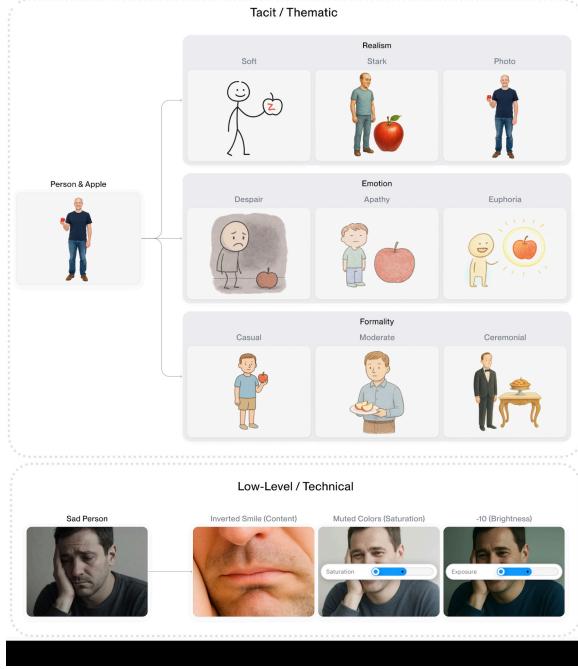


Figure 2: Visualization of tacit/thematic and low-level/technical edits in images.

ease (e.g., via tools like ChatGPT or RunwayML). For instance, individuals without expertise in visual editing software can now generate or modify images through simple prompts, enabling lay users to construct sophisticated outputs [16]. Nonetheless, achieving precise, intent-aligned results still demands technical knowledge, such as manually crafting detailed prompts or understanding the underlying model behaviors, which can hinder non-expert users [20].

Previous works have proposed systems where users can change low-level image parameters (e.g. with augmented prompt engineering scaffoldings [9, 24]). However, users seldom conceptualize desired changes in terms of such low-level technical parameters, layers, or explicit instructions. Instead, they reason in high-level semantic terms, like aspiring to make an image ‘warmer,’ ‘more dramatic,’ or ‘friendlier’ [4, 7]. This semantic gap as visualized in Figure 2—between users’ tacit, thematic intent and systems’ affordances—has spurred recent HCI research into intuitive editing paradigms, including keyword recombinations [5], reference image-based modifications [21] and interactive latent space explorations [1, 17].

Despite these advances, existing tools predominantly require users to externalize their vision through prescribed mediums, such as textual descriptions or reference images. This ‘externalization assumption’ presumes users can readily translate abstract ideas into concrete formats, which may not align with natural cognitive processes of creative ideation and refinement [6, 7, 23]. As a result, workflows can become rigid, limiting iterative discovery in generative tasks.

To address this, we introduce **THEMATICPLANE**, a system that supports interactions within thematic design planes which scaffolds the representation of multidimensional space for exploring

and lets users manipulate thematic attributes of visual content. It enables users to ‘ground’ and navigate high-level semantic concepts, such as mood, style, narrative, or emotional tone, in an exploratory fashion. This plane serves as a scaffolding layer, connecting users’ tacit intent with system capabilities with a ‘plane of existence’ for themes, drawing on semantic interaction paradigms to support creativity without externalization barriers.

1.1 System Prototype

THEMATICPLANE implements the thematic design plane as an interactive framework adapted from the Circumplex Model [19] for semantic image editing, enabling users to explore and manipulate high-level thematic attributes without explicit low-level inputs. Given an input image by the user, GPT-4o extracts keywords, which are then refined by removing object-based descriptors and retaining only thematic elements like mood or style. Next, we generate 12 thematic perturbations for each theme, assigning them to left or right directions along a semantic axis. Embeddings are computed using DINOv2 [18] for the input image and its aligned text encoder [15] for textual themes, ranked by cosine similarity. Ranked descriptors are then injected into prompts for the image generation model (*i.e.*, Imagen 3 [3]) to produce transformed images. After each regeneration, users can choose to make the new image the primary reference to continue editing.

2 Exploratory Study

We recruited 6 participants (4 women, 2 men), aged 19–31, through a corporate Slack channel. Participants had prior experience with image generation tools (e.g., Midjourney [13]). Participants were first provided 10 minutes to explore the system, using their own images or study provided examples. We then designed three image transformation tasks requiring participants to modify source images to match target images. Each participant completed tasks across three conditions: (1) baseline ChatGPT constrained to image generation only, (2) ChatGPT with full features, and (3) our system—with 5 minutes per condition, followed by a semi-structured interview and post-study survey. Upon completion, each participant received \$20 for their participation.

3 Discussion and Future Work

Aligning Interfaces to the Human Creativity Process. Our exploratory study revealed two emergent behaviors—open-ended discovery (*i.e.*, divergent exploration) and goal-based editing (*i.e.*, convergent refinement) [10, 25]. Although participants using **THEMATICPLANE** did not always anticipate the resulting images ($M = 3.43$, $SD = 1.27$), they reported high satisfaction with the outcomes ($M = 5.86$, $SD = 0.90$). Participants noted that non-linear generations either spurred intentional shifts in design direction during divergent tasks (P3) or enabled iteration in a space where themes amalgamated into cohesive affordances not characterized by a single plane (P6).

Different Perceptions of Thematic Planes. We observed that participants grounded themselves in themes based on their own understanding, enabling them to interpolate and navigate the rest of the thematic design plane; however, such understanding varied

across participants, leading to differing expectations during exploration. Specifically, some participants (P1, P3, P7) anticipated linear mappings between themes and outputs, while others (P2, P4, P5) encountered unclear connections between the plane and initial themes, prompting a desire for explainable methods to comprehend steering mechanisms, rather than merely executing them [2, 12].

Interactive Visualizations of Themes. Despite the steerability it offers, our interaction method currently provides a single axis for users to steer generative outputs based on an initial thematic attribute, which may restrict the exploration of interconnected semantic dimensions [12]. Future work could advance this to multi-dimensional representations, such as interactive planes or graphs, enabling users to simultaneously manipulate multiple attributes (e.g., mood and style) through gestures like dragging or clustering for more nuanced control over latent space trajectories [22].

Steerable Model Generations for Images. Building on the visual representation of steerable dimensions, these should reflect the technical methods for navigating these spaces, extending text-based approaches like LM-Steer [11] to incorporate vector-based steering in multimodal generative systems [8, 14] to create hybrid navigation mechanisms that dynamically adjust trajectories across semantic attributes during inference.

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