Augmented Practices


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Instructional Design of Soldering using Sonic Cues

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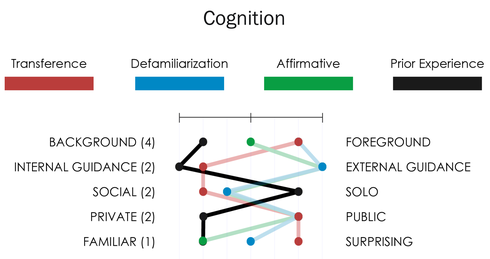


Figure 1: 4 repertory grids to visualize collected data. Black line shows soldering experience without presence of sonic cues. Left side includes desired poles and numbers represent number of pairs clustered in this category.

SOURCES

R. Sennett, The craftsman. New Haven : Yale University Press, c2008., 2008.

B. Caramiaux, A. Altavilla, S. G. Pobiner, and A. Tanaka, "Form Follows Sound: Designing Interactions from Sonic Memories," in Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems, New York, NY, USA, 2015, pp. 3943–3952.

ABSTRACT

Tacit knowledge is a type of knowledge that is difficult to convey through words, often existing in one's subconscious. Especially with physical making tasks, the learning experience relies heavily on one-on-one instruction, creating uneven power structures and constraining who can participate in a physical practice. However, distributed resources, such as video tutorials, cannot properly convey the rich information that is transferred through apprenticeship. By leveraging different areas of cognitive processing, we explored how augmenting the creative environment with sonic cues could affect the process of learning a new physical skill. We focused on soldering, a common technique for creating electrical or structural connections between two metal components. Soldering serves as an entry to STEM fields and is widely practiced across multiple professions with many independent users.

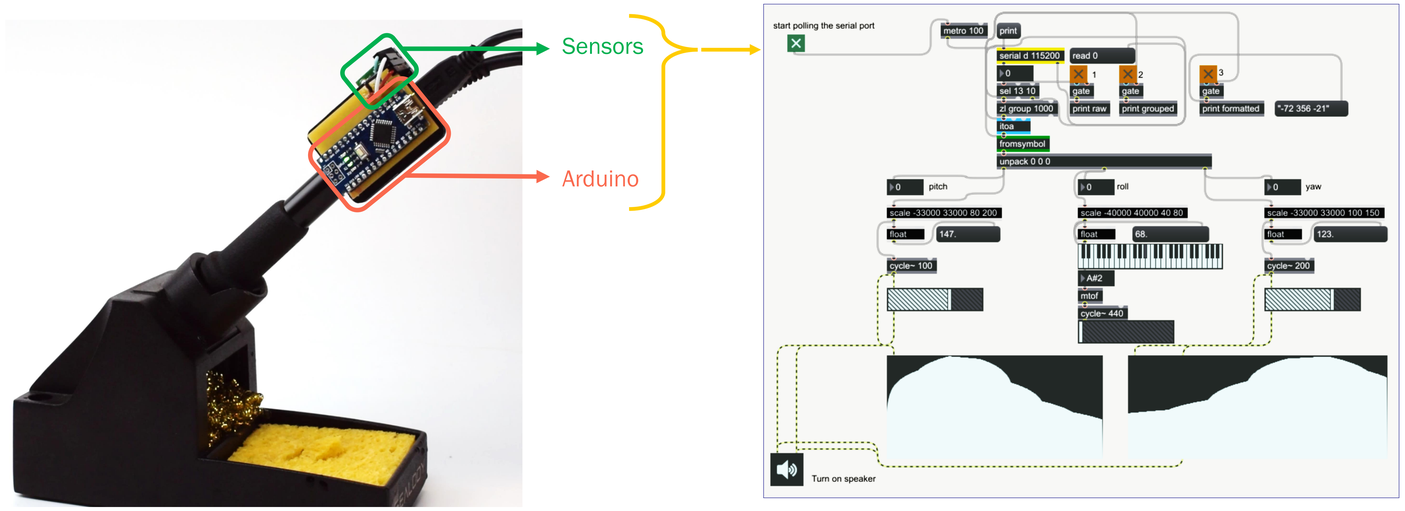
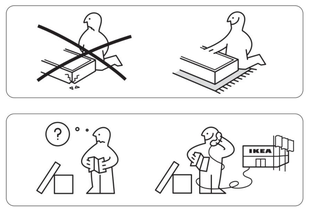


Figure 2: Structure of current prototype. We read in values from gyroscope's serial and use MAX/MSP to make a sonic salience of motion in pitch and yaw axis.

Principles of Tacit Instructional Design

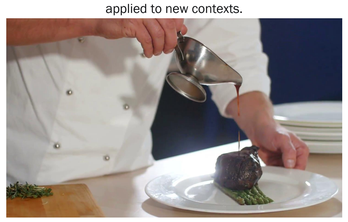
Concise



"Nobody reads the manual"

Abstracted

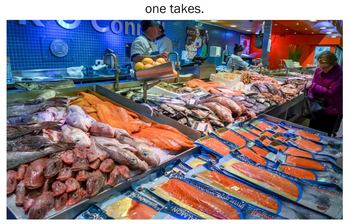
Metaphors encode symbolic information that can be applied to new contexts.



"Add the jewel to the child"
"Sinew cuts like a string"

Narrated

Describing context-specific details and the journey that one takes.



"Buy 1 tilapia"

Sympathetic

Places oneself in the novice's shoes.

"If the boning task seems too daunting, the butcher must be persuaded to bone the bird for you"

Enjoyable & Fun

Sustain Practice

Rewarding

Self-efficacy

Collaboration

Skill Level

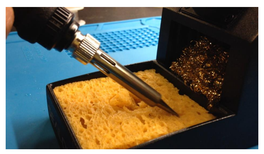
Psychological and Environmental Factors

Figure 3: The 4 elements of Instructional design and an example. Colored boxes represent constructional experience element. These elements include properties, effects, and variable in red, orange, and blue respectively.

Prototypes

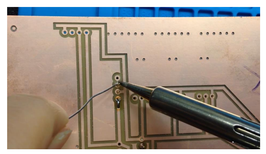
Transference

This technique was centered around developing a sonic salience of hand's motions to raise awareness of user and enhance their cognition on soldering.



Defamiliarization

Technique of presenting common events and concepts in an unfamiliar or strange way in order to enhance perception of the familiar and raise interest.



Affirmative

We expressed compassion with user's moments of difficulty and shared some knowledge and tips to assist them and assure them on their technique.

METHOD

- Wizard of Oz Prototyping
- Micro-Phenomenological Interview
- Repertory Grid

CONTRIBUTION

- Introduce an instructional design model to convey tacit knowledge.
- Encourage collaboration and sustaining creative practice by adding sonic cues.
- Abstracted instructions enables learner to apply gained knowledge to other physical tasks.

DISCUSSION

Results were synthesized into a high-fidelity prototype which binds inertial sensors on a soldering iron to create real time sonic cues mapped to physical motion. We demonstrate the value of augmenting the environment to make more salient and public the tacit knowledge that constitutes any physical task and encourage more collaborative and sustainable creative practices.