

HaptiColour: Haptic-assisted Digital Colouring Platform for Managing Anxiety and Increasing Mindfulness

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Abstract—Research suggests that mindfulness-based activities, such as structured colouring, are effective in reducing anxiety. Digital colouring is convenient but lacks the tactile experience of traditional colouring. We introduce HaptiColour, a haptic-assisted colouring platform that aims to help people manage anxiety and increase mindfulness. The platform is based on Haply, a 2-DoF grounded force feedback device, integrated with a graphical environment. We explored and implemented haptic guidance strategies and tool-tip effects that aid digital colouring experiences. We foresee the use of this platform in structured colouring practices. Initial evaluation shows that haptic-assisted colouring is intriguing and people would be interested in using such a platform.

I. INTRODUCTION

Anxiety is one of the most common mental disorders [1] affecting more than 260 million individuals globally [2]. While treatments are available, research efforts are underway to develop additional methods to ease symptoms of anxiety. Structured colouring has proven to be effective in reducing anxiety [3]. However, colouring usually requires several materials and tools. Digital colouring addresses this but does not offer a compelling tactile experience. To address this, we propose to use emerging do-it-yourself haptic devices to incorporate tactile experience in digital colouring. We use Haply¹, a 2-DoF grounded-force feedback device, to create an interactive platform to guide the user to colour within the lines while experiencing rich haptic effects.

II. SYSTEM

HaptiColour (Fig. 1) focuses on two components: haptic guidance and haptic richness. Manipulating the end-effector of the Haply, people can colour the interior of 2D sketches; they experience haptic guidance along the boundaries helping in precise colouring and haptic tool tip effects for a rich colouring experience. Our platform has a minimalist design. It supports different colour palettes, tool-tips, and haptic guidance effects, which users can choose based on their preferences. The user interface can be operated using Haply’s end-effector itself. We implemented two haptic guidance approaches to help people colour within the lines: *solid wall* and *glassy circumference*. The former is a barrier-like effect on the end-effector that people cannot cross or



Fig. 1. HaptiColour: a haptic-assisted digital colouring platform built with the Haply device and the Processing graphical environment.

penetrate. The latter is a translucent circumference around the cursor. When this circumference touches the boundary, the damping of the end-effector increases, thus slowing down the motion of user’s hand. We implemented eight haptic tool-tip effects exploring design space in three different ways: (1) by dynamically varying the forces applied to the end-effector, (2) by creating geometrical objects on the colouring space (based on the Fisica² library), and (3) by changing the damping of the Haply’s end-effector. There are three temporal force-based, one temporal damping-based, one temporal-and-spatial object-based, and three spatial damping-based haptic effects. Within force-based effects, we have controlled vibration produced by randomized force values in x and y dimensions which produces a grainy sensation and several other effects guided by functions (e.g., linear, sine, cosine, etc). The damping-based effects are created by having a grid of geometrical objects on the colouring space that can be varied in dimension and object spacing to create a desirable haptic experience.

III. PRELIMINARY USER FEEDBACK

We collected feedback during our design iterations from six individuals. Overall, the prototype was well received and everyone enjoyed the haptic feedback rendered while colouring. Future work includes adding custom sketches which have proven effective for structured colouring (e.g. mandalas), including specific haptic feedback based on their therapeutic effect, and designing a controlled study to evaluate our platform’s effectiveness to reduce anxiety.

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¹<https://haply.co/>

²www.ricardmarxer.com/fisica