

RESONANT RELAXATION:

AFFECTIVE STATE CHANGE VIA PROCEDURALLY GENERATED HAPTICS

Keywords: Affective Haptics · Generative AI · Audio-Haptic Feedback · Personalised Relaxation · Emotional Well-being

The ongoing shift towards digital sedentary lifestyles has increased stress in daily life and calls for innovative approaches to improve mental and physical health. **Resonant Relaxation** explores the capabilities of AI-generated audio for affective haptic feedback to create experiences that induce **relaxation** and enhance emotional well-being and productivity.

OUR PRIMARY GOAL

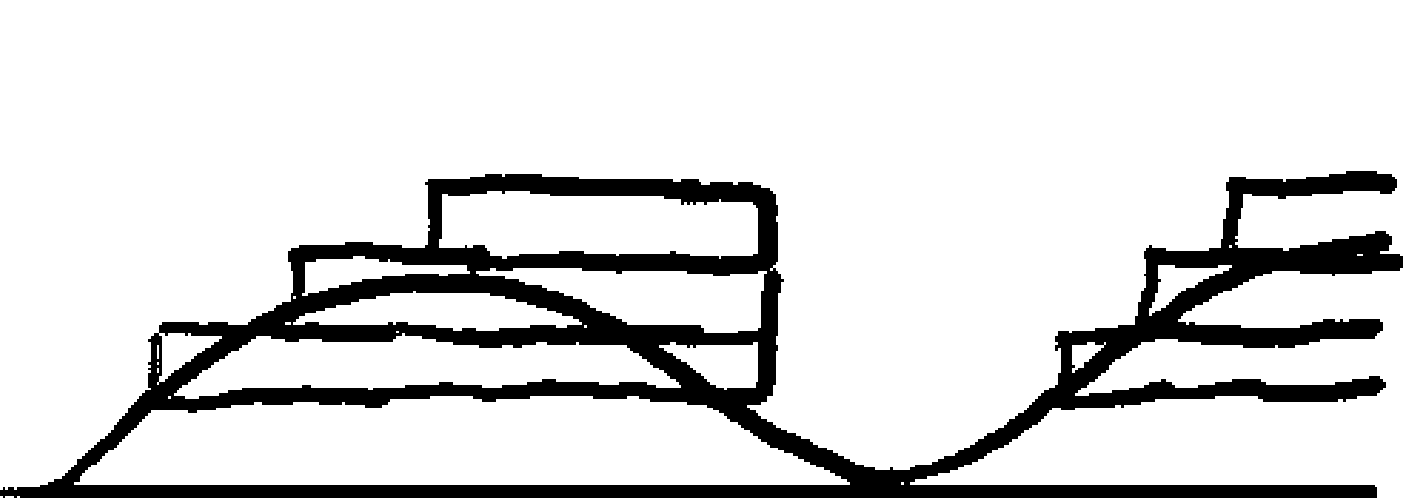
was to enhance users' emotional well-being during productivity or relaxation sessions by providing personalised audio-based haptic experiences. We focused on creating a baseline state for relaxation, which could serve as an emotional baseline to facilitate a flow state.

We developed a React-based web application to generate customised haptic patterns. The haptic output included an amplitude-modulated sine wave as the **baseline** and AI-generated "**sparkles**", harmonically based on the baseline frequency representing the closest musical note to that frequency. Based on this musical note using the ChatGPT API, we created MIDI compositions, converted them into waveforms with Tone.js, an OpenSource Javascript Library, and played them through voice coil actuators.

“AI SPARKLES”

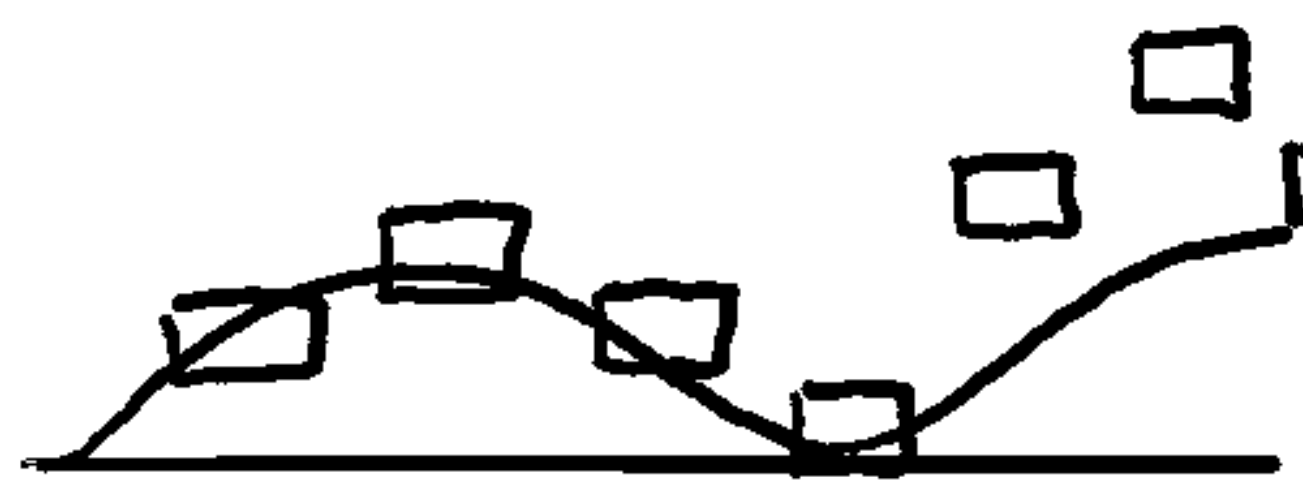
For the sparkles, we prompted the LLM with harmonic and disharmonic components based on the baseline. Using few-shot prompting, we provided examples of the note notations needed for correct parsing into a MIDI file that can generate output with Tone.js instruments.

This allowed us to generate adjustable haptic outputs that maintained harmony with the baseline frequency, effectively integrating musical theory into the haptic feedback system. To further reduce haptic numbness, we conceptualised **three types of “sparkles”**:



Chords

Triads based on the baseline frequency



Ladders

Split chords played up and down



Twinkles

Random but harmonious short notes that create a vibrant soundscape

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*Github Repo

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BASELINE

An amplitude-modulated sine tone that gradually decreases in frequency and in wavelength (tempo), resulting in a calming effect that gradually decreases the breathing rate from 11 to 6 breaths per minute.

SPARKLES

Nuanced notes that are created based on the baseline to add texture and variety to a soundscape, preventing it from becoming monotonous and enhancing its richness and interest.

COMBINED

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