

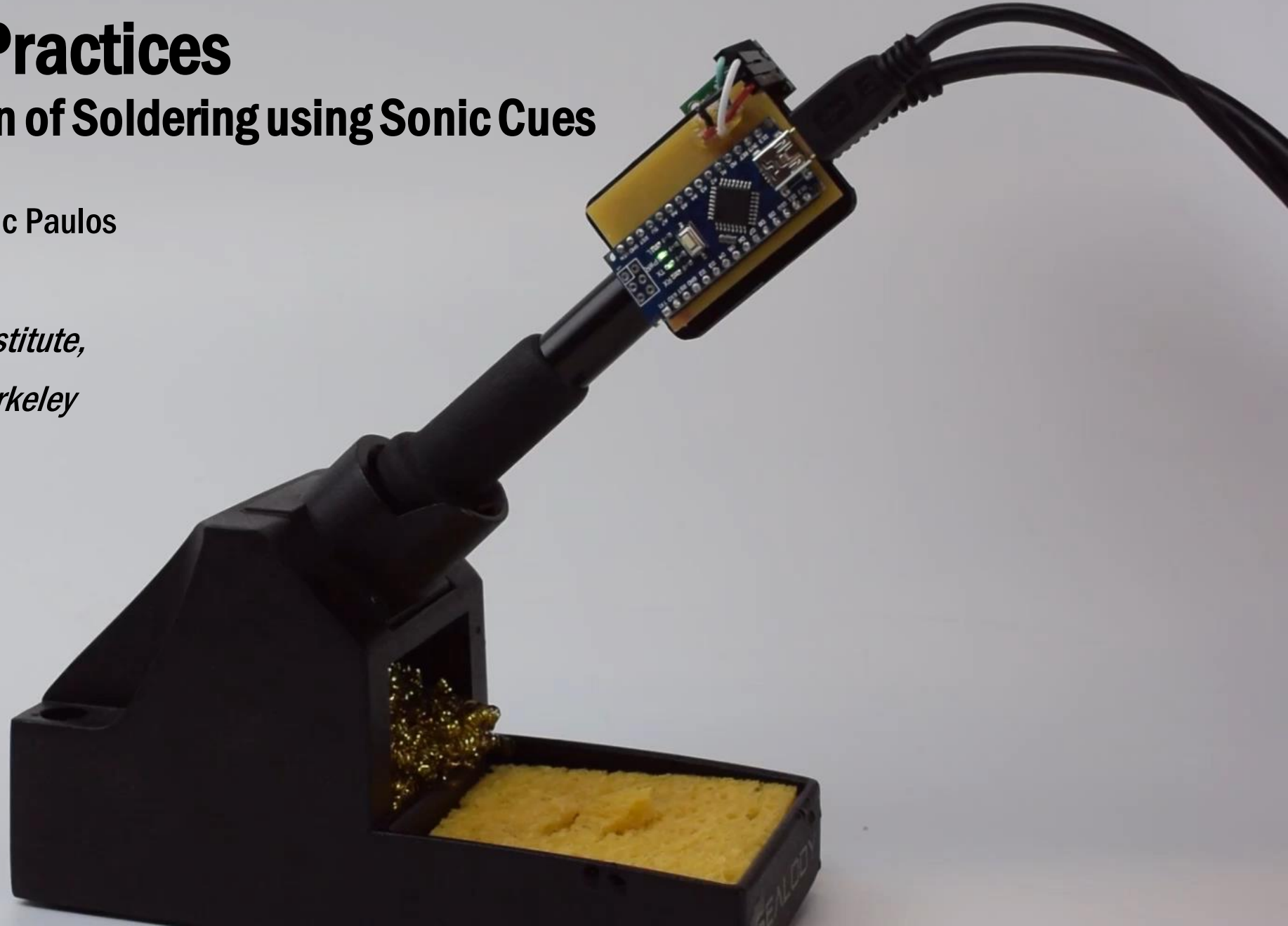
Augmenting Practices

Instructional Design of Soldering using Sonic Cues

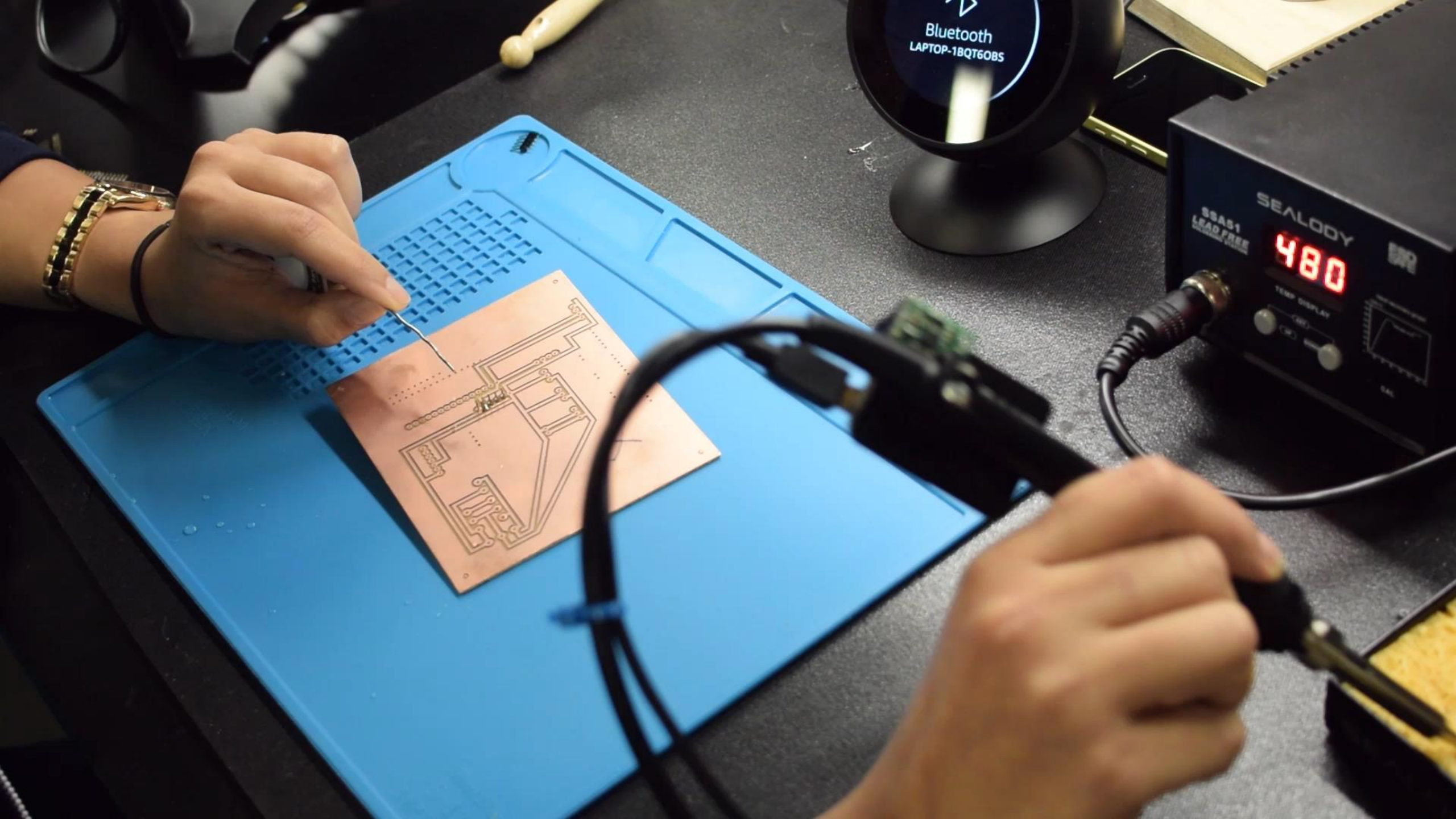
Tina Taleb, Cesar Torres, Eric Paulos

*CITRIS and the Banatao Institute,
University of California, Berkeley*

Summer 2018



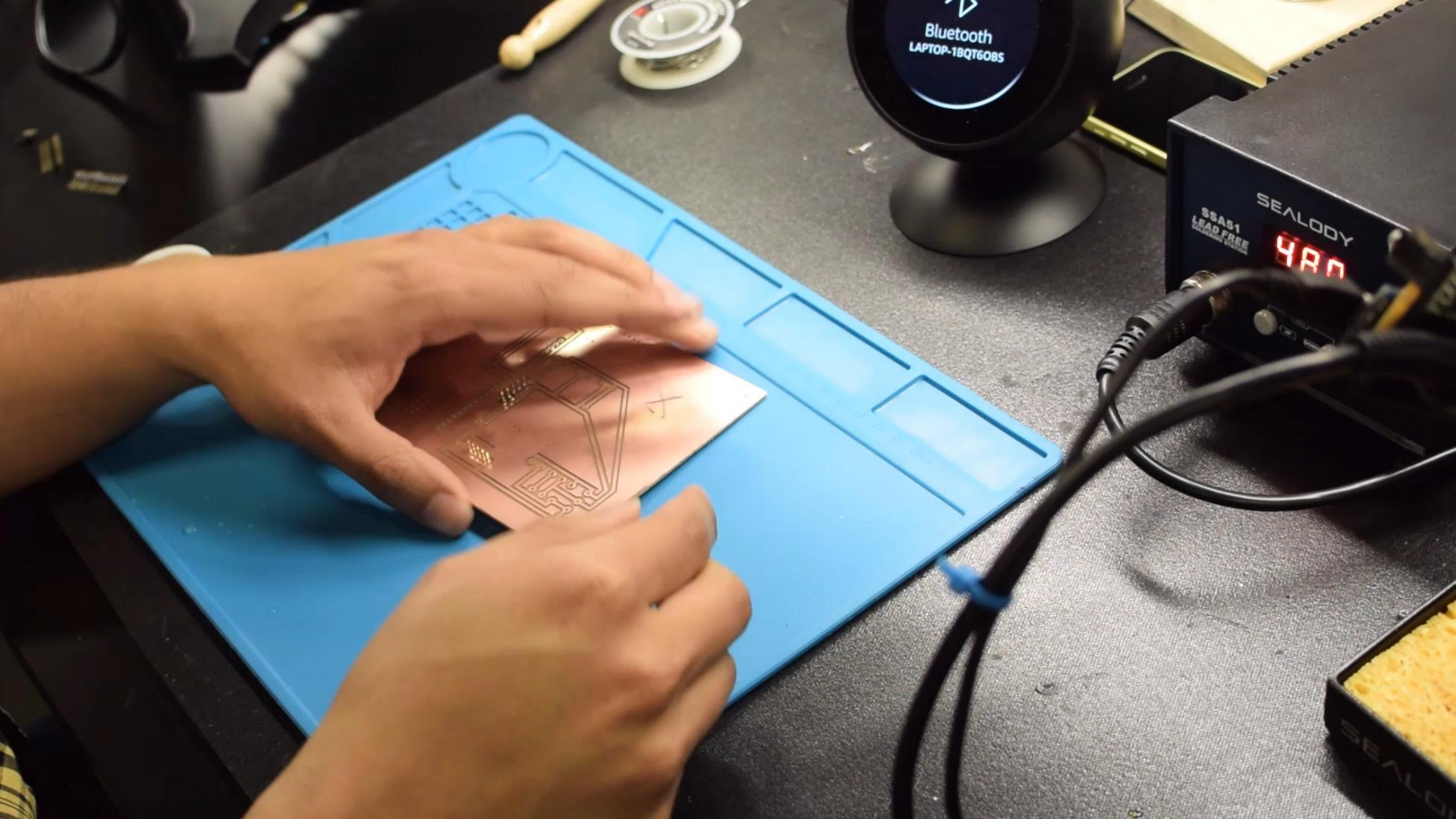
**“Language struggles with depicting physical action, and nowhere is the struggle more evident than in the language that tells us what to do.”
-Richard Sennett**



Bluetooth
LAPTOP-1BQT60BS

SEALODY
SSA51
LEAD FREE
480

TEMP DISPLAY

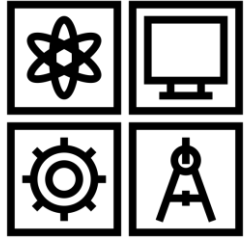


Bluetooth
LAPTOP-18QT608S

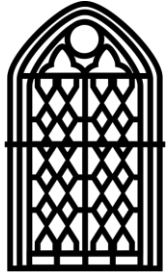
SEALODY
SSA51
LEAD FREE
DIGITAL THERMOMETER
480

SEALODY

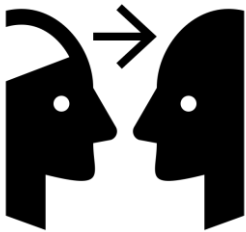
Why soldering?



Entry to STEM field



Used in electronics and stained glass



Tacit physical task

RESEARCH QUESTIONS

R1

What are design principles for conveying tacit knowledge?

R2

How can sonic cues be used to relay instruction and information?

R3

How can we characterize different sonic experiences?

Principles of Instructional Design



Concise



Abstracted

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



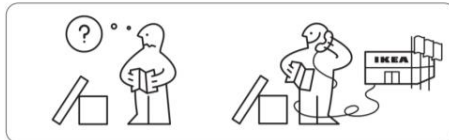
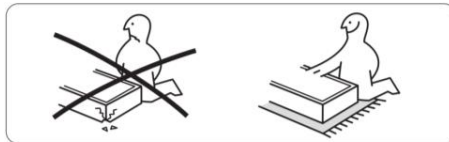
Narrated

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



Sympathetic

Places oneself in the novice's shoes.



"Nobody reads the manual"



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



"Buy 1 tilapia"



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

Elements of a Constructionist Experience

Properties

Self-Efficacy

Enjoyable & Fun

Rewarding

Effects

Collaboration

Sustain Practice

Variables

Psychological
and
Environmental
Factors

Skill Level

PROTOTYPES



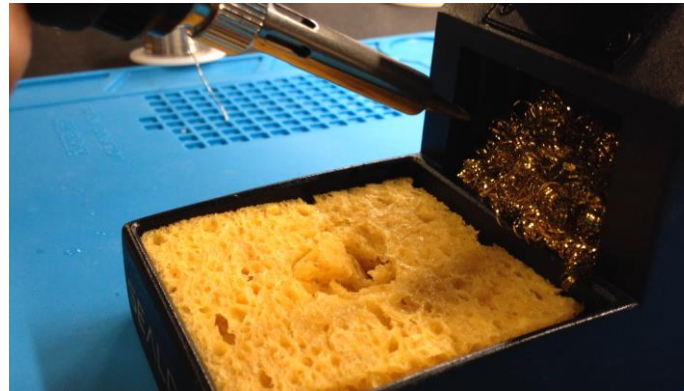
Transference



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



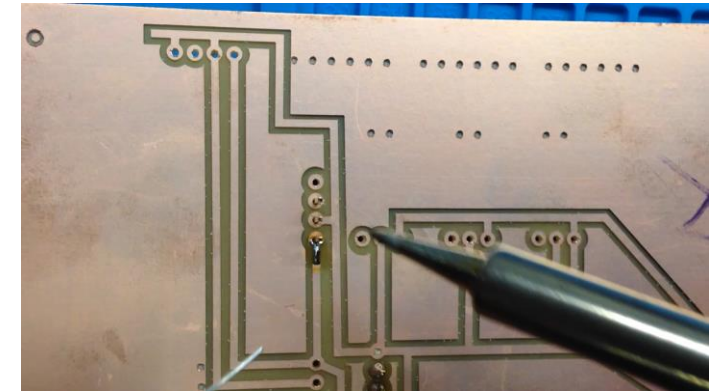
Defamiliarization



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.

EVALUATION

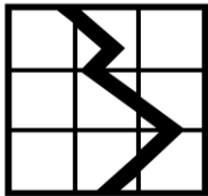
METHODS



Wizard of Oz Prototyping



Micro-Phenomenological Interview

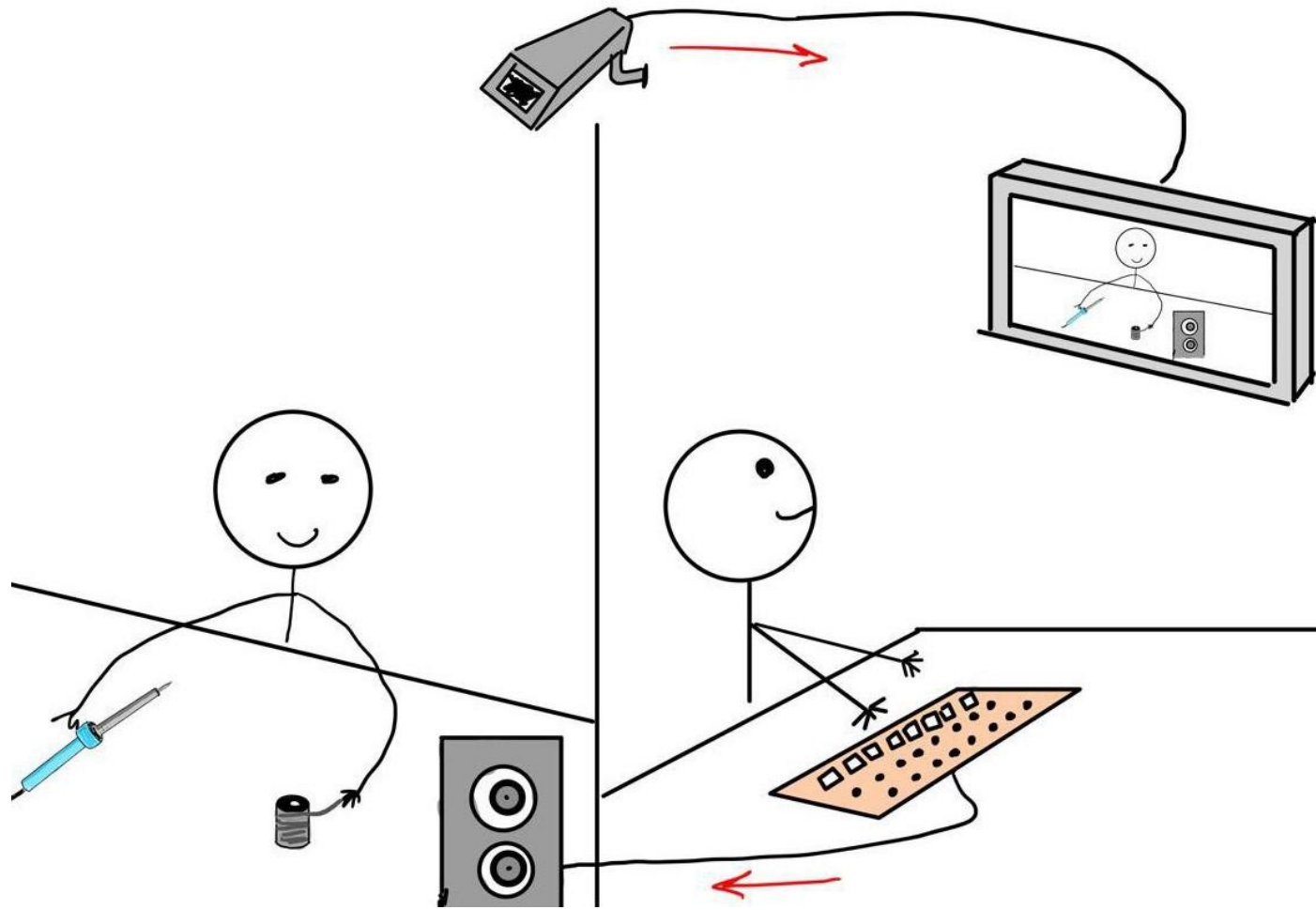


Repertory Grid



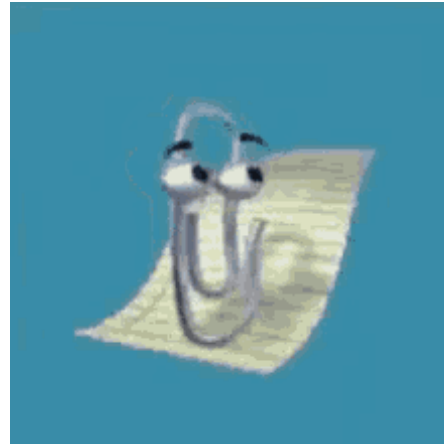
Wizard-of-Oz Prototyping

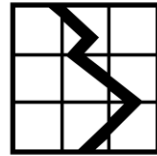
Wizard of Oz prototyping (WOZ prototyping) is a design methodology used in rapid product development to improve the user experience (UX).



Micro-Phenomenological Interview

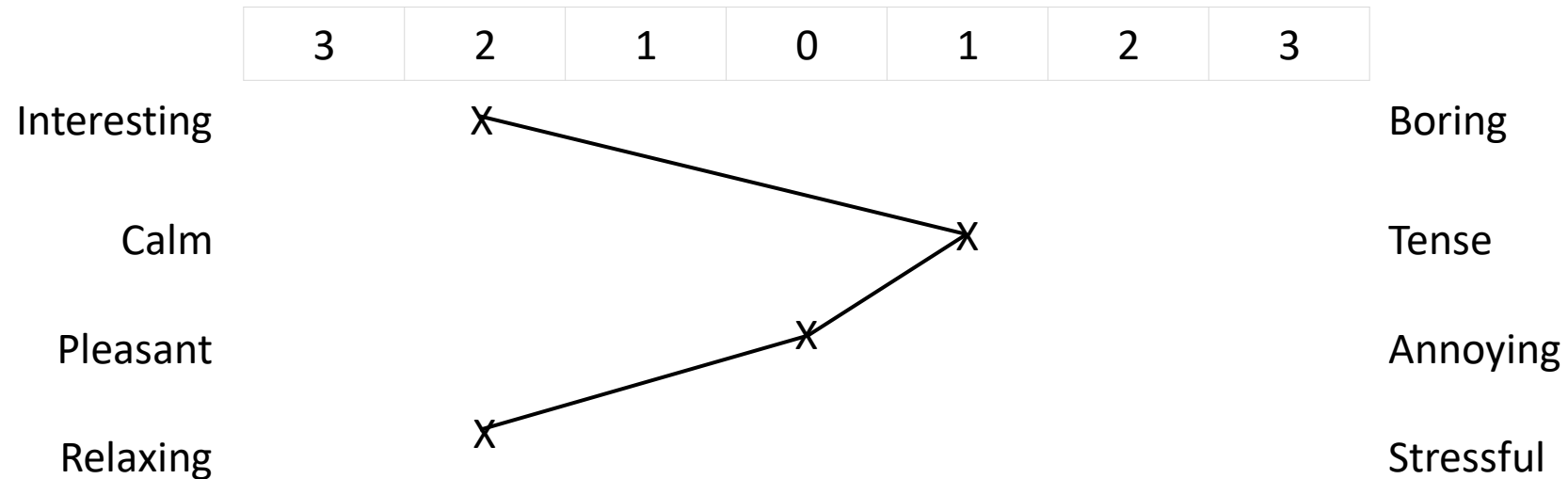
Micro-phenomenology is a method of descriptive phenomenology to help persons engaged in professional practices to become aware of the implicit part of their mental or physical actions.





Repertory Grid

The repertory grid uses the interviewee's own language and sets out their responses in the form of a grid.

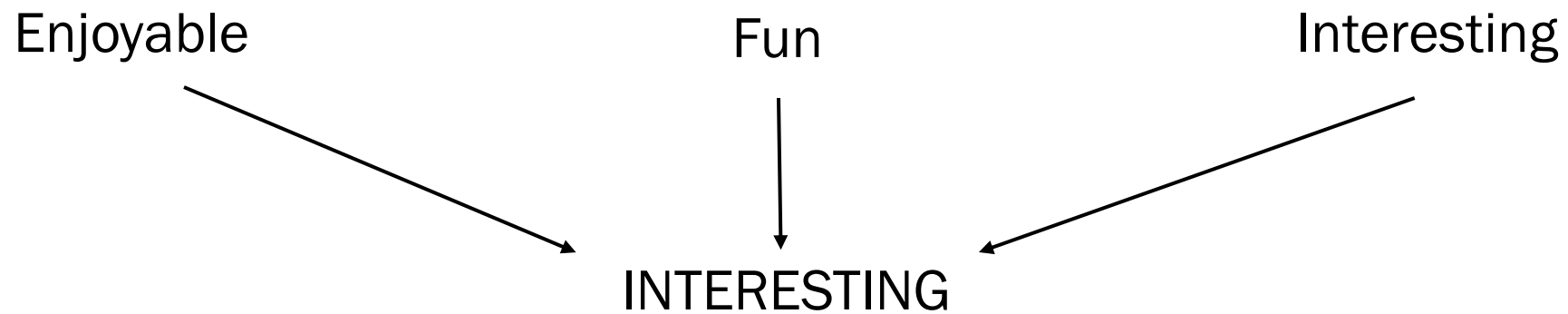


Demographics & Protocol

Pre-Study	During Session	Post-Study
Questionnaire Introduction Short interview	Name prototypes	Repertory Grid Micro-phenomenological Interview
Number of Users	Age Range	Gender
3	20 - 26	Female and Male
Profession	EECS Undergraduate and PHD students	
Experience	All had backgrounds with soldering electronics but not glass	
Frequency	Semesterly, Monthly, and only if required for Class	

Data

There were 72 poles, including repeated and similar words that we clustered to form constructs.



After clustering, we had four categories each including 4 to 5 pairs of poles.

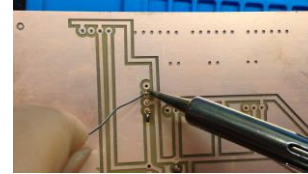
Cognition



Transference

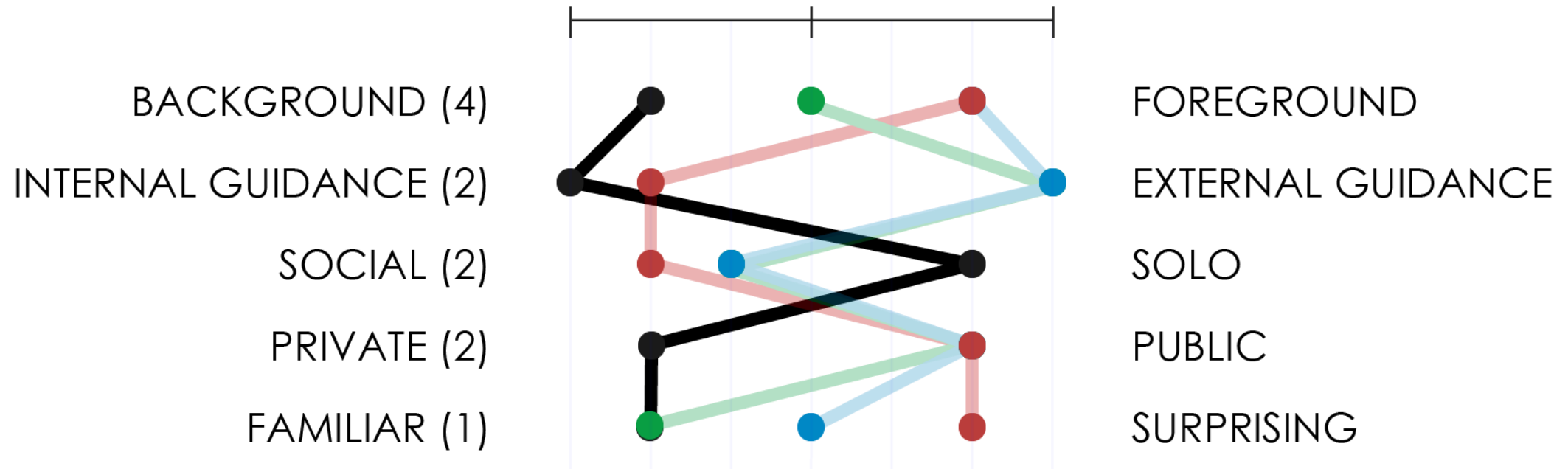


Defamiliarization



Affirmative

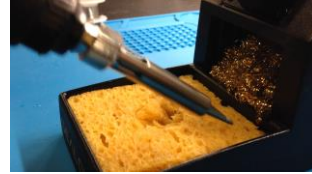
Prior Experience



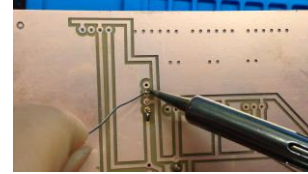
Emotion



Transference



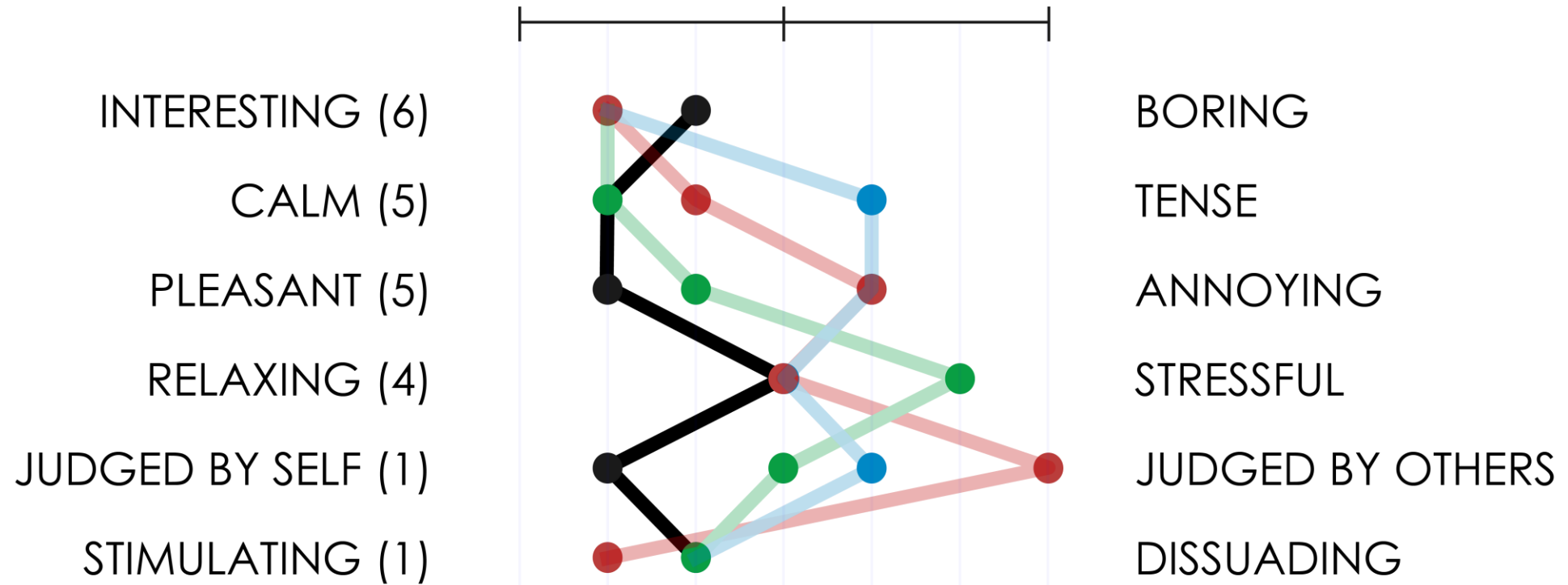
Defamiliarization



Affirmative



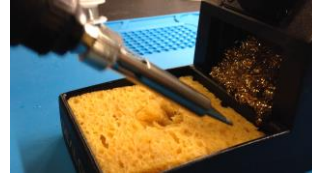
Prior Experience



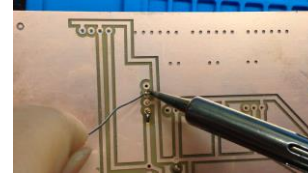
Usefulness



Transference



Defamiliarization



Affirmative

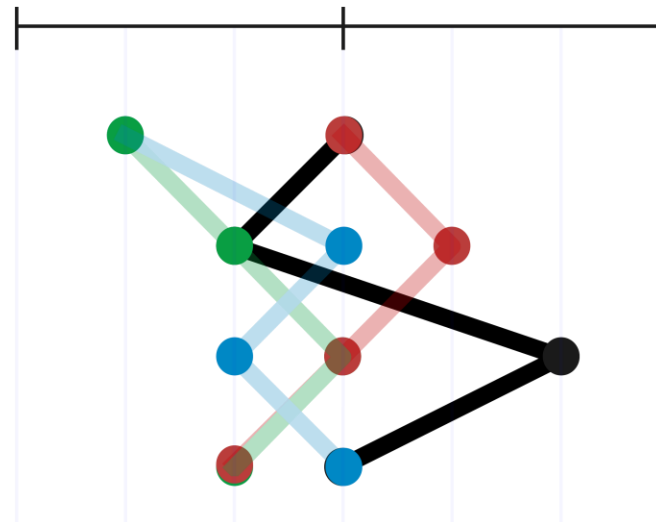
Prior Experience

EASY TO UNDERSTAND (4)

INFORMATIVE (3)

ASSURING (2)

GUIDING (1)



COMPLICATED

DISTRACTING

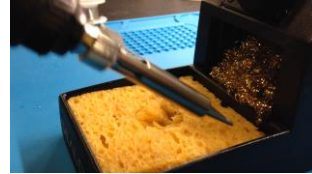
DISCOURAGING

CONFUSING

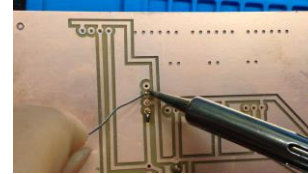
Sonic Characteristics



Transference

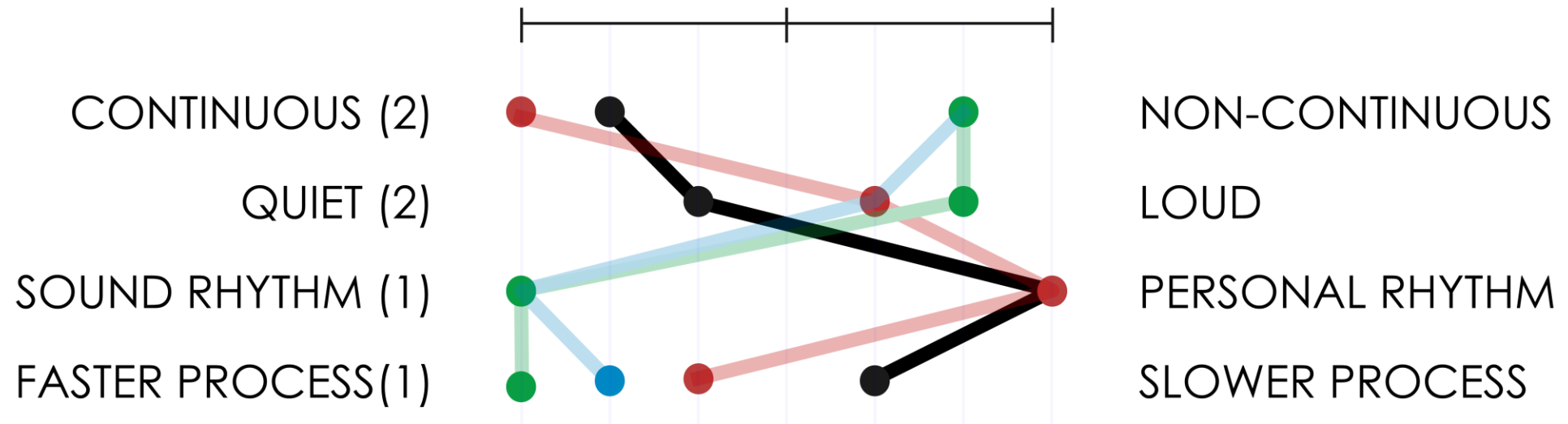


Defamiliarization



Affirmative

Prior Experience



Insights & Analysis

Investigate to understand the reason behind having negative emotion while believing the cues were useful.

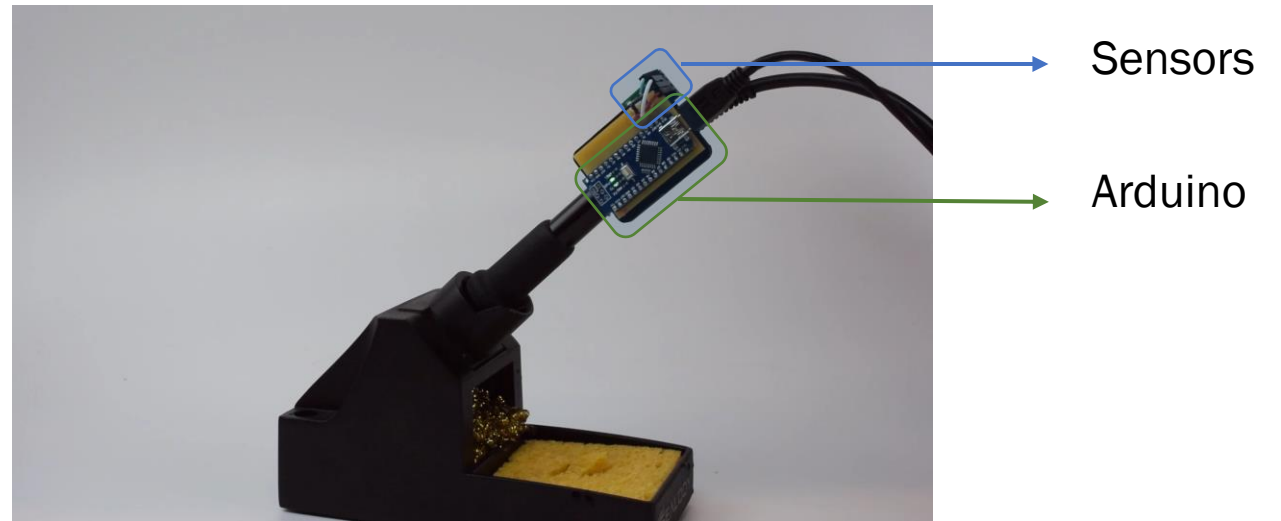
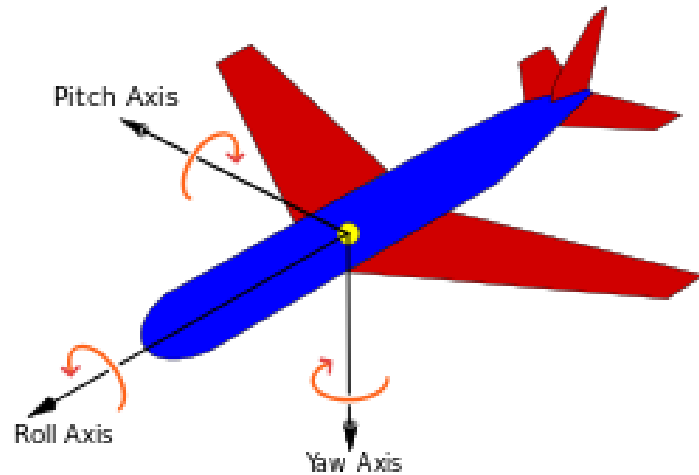


Design decision:

Continuous and low stimulus sound to keep sonic cues on cognitive background and non-distracting.

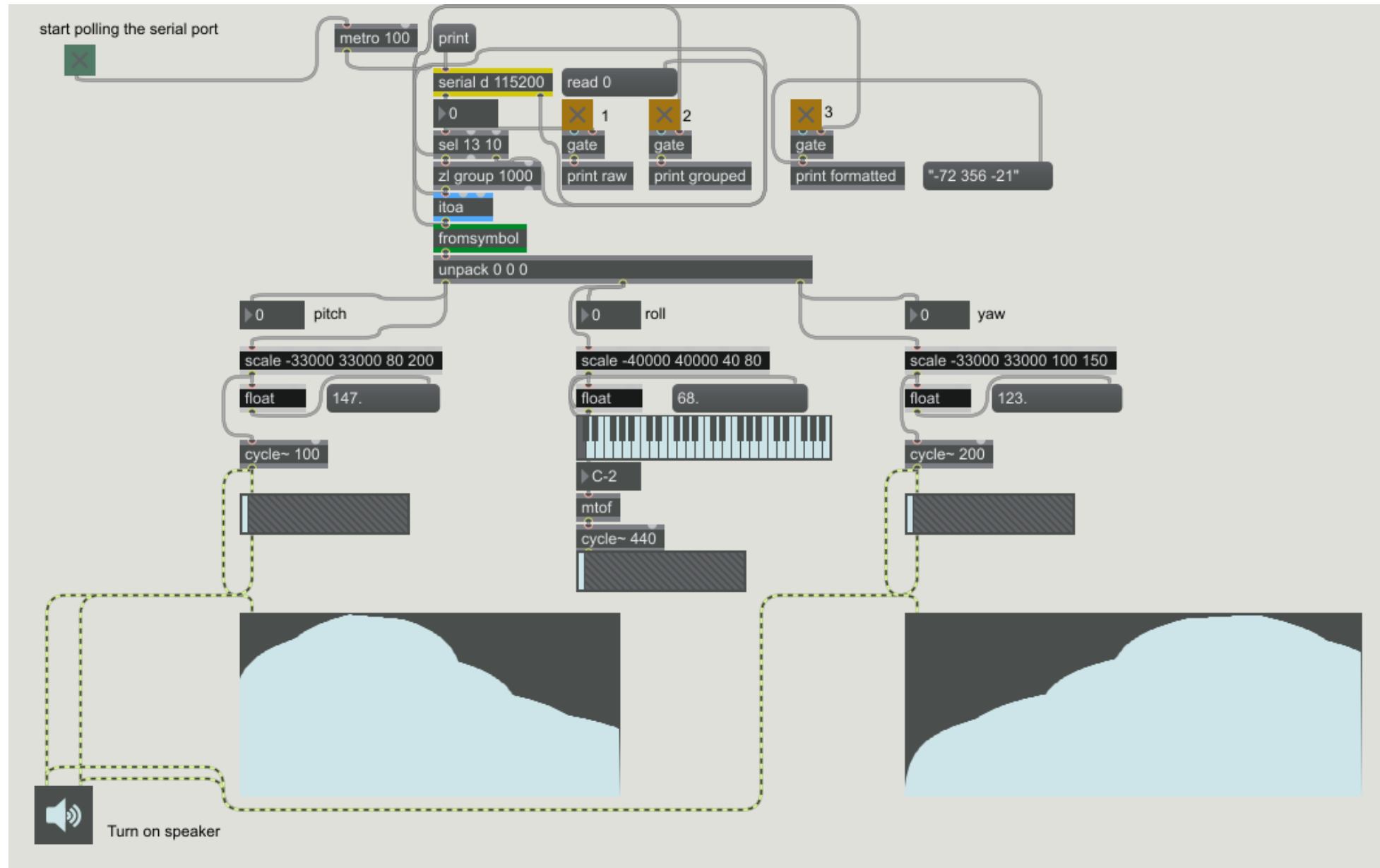
Current Prototype

We made a high fidelity prototype that binds data from inertial sensors on the soldering iron to sonic cues.



In future, we will conduct another comprehensive user study to test this prototype.

MAX / MSP



Principles of Instructional Design



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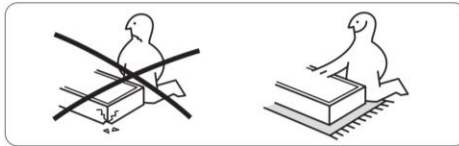
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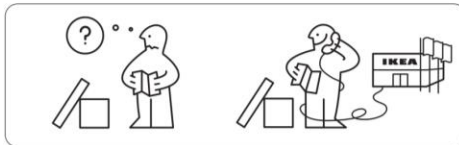


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Enjoyable & Fun

Sustain Practice

Rewarding

Self-efficacy

Collaboration

Skill Level

Psychological and Environmental Factors

Summary

