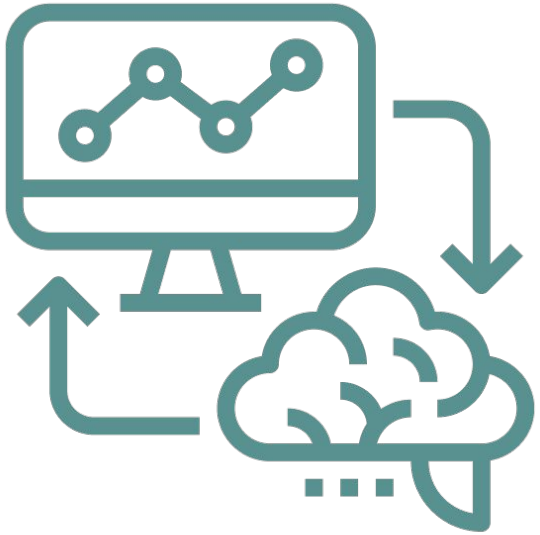
How the Appearance of Brain-Computer Interface (BCI) affects People's Perceptions.

By Wesley Deng and Isabella Dyc-O'Neal
Advised by Dr. Niloufar Salehi



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Research Question

How does the appearance of BCI head-mounted devices affect people's perception of this technology?

Methods

Formative Survey

We created and sent out an online survey to get preliminary information about people's familiarity and perceptions of BCI devices.
We had 64 responses, n=64.

Design Prototypes

We designed and prototyped 4 head-mounted BCI 3D models each accentuating one of the most valued factors from our survey results.

Interviews

We conducted 8 semi-structured interviews using our 4 prototypes to see people's reactions and gain further insights about important factors of appearance.

Background

Brain-Computer Interface (BCI)

Brain-computer interfaces (BCIs) acquire brain signals, analyze them, and translate them into commands that are related to output devices that carry out desired actions.

Definition by Shih et al.

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Photo Credit: He et al. at CMU

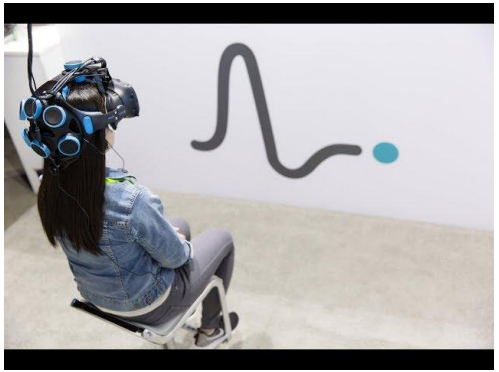

Photo Credit: Nerable

Photo Credit: BioSense, Information School, UC Berkeley

Background

Why the appearance of BCI?

In Human-Robot Interaction(HRI), the appearance of the robot has been extensively studied.

Robot vs BCI: similar emerging technologies.

Survey

What factors do people value most for head wearables?

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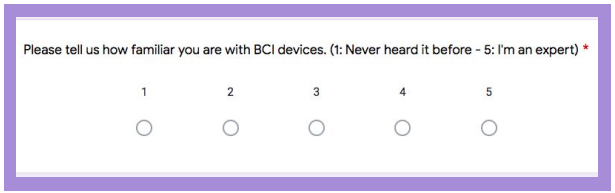


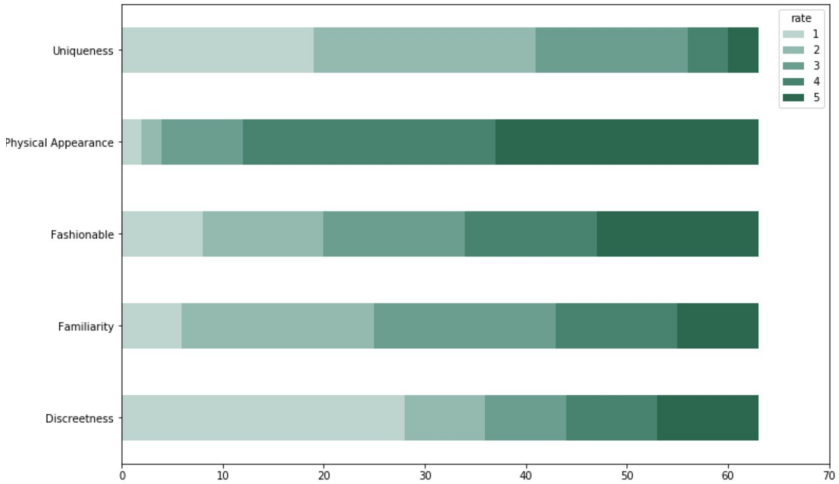
Context Questions

BCI devices

Regular Head Wearables

Survey Results (n = 64)

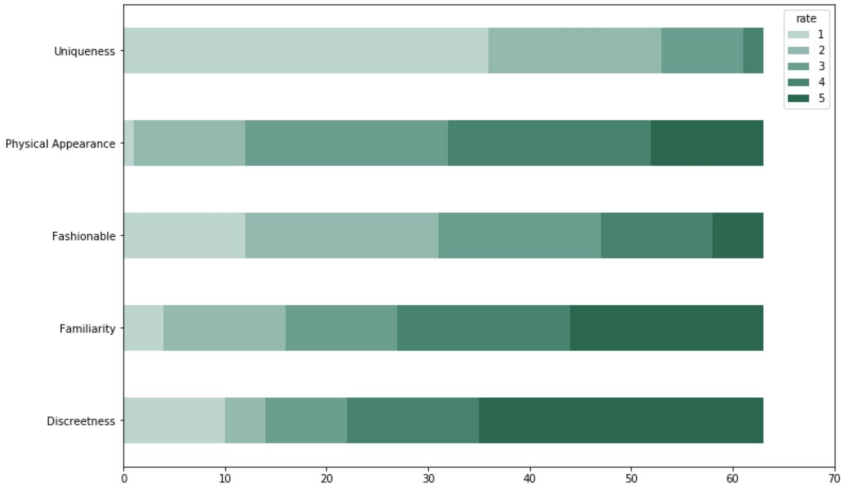
Regular Head Wearables



Top factors

1. Physical Appearance
2. Fashionable

BCI Devices



Top factors

1. Discreetness
2. Familiarity

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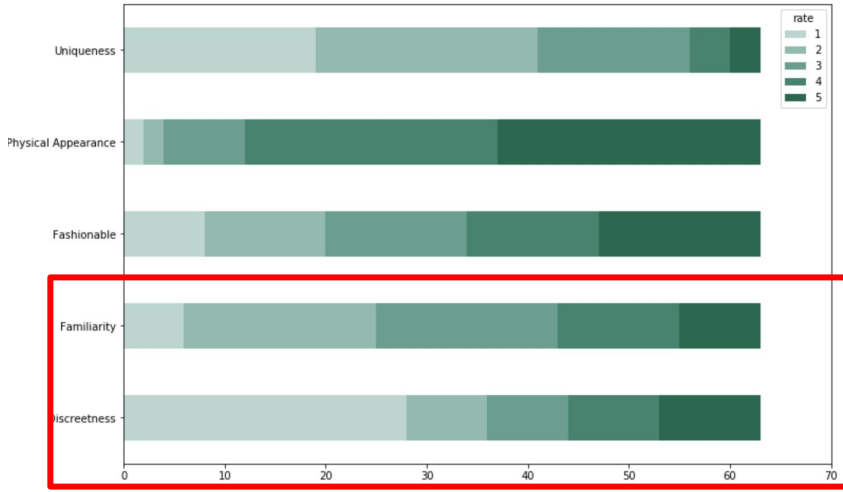

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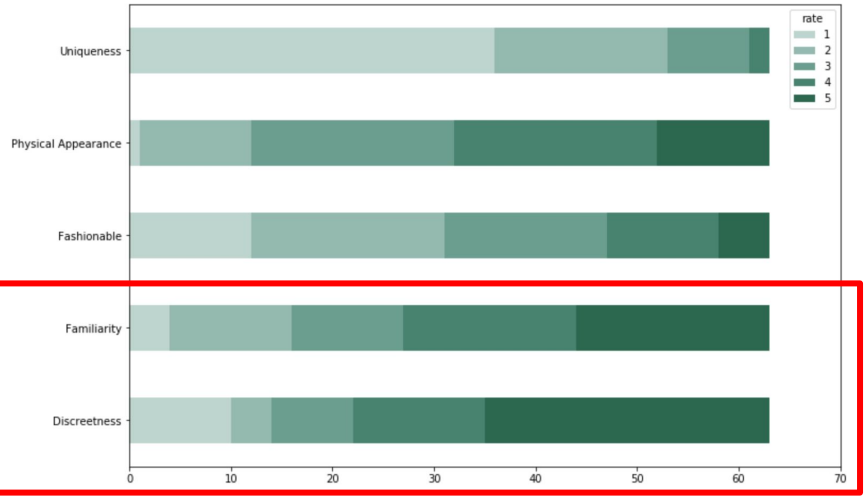

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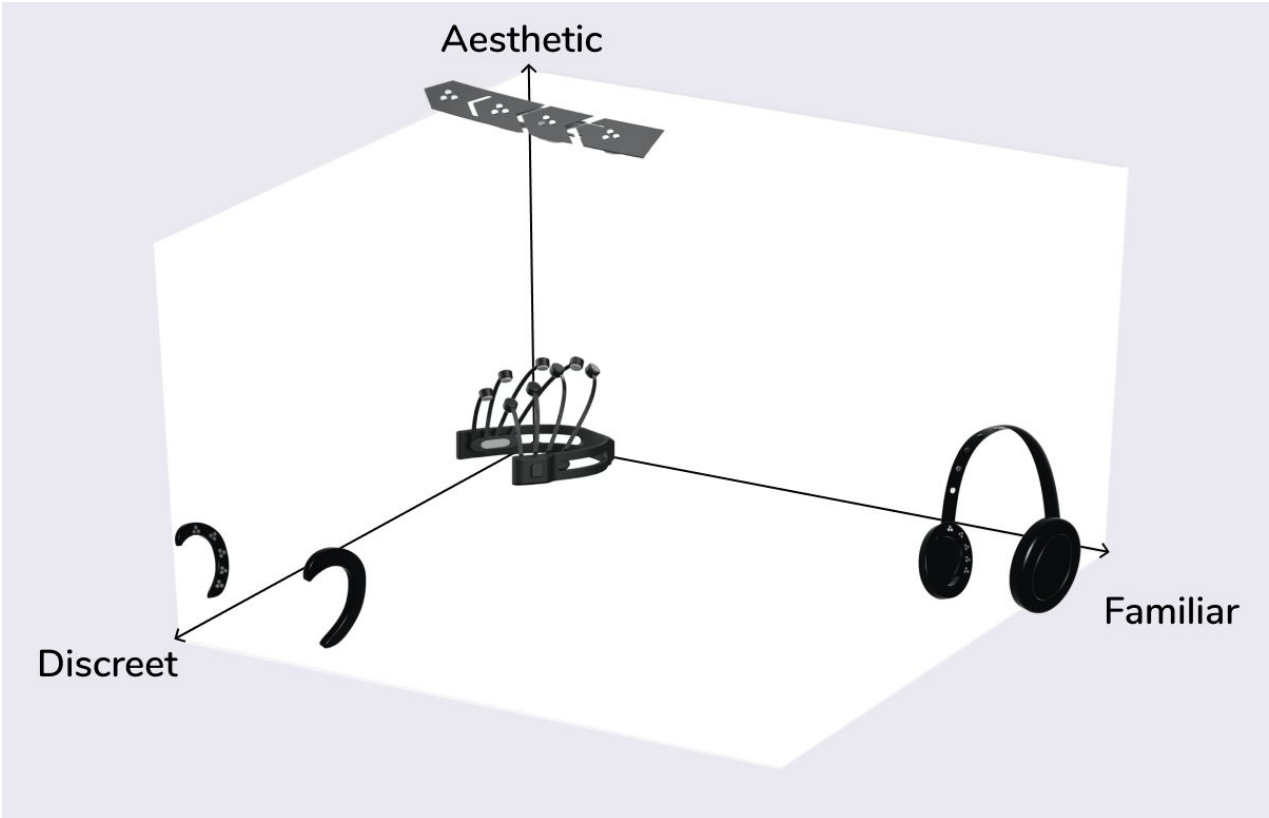
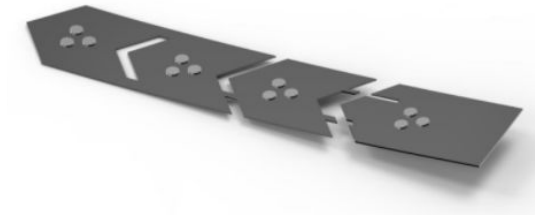
Covering the design space



Designing the Prototypes

Discreet Model

Aesthetic Model



Familiar Model

Outrageous Model

By Dylan Arceneaux

By Lei Jiang

Interviews with the Prototypes

Participants

- 8 total
- 3 experts, 3 familiar, 2 unfamiliar

Logistics

- Zoom 45 min - 1hr
- Share screen to 3D models
- Recording if permitted.

Interviews with the Prototypes

Reaction Cards

Individual Prototype Questions

"Based on appearance, would you use this device?"

"What would you think if you saw others wearing this device?"

Overall Questions

"Which device would you be most likely to use?

"Under what scenarios would you use each of these devices?"

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Results

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Familiar →

Outrageous →

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Familiar →

"The headband seems too thin"

"Maybe it could collect brain data while listening to music"

Outrageous →

"I would think it would be more comprehensive"

"I wouldn't want to wear this in public because people would think something is wrong with me"

Results

People use the head placement of BCI to infer functionality more so than the appearance.

Familiar model “should detect something about speech and words as it’s near the temporal lobe.”

Aesthetic model “[is] placed at the frontal cortex, might be related to emotion or some other high-level thinking analyzing.”

Discreet Model: “What does this part of the brain do? Is that the temporal lobe? I’m not sure what the temporal lobe does but it [the functionality] would have something to do with that.”

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Revealed informations are not evenly distributed among the users.

Discussion & Future Work

- Larger and more diverse sample size
- Create higher fidelity prototypes and conduct in person testing
- Cover a greater amount of design space by making more models