

Tiny Twist Instruments: Collaborative Musical Performance Anywhere

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Abstract—This paper proposes “Tiny Twist Instruments,” a set of lightweight, self-contained hardware synths aimed at extending previous work with Tiny Touch Instruments: software-based mobile tools for collaborative, improvisational performance. While the original TTIs leveraged smartphones to create engaging group experiences, reliance on personal devices introduced challenges such as distraction and digital fatigue. Tiny Twist Instruments address these issues by providing simple, tangible hardware interfaces inspired by modular synth VCO designs and game controller ergonomics. Featuring limited but expressive controls, integrated speakers, and portability, these instruments are intended for ease of manufacture and group deployment.

I. BACKGROUND

Explorations in mobile phone music-making have demonstrated how smartphones can be effective platforms for collaborative performance, as detailed in my previous research creating Tiny Touch Instruments (TTIs), touch-based software instruments optimized for smartphone web browsers. These instruments leverage touch-screen interactions and multimodal feedback to create engaging, texturally rich, improvised experiences with groups of unrehearsed performers. While these explorations have been successful, reliance on personal mobile devices also introduces challenges related to user distraction, anxiety, and the psychological baggage of everyday smartphone use. To address these issues, this project envisions a custom hardware synth that retains the accessibility and collaborative focus of TTIs but provides a dedicated, tangible musical interface. These “Tiny Twist Instruments” will reconnect performers with hardware that is playful, approachable, and purpose-built for collaborative creative expression, fostering new participatory group dynamics.

II. RELATED WORK

TTIs are touch-based instruments that live on a website optimized for mobile web browsers [1]. I designed TTIs to facilitate performances in workshop and festival settings, utilizing accessible graphic and animated notation that allows participants of any experience level to join in on a collaborative improvised music experience. Mobile technology is convenient for this application and is even recontextualized when used as a collaborative musical instrument rather than a means of disengagement. To move beyond these devices and to make the experience agnostic to ever-changing mobile technology, I’m interested in

exploring the affordances of a purpose-built hardware synth deployed in similar settings. I envision using them either alone or along with existing TTIs to give participants more choice in how they engage.

Modular synth VCO designs provide a rich foundation for sound generation. Existing pocket synths, such as stylophones and the Synthassete [2], serve as inspiration. The Dragonfly Synth [3] is an example of a recent portable synth with an integrated speaker. This project extends these insights while transitioning from software-based TTIs to physical, embedded devices, drawing inspiration from game controller ergonomics and minimalist yet expressive hardware synth design.

III. IMAGINED PROTOTYPE

The Tiny Twist Instruments prototype will be a compact, stylized printed circuit board (PCB). Controls will consist of two joysticks or one joystick and two buttons, offering a limited but expressive gesture set. A small integrated speaker and battery compartment will ensure portability and standalone operation. Sound generation circuitry will be derived from modular synth voltage-controlled oscillator (VCO) principles, incorporating simple envelope controls for dynamics. The hardware will emphasize minimalism, durability, and especially ease of manufacture, enabling deployment in large group settings similar to those in previous TTIs performances. Visual design will highlight a clean, playful aesthetic intended to position the device as an inviting and accessible musical tool. Furthermore, the design will aim to support new forms of accessible musical notation through color and symbol.

IV. RESPONSIBLE INNOVATION

This project foregrounds ethical and inclusive design practices by prioritizing accessibility, affordability, and performer well-being. By offering an alternative to smartphone-based interfaces, it aims to reduce digital fatigue and anxiety often associated with personal mobile devices in performance contexts. All participants will be invited to provide informed consent and engage in the co-creation of participatory pieces, ensuring respect and transparency throughout. Environmental sustainability considerations will guide component selection and fabrication methods to minimize electronic waste. Efforts will be made to document and share open-source designs and compositions to foster

community access and further research. This project isn't intended for large-scale commercial manufacturing but rather to support community-scale artistic research so manufacturing runs will be limited and the instruments and parts can be reused for future projects.

V. AUTHOR BIO

Rebecca Abraham (Beccy) is an MFA student in the Sonic Practice program at Dartmouth College. They graduated from UC Berkeley in 2020 with a degree in Electrical Engineering and Computer Science. They were a research fellow at the Berkeley Center for New Media, where they started working on the Magical Musical Mat with Professor Rachel Chen.

At Dartmouth, Rebecca researches collaborative instrument design and creates participatory, site-specific musical experiences. They were a finalist for the Processing Foundation Fellowship in 2024 for their work creating Tiny Touch Instruments. Rebecca has presented work at Sensing the Forest, through the Center for Digital Music at Queen Mary University; the Open Source Arts Contributors' Conference; and NIME. At NIME in 2024, they won "Best

Music / Art Installation Award" for their piece, A Thousand Mornings, with support from the Arts Integration Grant at Dartmouth. Most recently, they presented their work with Tiny Touch Instruments at the Sound / Image Festival, hosted by the University of Greenwich.

VI. ACKNOWLEDGEMENTS

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VII. REFERENCES

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