

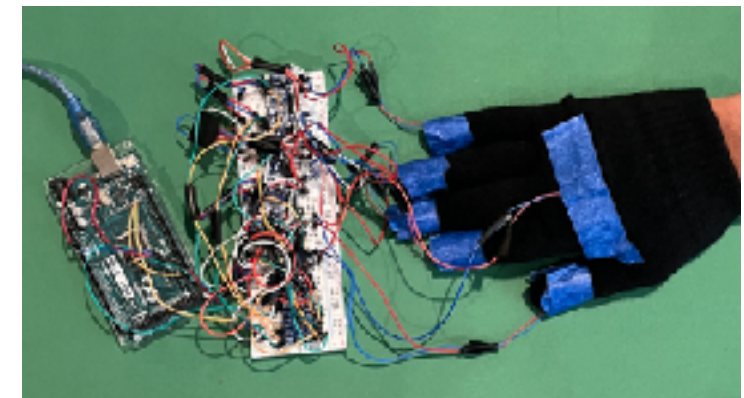
HACI

A **Haptic-Audio Code Interface** to Improve Educational Outcomes
for Visually Impaired Introductory Programming Students

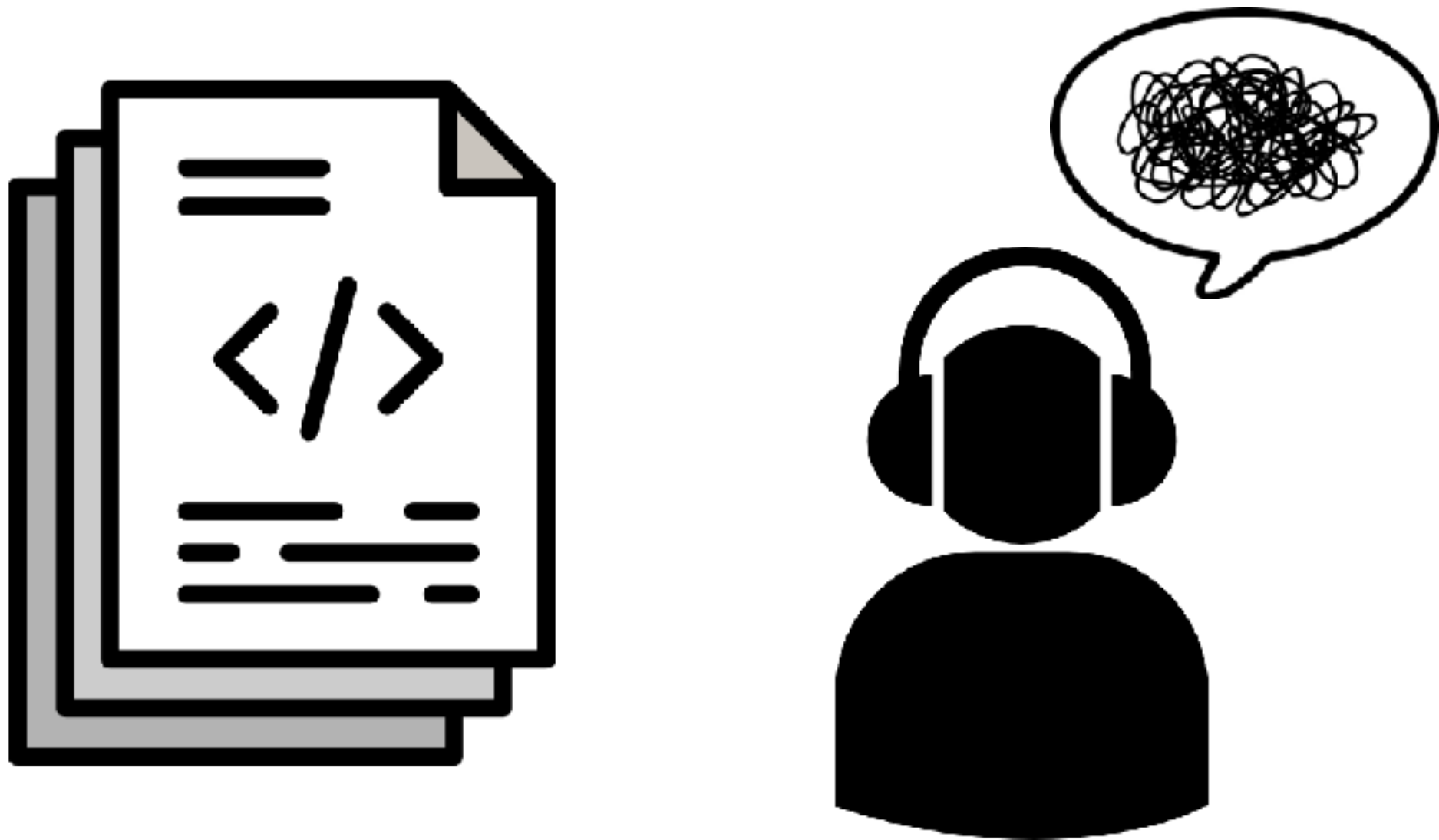
Browser IDE



Glove



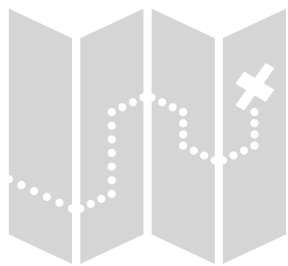
The Problem



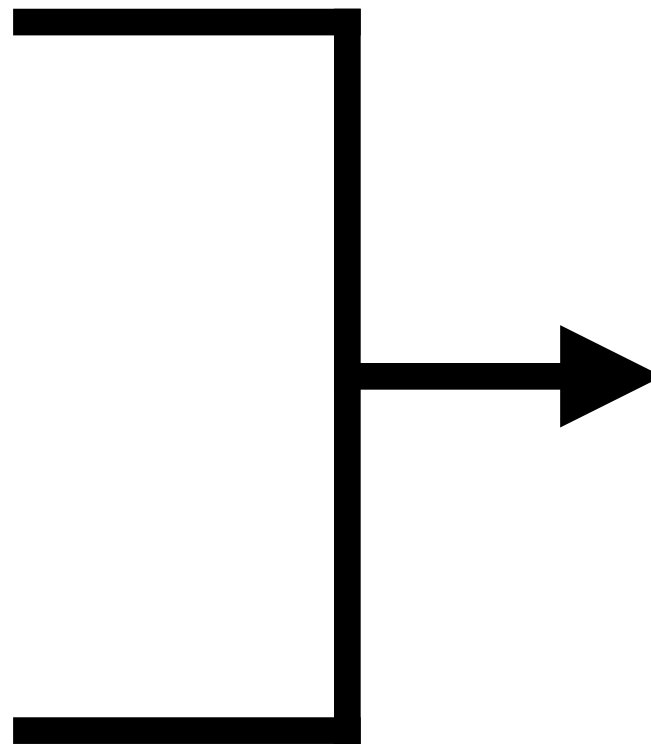
HACL in One Sentence



Audio (what)

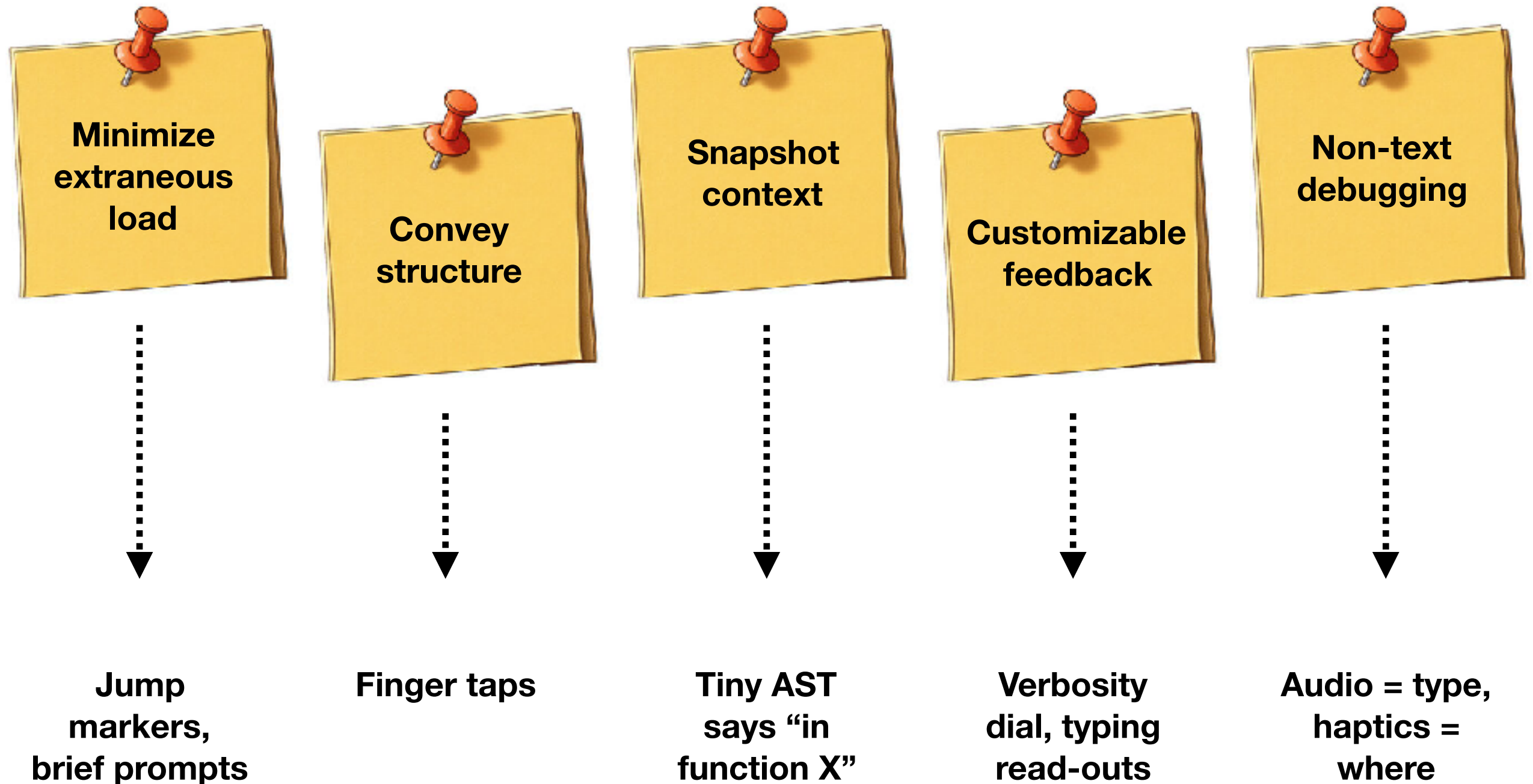


Haptics (where)

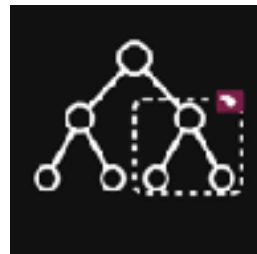


Orientation

Design Principles



System Diagram



AST Snapshot

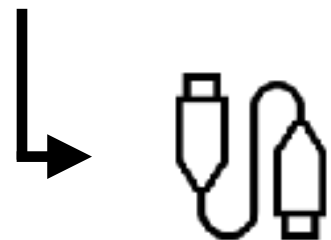


Audio Engine
Speech + Tones

User Keyboard Input



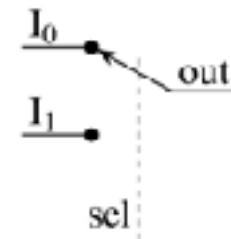
Browser IDE
React + Ace



Web Serial



Arduino Mega



TCA8548A I2C Mux



DRV2605L x6
Vibrotactors

Study Design (Lightweight, Real Use)



IRB



Participants



Tasks



Privacy

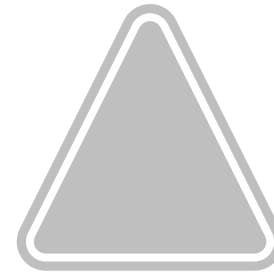
Tasks & Measures



Summarize



Edit



Debug

Timer



**Compiler
Error Counter**



**Feature
Usage Logs**



What Worked (and Didn't)

Helped

Short, well-timed cues

One signal = one meaning

Audio & haptics in sync

User “amount” dial

Hurt

Verbose cues

Overlapping channels

Channel drift

Single fixed default



Limits & Next Steps



**Recruit VI
Participants**

**Longer
Summer
Camp Study**

**Generalize
to HRI**

Research Habits I'm Keeping



Define “better” before you build; instrument it



Schedule multimodal cues very intentionally



Prefer reliable fixes over clever ones



Ethics is part of design, not paperwork



Keep users in control of “amount”