

Natural Language and AI-Assisted Palette Generation for Intuitive Color Selection
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Introduction & Background

Colors are essential in designs. Each color conveys unique meanings and can shape one's impression of the design. Novice designers often struggle to select appropriate colors, especially when using mainstream color pickers based on hex codes, RGB sliders, and color wheels. These tools require technical fluency and rely on trial-and-error exploration, which can be time-consuming and discouraging. Bailey et al.[1] similarly show that participants with little knowledge of color theory have difficulty selecting specific colors.

Prior work from Jalal et al. [2] has explored interacting with color such as mixing, comparing, or blending palettes and tools like Shugrina et al.'s Playful Palette [3] enable expressive color manipulation and separation of blended hues. However, these systems do not address how users select colors in ways that feel intuitive or align with their everyday language. In everyday context, people describe colors using natural language through making connections to an existing object, rather than the hex code. Heer and Stone [4] demonstrate that naming models can support selection, but they rely on predefined color terms. In contrast, Griber et al. [5] found that people frequently describe colors by referencing objects (e.g., "mint," "sand," "cherry"), with nearly half of all elicited color terms in Russian derived from object names. Memory-color research by Bartleson [6] further demonstrates people consistently associate characteristic hues with familiar objects such as dry grass, green grass, red brick, and beach sand.

These findings suggest that current tools do not mirror natural language descriptions of color nor support users who lack confidence in choosing palettes. To address this gap, I propose a system integrating 1) a Natural Language Color Picker that retrieves colors from object- or phrase-based descriptions using image-driven extraction, and 2) an AI-assisted Palette Generator that analyzes sketches and generates contextual palette suggestions derived from real-world imagery. Together, these components aim to make color selection more intuitive, descriptive, and educational.

This proposal examines the following research questions:

RQ1: How can natural language input and AI-assisted palette generation support intuitive color selection, and how do these systems influence users' creativity and learning in color theory?

RQ2: How do these systems affect users' engagement and confidence during the color selection process?

RQ3: How using natural language in the color selection process improves usability and accessibility for users with color vision deficiency? (Evaluated only if such participants are present in the sample.)

Methodology

The AI-assisted Palette Generator analyzes the user's line sketch by detecting visual cues such as shapes or dominant regions. It retrieves similar reference images from online datasets and extracts representative colors to generate palette suggestions ranked by contextual relevance or frequency. When a user selects or adjusts a palette color, the system automatically updates the corresponding regions of the sketch, allowing users to immediately visualize how global color changes influence their design. The Natural Language Color Picker allows users to input short phrases or object references (e.g., "sunset orange," "night sky with stars"). As demonstrated by Van de Weijer et al. [7], color names can be learned from real-world image datasets, enabling flexible mappings between language and color appearance. The system retrieves associated colors from online images using extraction techniques similar to Van de Weijer et al. and ranks results by common associations. Users can double click to reveal an RGB/hex breakdown, and a floating hex tooltip appears while drawing, reinforcing the connection between the

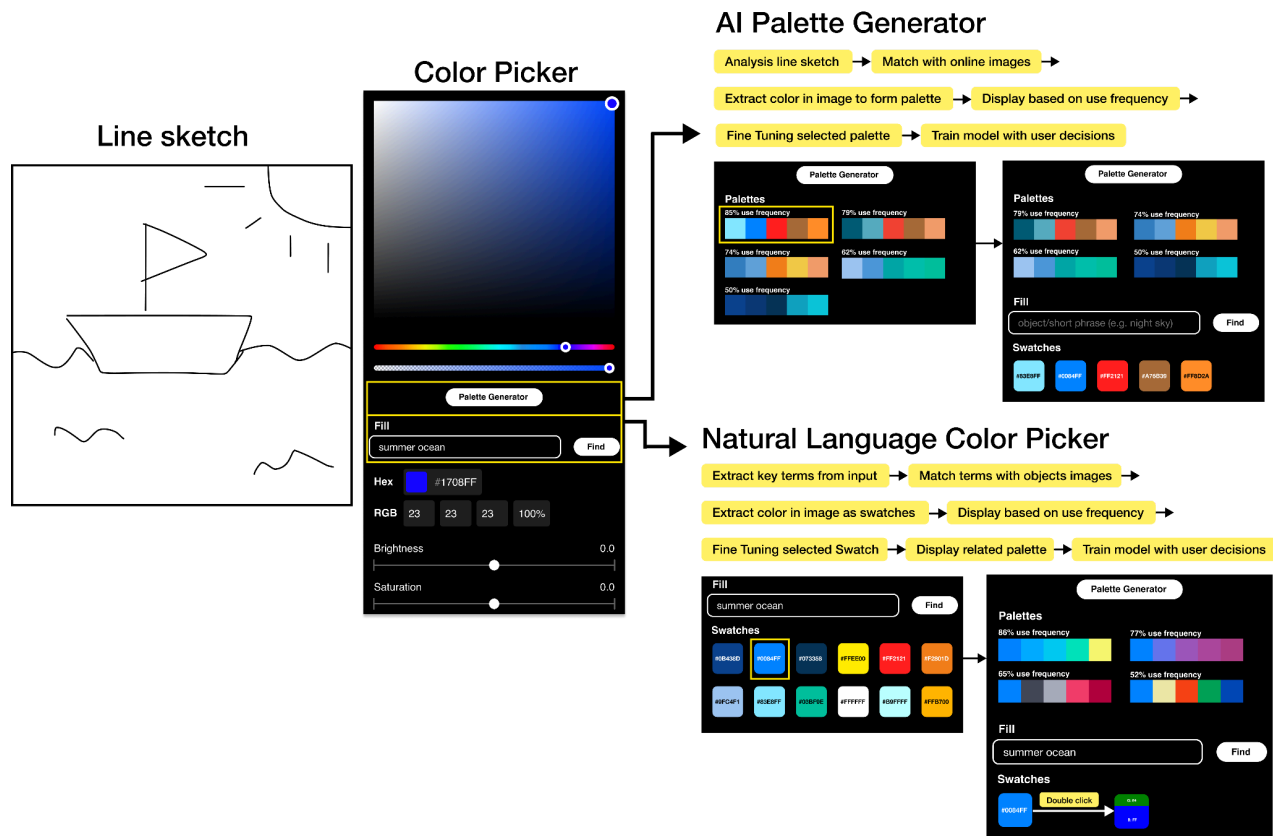


Figure 1. System workflow for color selection: 1) AI Palette Generator; 2) Natural Language Color Picker. The AI Palette Generator extracts colors from similar online images based on a user's sketch, while the Natural Language Color Picker retrieves colors associated with object or phrase-based input. Both display ranked color suggestions, allow fine-tuning, and use user selections to improve future recommendations.

language input and technical color representations to enhance learning. The system also logs final color choices to refine future recommendations.

This study consists of 2 phases using a between-subjects design. In Phase 1, participants receive a colored reference image and are asked to recreate it using a blank outline. One group uses traditional color picker tools, while the other group uses the new system. This phase evaluates color accuracy, efficiency (time and number of adjustments), and incidental learning. Hex/RGB recall will be measured as an indicator of increased fluency and confidence with technical color representations. The system will be demonstrated only to the group assigned to use it.

In Phase 2, participants switch tools and are asked to color a second blank image freely. This phase investigates how the system influences creativity, exploration, and user engagement. Creativity will be assessed by the number of colors used, the uniqueness of color combinations, and users' palette selection behavior (which palettes they choose, how often they modify generated palettes, and how many variations they explore). A post-task survey will measure how well the final output aligns with their creative intentions and collect qualitative feedback on their experience with each tool. Hex/RGB recall will again be assessed to evaluate continued incidental learning.

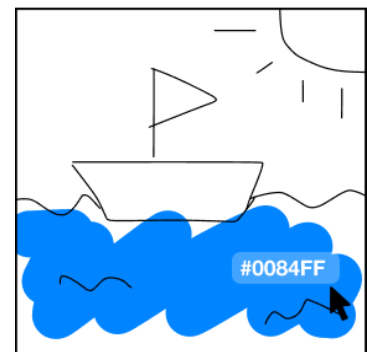


Figure 2. Hex value tooltip displayed when applying a selected color to the sketch.

Reference

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- [8] Inspiration and UI components adapted from: Walker M. Color Picker (Figma Community). CC BY 4.0.<https://www.figma.com/community/file/863267706541796233/color-picker>