Projects

Project 1: Master Thesis – Prototyping Emotions: A Toolkit for Affective Haptic Feedback

Categories: UX Research, Interaction Design, Prototyping Methodologies, Affective Haptic Design, Educational Workshop

Project Overview:
In my Master Thesis at FH Salzburg, I designed and evaluated a modular methodological toolkit for novice designers to create affective haptic feedback systems. The goal was to address the lack of accessible resources for translating emotional intent into tactile experiences. The project combined third-wave HCI principles with affective haptics, focusing on emotional articulation, embodied metaphors, and iterative prototyping.

Problem Statement:
Many novice designers face technical challenges when prototyping emotional and affective haptic feedback, resulting in limited accessibility and creativity in the field. My research aimed to remove these barriers through a structured, hands-on toolkit.

Research Foundation:
The thesis is grounded in research from HCI (first, second, and third wave), affective computing, wearable technology, and emotional design. Key models included:

- The Circumplex Model of Affect for emotional mapping.
- The Emotion Typology developed by Delft Institute of Positive Design.
- Insights from affective haptics literature and emerging prototyping frameworks.

Methodology and Toolkit Design:
The research employed a tandem design workshop structure where participants worked in pairs, alternating between designer and user roles. The toolkit incorporated:

- **Embodied Metaphor Elicitation**: Guiding participants to associate personal emotional objects with haptic sensations.
- **Body Mapping**: Visualizing emotional areas on the body to inform actuator placement.
- **Tandem On-body Prototyping**: Using low-fidelity materials and the Hapticlabs DevKit (ERM, LRA, VC actuators) to prototype haptic feedback directly on the body.
- **Real-time Iteration**: Participants tested and iterated on their prototypes collaboratively, improving both technical and emotional resonance.

Study Design and Participants:

- Workshop with 6 participants, forming 3 tandem groups.

- Participants came from interdisciplinary backgrounds, with varying levels of haptic design and prototyping experience.
- Sessions were divided into 4 phases (totaling ~4 hours): Emotional Framework Introduction, Body Mapping & Metaphors, Prototyping Sessions, and Reflection.

Key Findings:

- The combination of the Circumplex Model and embodied metaphors enhanced participants' ability to articulate and prototype emotions.
- Tandem design fostered collaborative learning and iterative refinement.
- Technical limitations of the DevKit (e.g., actuator constraints) and the subjectivity of emotional interpretation emerged as challenges.
- Participants valued the intuitive, hands-on nature of the toolkit, with feedback emphasizing its usefulness for bridging theory and practice in affective haptics.

Outcomes:

- Delivered a comprehensive toolkit for affective haptic prototyping.
- Provided design insights on translating abstract emotions into tactile interactions using embodied metaphors and body maps.
- Workshop structure and findings were integrated into a "work-in-progress" paper presented at Interhaptics Conference 2024.

Future Work:

- Expand the toolkit with more diverse haptic actuators and improved software usability.
- Explore longitudinal studies and workshops with larger, more diverse participant pools.
- Incorporate biofeedback loops and extend applicability to therapeutic and wearable technology domains.

Project 2: Resonant Relaxation – Affective State Change via Procedurally Generated Haptics

Categories: UX Research, Prototyping, Haptic Design, AI LLMs

Project Overview:
In collaboration with Innovobot Labs and FH Salzburg, this project aimed to address the rising stress levels caused by sedentary digital lifestyles by creating a system for affective state change using procedurally generated haptics. The research and development resulted in a React-based web application that helps haptic designers craft personalized audio-haptic feedback for relaxation and stress reduction.

Research Context:
The project builds on research into biofeedback, haptics, and affective

computing, drawing inspiration from studies on the relationship between audio signals, haptics, and emotional well-being. The central question was: *“How could generative AI support designers in creating relaxation-inducing haptic experiences to enhance emotional well-being during sedentary activities?”*.

Methodology and System Design:

- Developed a web application using React and Tone.js capable of generating custom haptic patterns for wearable devices such as wristbands and neckbands.
- Integrated AI-generated MIDI compositions via ChatGPT API to enrich the audio-haptic experience with dynamic “sparkle” elements layered onto a calming baseline.
- Designed amplitude-modulated sine tones to guide users towards slower breathing rhythms, promoting relaxation and flow states.
- The system allowed designers to fine-tune parameters such as tempo reduction rates and the density of AI-generated sparkles.

Prototyping and User Testing:

- Early-stage prototype connected with voice coil actuators to deliver haptic feedback synchronized with AI-generated audio patterns.
- Conducted an initial user study (n=3) involving participants with varied workloads to collect qualitative insights. Participants reported a heightened sense of calm and expressed a preference for the dynamic “sparkles” paired with the baseline rhythm.

Outcomes:

- The prototype successfully demonstrated the potential of AI-driven procedural audio-haptics to induce relaxation and modulate affective states.
- Published a work-in-progress paper at the EuroHaptics Conference 2024, marking the project’s contribution to the broader field of affective haptics and well-being technologies.

Future Work:

- Planned enhancements include deeper integration with Cycling ‘74’s RNBO patches for more sophisticated haptic synthesis.
- A larger-scale user study and exploration of biofeedback loops are intended to further validate and refine the system’s effectiveness.
- Exploring the use of local LLMs and expanding actuator configurations for broader user personalization.

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Project 3: AMIAI

Categories: Prototyping, Graphic Design

Project Overview:
AMIAI is a graphic design project that revolves around creating a visual campaign with a key visual element revolving around a specific fictional movement. We decided to tackle the topic of AI generated content and its credibility and attempts to alter the reality through digital AI content.

Key Design Element:
The pixelation effect that happens when taking a photo to convert the analogue into the digital realm was the key design element that we went for.

Outcomes and Future Directions:
This project taught me to work on a design concept, find guiding design rules, how to apply them in a systematic way and create a campaign for a movement that is daring people to question their autonomy under the influence of AI and technology on an every day basis.

Project 4: TTF 2023 Hackathon – Green Wallet: Cashless Payment Innovation

Categories: UX Research, Prototyping

Project Overview:
In this high-impact hackathon project, our team developed the “Green Wallet” concept during the Tourism Technology Festival 2022. The goal was to reimagine cashless payment solutions in the gastronomy sector by introducing gamification elements and user-centered design to encourage adoption.

Research and Analysis:
We conducted semi-structured interviews with vendors at a gastronomy convention, exploring the challenges and benefits of cashless payment systems. Our research highlighted issues such as security concerns, high transaction fees, and inconsistent adoption rates, while also revealing potential advantages like automated accounting and increased revenue.

Design and Prototyping:
The project involved the creation of detailed Figma prototypes for both the shop owner and customer interfaces. For the shop owner, the design focused on delivering clear, actionable insights and gamified elements that incentivized the use of cashless payment methods. Our collaborative approach, with roles clearly defined among team members, ensured that the prototype addressed real-world needs effectively.

Outcomes and Reflections:

Our innovative solution was recognized with a 1st place award in Stream 1, validating our approach and design. The experience reinforced the value of rapid prototyping, cross-disciplinary teamwork, and the importance of aligning design solutions with business objectives.

Project 5: Phone-based Intervention in Self-driving Cars – Bachelor Thesis

Description:
A Bachelor thesis at LMU Munich focusing on mobile user interface design to enable rear-seat passengers in autonomous vehicles (AVs) to intervene in route selection, addressing trust and usability challenges in high-stress scenarios.

Project Overview:
This project explored how passengers can interact with AV navigation systems via mobile devices, particularly during rerouting decisions. The goal was to study how trust and decision-making are affected by time constraints and information density in a critical autonomous driving context.

Research Context:

- Investigated cooperative driving systems and rear-seat passenger intervention in SAE Level 4/5 AV scenarios.
- Focused on improving trust between passengers and autonomous driving systems through interface design.
- Addressed gaps in research concerning passenger-initiated interventions in self-driving vehicle rerouting.

Design and Prototyping:

- Created three mobile UI prototypes in Figma with varying levels of information density: minimal, balanced, and information-rich.
- Integrated a map-based interface with route suggestions, shop recommendations, and a live AR traffic camera overlay.
- Ensured task complexity through different decision-making scenarios, including stopover choices within time constraints.

Study Design:

- Conducted a remote between-groups user study (n=30), split into Fast Thinking (3 minutes) and Slow Thinking (15 minutes) groups.
- Collected data through Figma Mirror, Zoom recordings, SUS questionnaires, trust ratings, and semi-structured interviews.
- Measured how information density and decision time affect user trust and cognitive load.

Key Results:

- Significant increase in user trust after interacting with the prototypes.
- Simple interfaces (low information density) achieved higher trust scores under time pressure.

- Identified cognitive load as a critical factor influencing user satisfaction and decision-making speed.
- SUS score of 75.38, indicating good to excellent usability.

Outcomes:

- Delivered actionable UX insights for designing cooperative passenger-vehicle interfaces.
- Provided design recommendations to balance trust and cognitive workload in AV rerouting scenarios.
- Proposed future work including the integration of voice assistants and contextual audio feedback to improve user experience.

Categories:

- UX Research
- UI Design
- Prototyping
- UX Testing

Tools Used:

- Figma
- Zoom
- Figma Mirror
- Google Drive
- LimeSurvey

Project 6: ADHDeer

Categories: UX Research, Prototyping, UI Design

Project Overview:
ADHDeer is a project aimed at assisting young adults with ADHD and their families to navigate daily challenges associated with the condition. The project was developed during a Design Thinking course at FH Salzburg and is backed by personal experiences, in-depth research, and interdisciplinary collaboration.

Research and Empathy:
Our design process started with deep empathy. Through interviews with educators, children, and ADHD experts, we gathered insights into the daily challenges faced by individuals with ADHD. We also engaged with online communities and forums to understand a broad range of experiences, highlighting the need for a supportive and intuitive self-tracking solution.

Design Process and Prototyping:
The project was carried out by a team composed of UX/UI designers, HCI researchers, and project managers:

- **Anica Hummel:** UX/UI Designer, ADHD Expert
- **Lucia Migacová:** HCI Researcher, Graphic Designer, ADHD Expert

- **Vincent Göke:** Project Manager, UX Researcher

Our Design Thinking process included the phases of Inspiration, Empathize, and Define, where we identified communication gaps between children with ADHD, their parents, and educational institutions. The Ideation phase led us to conceptualize an application that supports scheduling, education, and self-care. The culmination of these efforts was the creation of the ADHDeer application prototype, which features playful UI components, gamified tracking elements, and progress visualization tools.

Outcomes and Future Directions:
Initial pilot testing indicated promising engagement levels, and our documentation (via an online collaboration space and Miro Board) captures the entire journey—from first design sessions to prototyping. The project invites further refinement and testing to fully realize its potential in aiding ADHD management.