

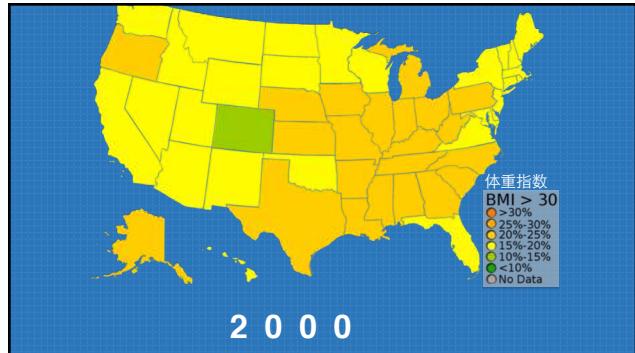
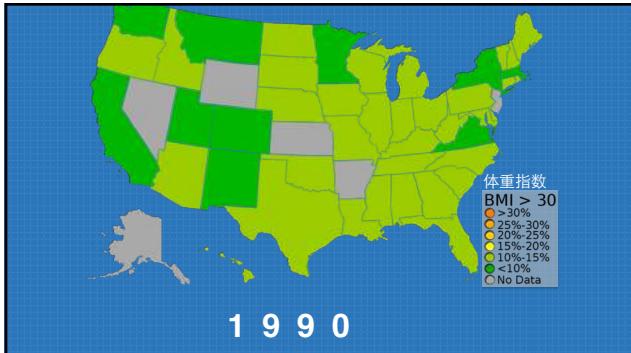
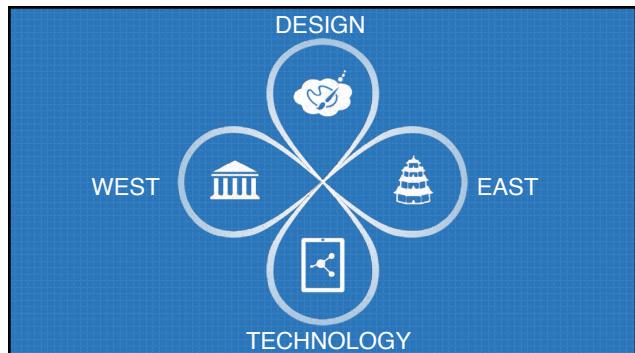
# Designing & Prototyping Smart Applications

ViaX James Landay CS Summer School

Summer 2018

Prof. James A. Landay

Stanford University



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**SURPRISING RESULT**  
 出人意料的结果

Thought activity inference the **key** feature  
 以为活动的准确判断是最重要的特性

3-month field trial (n=28)  
 3 key conditions
 

- full system (garden/activity)
- no activity inference (garden)
- no garden/ambient display (activity)

Only **garden** participants maintained exercise

**Ambient display is the key feature!**

示范性界面是最关键的特性



**UBIGREEN**  
 TRANSPORTATION DISPLAY  
 交通工具形象展示

Froehlich, et. al.,  
 CHI 2009

**SURPRISING RESULT**  
 出人意料的结果

Thought ambient display simply for information

4-week pilot study (n=12)

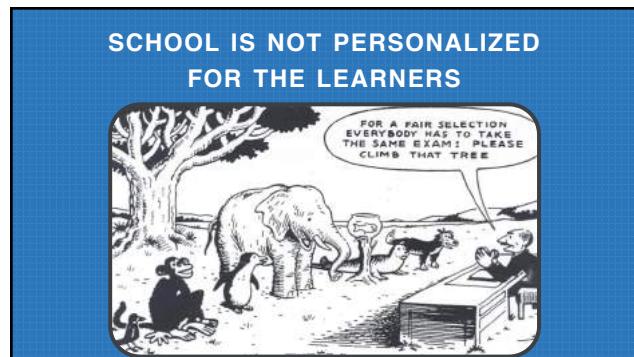
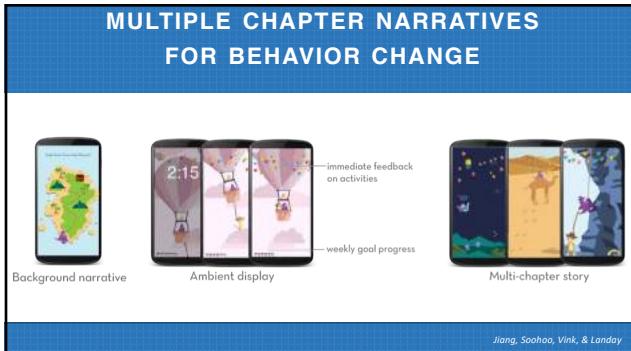
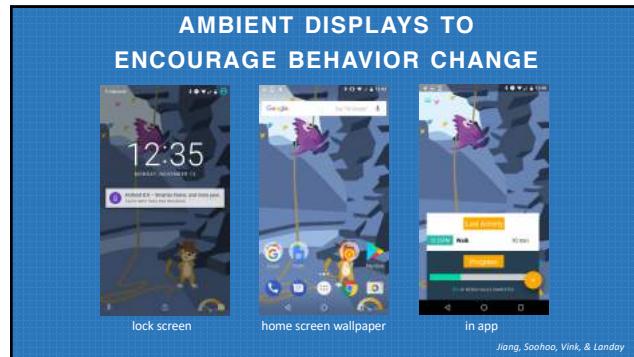
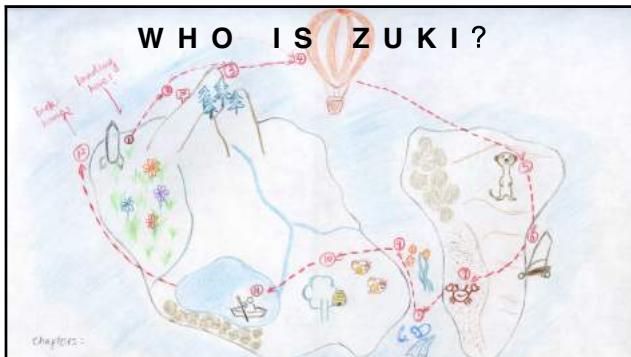
Results
 

- several wanted to keep using
- saw some behavior "change"
- many liked unfolding **story** or **game**

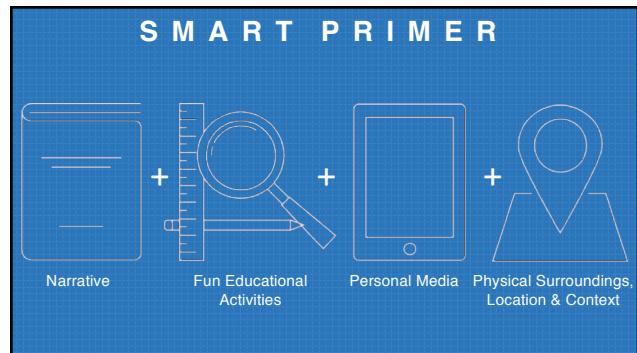
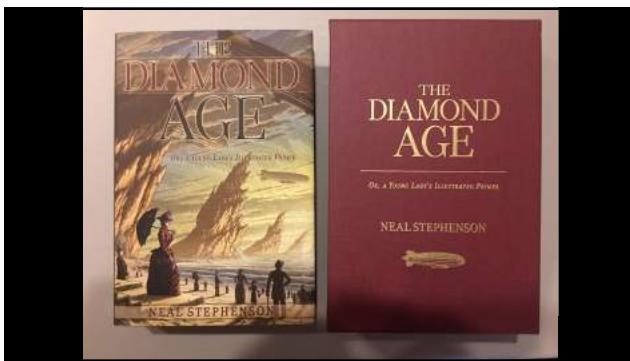
**Use story to drive long-term engagement**

使用故事驱动用户长时间的参与

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**Archimedes Story**  
by Smart Primer Group

Hello there! I'd like to tell you a story. But first, tell me a little about yourself.

My first name is:   
My gender is:  Female  Male

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**Archimedes Story**  
by Smart Primer Group

**The History**

For nearly one hundred years, the ancient Syracuse and Carthage had been at war as ruler after ruler fought each other for the throne. Finally, in 275 BCE, the troops from Syracuse grew weary of the inefficiency and selfishness of their leaders and elected commanders from amongst themselves. One of their chosen leaders was a young general named Hiero.

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returned to the king with a beautiful and intricate crown in the form of a laurel wreath, just as the king had requested. This crown weighed exactly the same as the gold the king had given to the smith and King Hiero, pleased with the work, rewarded the goldsmith.

King Hiero began preparations for the ceremony in which he would place the crown in the temple. But something has gone wrong. The king is *furious*, the festival has been put on hold, and the city is in turmoil.

**Sherry's Task**

Sherry is to travel to ancient Greece, figure out what is causing the king's anger and creating so much tension in the city, and fix the problem. Don't forget, it can get very hot in Greece; bring a disposable plastic water bottle back with you.

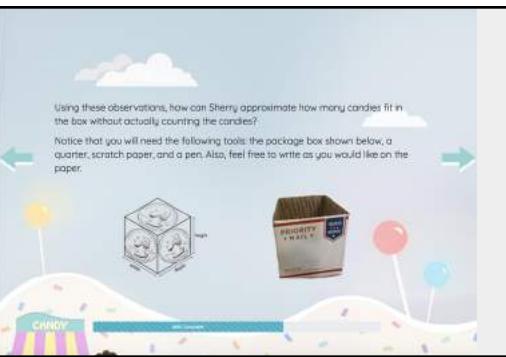
**Ready to go undercover?**

Move on to the next page when you are ready to proceed.

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"have. You see that box over there," the confectioner gestured to a large crate. "It's filled with sesame candies and I need to know how many there are. The number doesn't have to be exact, a good approximation'll do. But if you count that real quick and let me know what's left, I can tell you what I know about the crown, although I'm warning you, it isn't much."

Looking at the crate, Sherry noticed it was about the size of a shoe box, and each cube-shaped candy had the width, height, and depth that was about the same as the diameter of a quarter. The crate was about half full. Sherry decided that instead of counting the candies, he'd approximate how many could fit in the box.

Using these observations, how can Sherry approximate how many candies fit in the box without actually counting the candies?

Notice that you will need the following tools: the package box shown below, a quarter, scratch paper, and a pen. Also, feel free to write as you would like on the paper.

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MISSION  
Optimize = Weight of the Displaced Water

**MISSION:**  
Find the volume and mass of the bottles with air and the bottle filled with dust. You may find that submerging the bottles in a large bowl of water and measuring the amount of water you displace may help you measure the volume of the two bottles.

[Click here for more hints](#)

 <b>Air Filled Bottle</b>	<b>Dirt Filled Bottle</b>
Mass (in grams): <input type="text"/>	Mass (in grams): <input type="text"/>
Volume (in mL): <input type="text"/>	Volume (in mL): <input type="text"/>

[Next](#)

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density than a lesser material such as silver. The density of gold is 19.32 grams per cubic centimeter.

"Now, I'm desperately in need of a bath, but I think with this knowledge we have enough information to solve the king's problem. Don't you? Will you write up a proposal for an experiment and bring it to me in the bath house just down the street when you are done?"

 **How will you determine whether the crown is gold or not?**  
Can we figure out the weight and volume of the crown? How?

Once we have the weight and the volume, can we find out the density? How?

What if the density is less than 19.32 grams per cubic centimeter? What if it's more?



## CHATBOTS WILL CHANGE THE FUTURE OF EDUCATION

*Even the most complex and subjective disciplines could be taught with the help of educational chatbots as tutors.*

— Bill Gates

## DOMAIN-SPECIFIC CHATBOTS

What are the units of density? What are coordinates?

How do I measure volume?

What's density?



## INTEGRATING CHATBOTS WITH ACTIVITIES

Sophia's Task

Now it's your turn to find how many candies the candy man has in the boxes in the picture below, while the bot measures its strong axis of the width, height, and depth. Then answer the first question below by writing what you can always get from your personalized tutor Sofya!

How many candies does the candy man have in the box?

Do the numbers need to be the same?

Not necessarily! It is not a cube.

From your message

## INTEGRATING CHATBOTS WITH ACTIVITIES

Sophia's Task

Now it's your turn to find how many candies the candy man has in the boxes in the picture below, write how many cubes fit along each of the width, height, and depth. Then answer the first question below by writing what you can always get from your personalized tutor Sofya!

How many cubes does the candy man have in the box?

400

I solved it!

To be the winner

Not necessary! It is not a cube.

Ack! Wrong!

No your measurements are completely correct!

Yeah!

Remember that the box is a cube!

So how many cubes will you have?

Perfect!

Type your message

## INTEGRATING CHATBOTS WITH READING

The Story of Taro and Cari

Once upon a rainy afternoon, there was a lot of water in the forest. After the mother died, she and her father had to migrate for one day. Taro's father married again, this time with a widow who also had a young daughter named Cari. They all lived together in a small hut and together peacefully. The water from the forest passed away, everything changed in the hut. Taro's stepmother was mean and terrible. She didn't let Taro eat, sleep, or play. She always puns Taro off. One day, Taro and Cari went to the forest to collect mushrooms and learned that the owl was their mother. They were very happy to see their mother again. They picked wild berries.

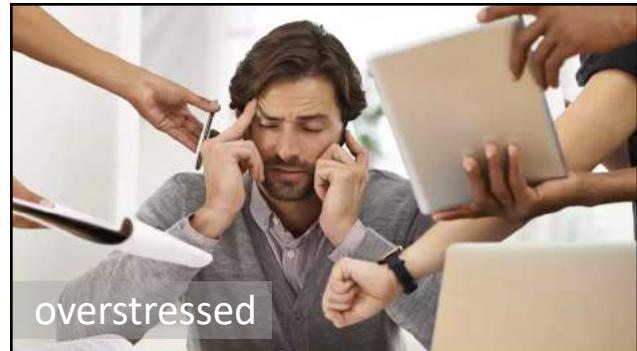
Why did the owl choose Taro?

Because she was mean and terrible.

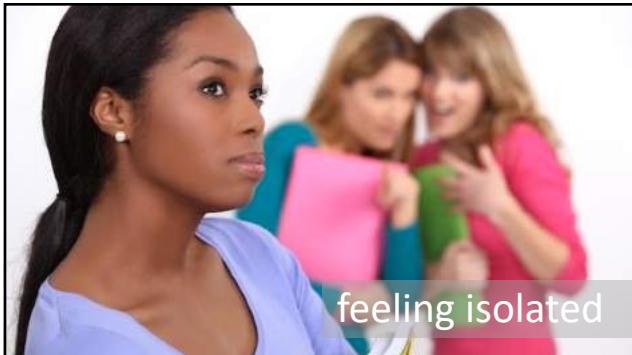
It's raining outside now.

If I leave a message without tracking him.

owl with a speech bubble



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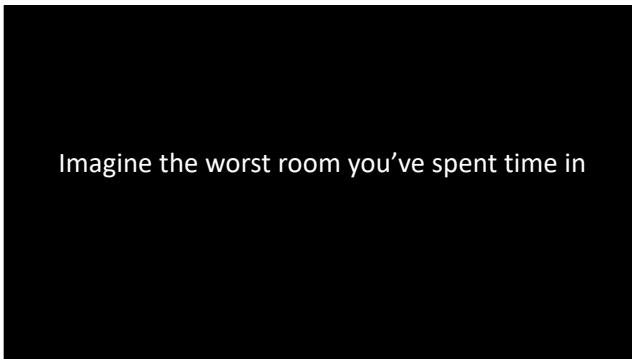
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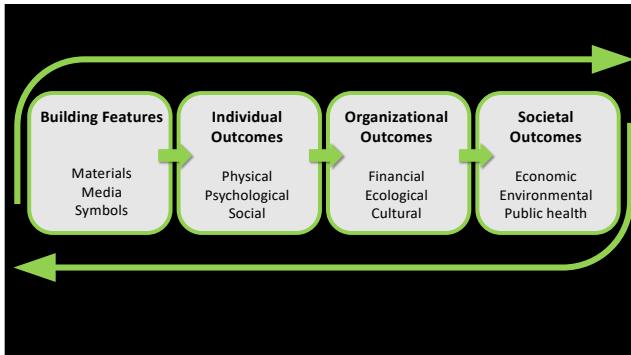
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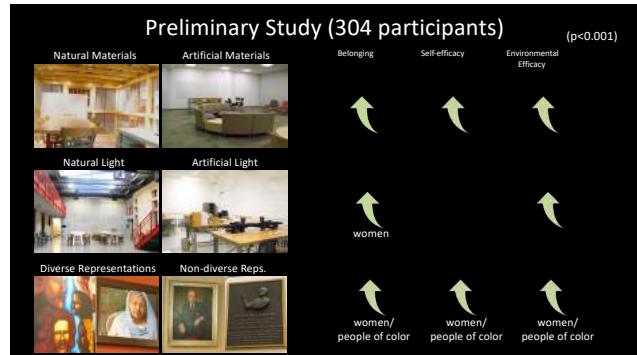
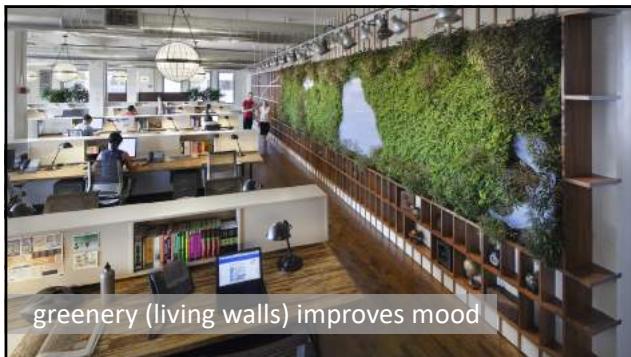
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“We shape our buildings;  
thereafter *they shape us.*”  
– Winston Churchill



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## How Can Our Buildings Support Wellbeing?

"When you cannot **measure it**...you have scarcely advanced to the stage of *science*."

- Lord Kelvin

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### Establish the Science

- Technology
- Experiments

## How Can Our Buildings Support Wellbeing?

"When you cannot **measure it**...you have scarcely advanced to the stage of *science*."

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### Establish the Science      Understand Acceptance

- Technology
- Experiments

### Understand Acceptance Constraints

## How Can Our Buildings Support Wellbeing?

"When you cannot **measure it**...you have scarcely advanced to the stage of *science*."

- Lord Kelvin

### Establish the Science      Understand Acceptance      Design Adaptations

- Technology
- Experiments

### Establish the Science

#### Lab Studies

Stanford

#### Field Studies

Stanford

wework

Google

view



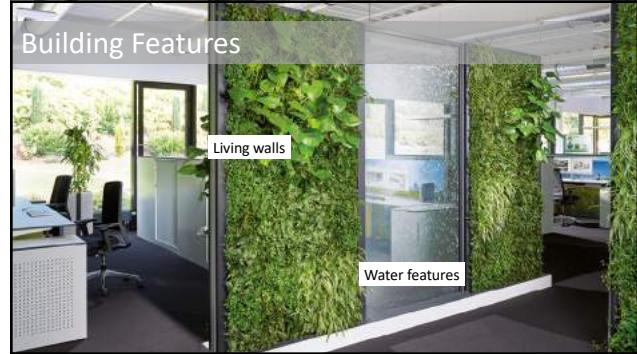
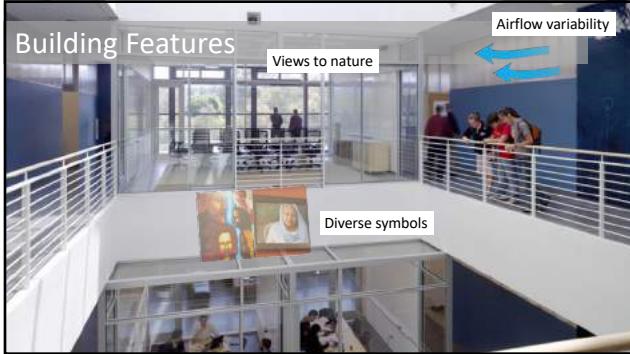
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## Measuring Wellbeing Outcomes

**Personal Devices**  
Phones  
Wearables  
Computers

**Building Data**  
Occupancy  
Temperature  
Air flow / quality  
Water / energy use  
Recycling / waste

**Outcomes**  
Stress  
Belonging  
Creativity  
Physical Activity  
Environmental Behavior

**Self-Report**  
Experience-Sampling Method (ESM)

## Technology We Will Use to Measure Belonging

Occupancy sensor  
Other people nearby



## Privacy, Consent & Control, Security Research



User concern over data collection & data security is legitimate

- Mixed methods assessments w/ stakeholders
  - understanding of & comfort level with collection of data
  - how do individuals communicate privacy preferences?
  - what designs improve willingness to live w/ this tech?
- All studies are opt-in
  - mechanisms for users to view & delete their data
  - clear notice in public spaces of any data collection
- Security
  - all data secured with current best practices
  - ML algorithms that anonymize underlying data (e.g., speech)
  - restrict analysis & queries of data

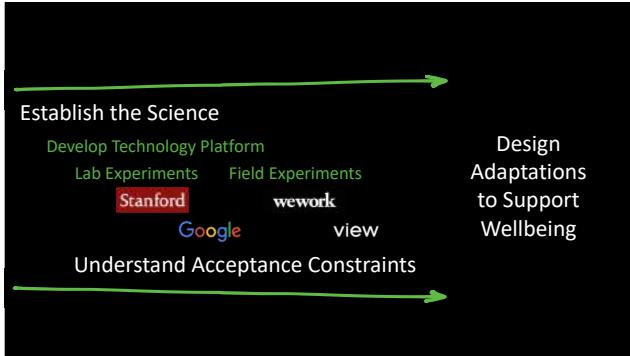
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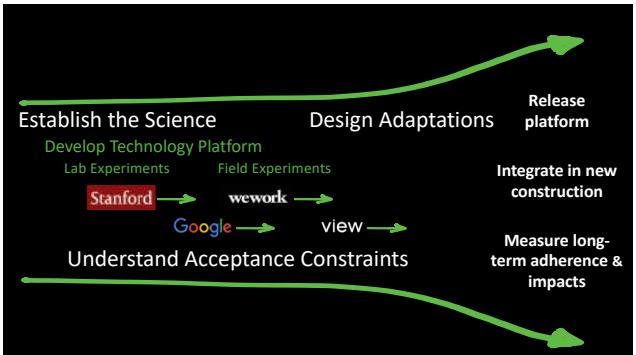
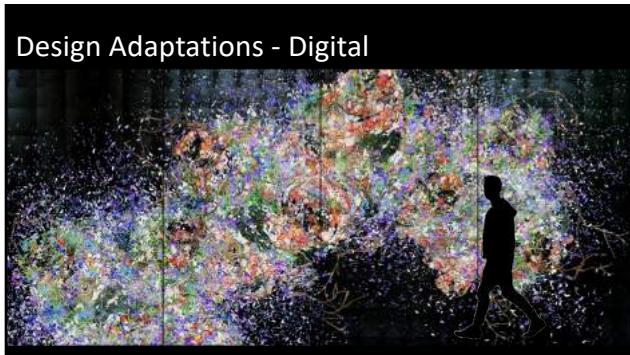
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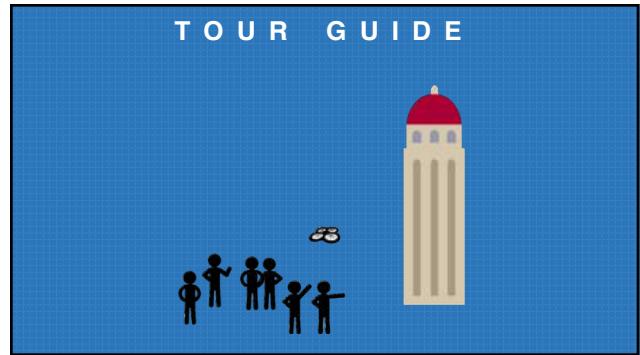
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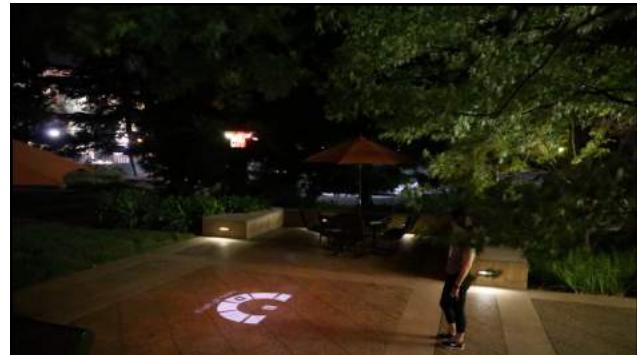
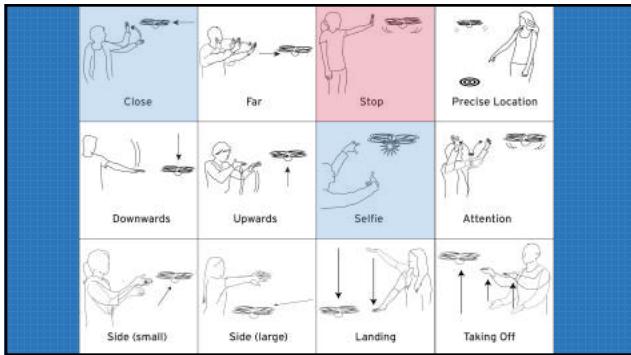
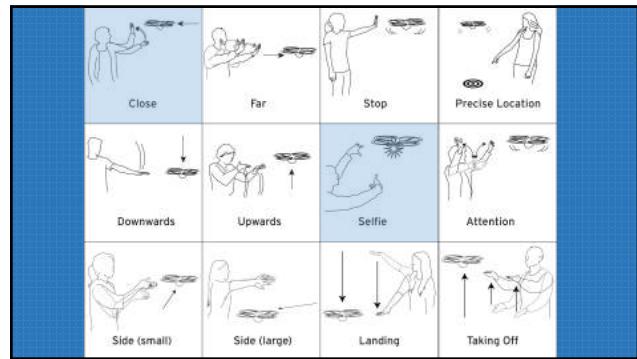
## Design Adaptations - Physical



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**HOVERING HAPTIC DEVICES**  
*DRONES FOR HAPTIC FEEDBACK IN VR*



Virtual Environment      Drone simulating object's texture

Abtahi, Yang, Follmer, & Landay

**HOVERING HAPTIC DEVICES**  
*DRONES FOR HAPTIC FEEDBACK IN VR*



Abtahi, Yang, Follmer, & Landay

**HOVERING HAPTIC DEVICES**  
*DRONES FOR HAPTIC FEEDBACK IN VR*



Abtahi, Yang, Follmer, & Landay

**AEROQUAKE**  
*DRONE AUGMENTED DANCE*



Kim & Landay, DIS 2018

**VR SEGWAY**  
*AFFORDABLE VR LOCOMOTION & ILLUSION*



Yang, Lam, & Landay

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