



Go Mobile! Designing Accessible Mobile Experiences

Leah Findlater and Jon Froehlich

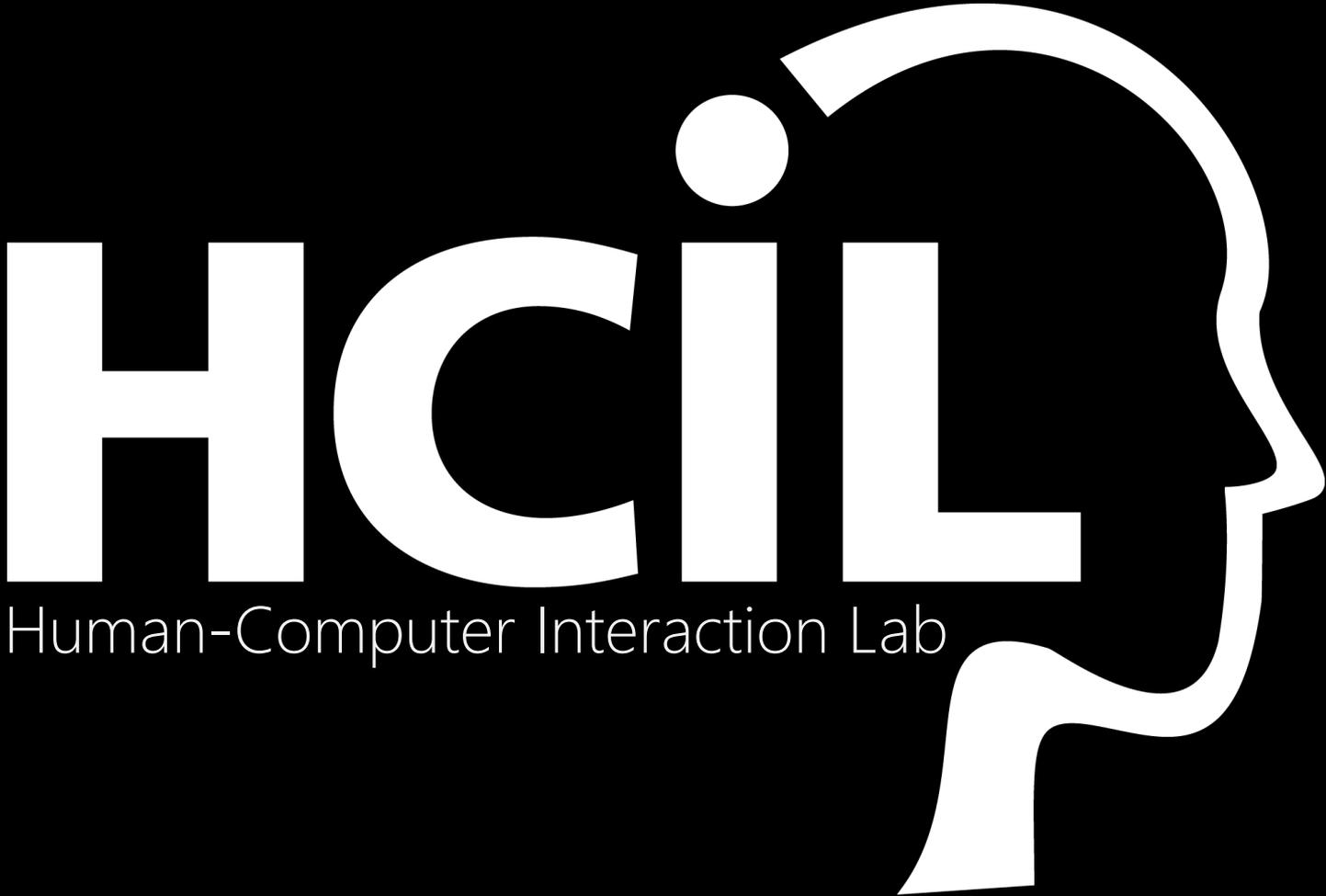
Enabled-by-Designathon
November 8, 2013

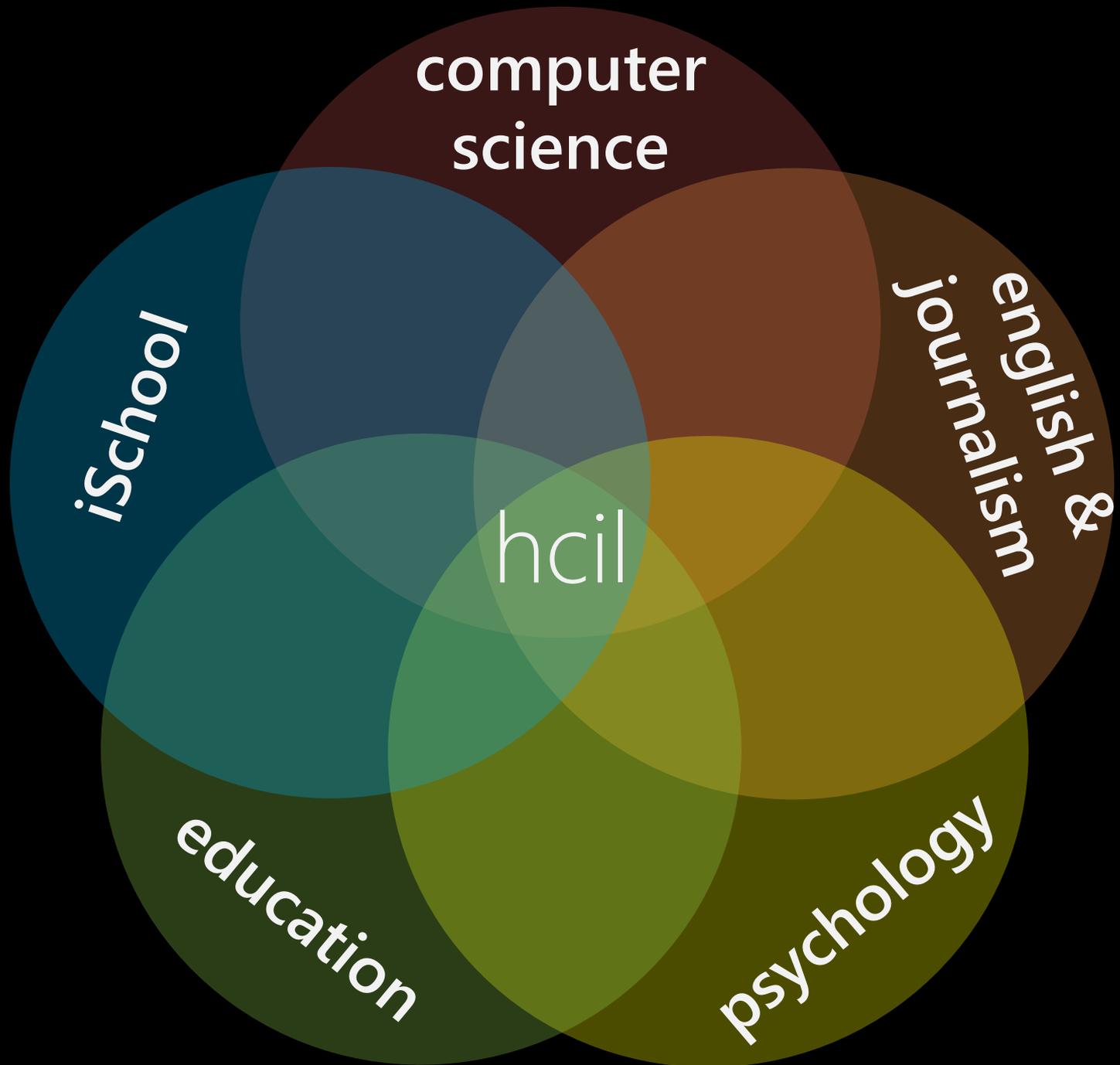


**inclusive
design lab**

A person is working on a breadboard in a workshop. The breadboard is yellow and has several red LEDs and wires connected to it. The person is using a red-handled tool, possibly a soldering iron or a wire cutter, to work on the breadboard. The workshop is filled with various tools and equipment, including a white hard hat, a blue soldering iron, a pair of pliers, and a pair of glasses. The text "makeability lab" is overlaid on the image in a white, lowercase, sans-serif font.

makeability lab







Leah Findlater



Jen Golbeck



Ben Shneiderman



Ben Bederson



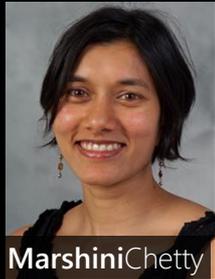
Jon Froehlich



Anne Rose



Catherine Plaisant



Marshini Chetty



Jenny Preece



Allison Druin



Mona Leigh Guha



Tammy Clegg



June Ahn



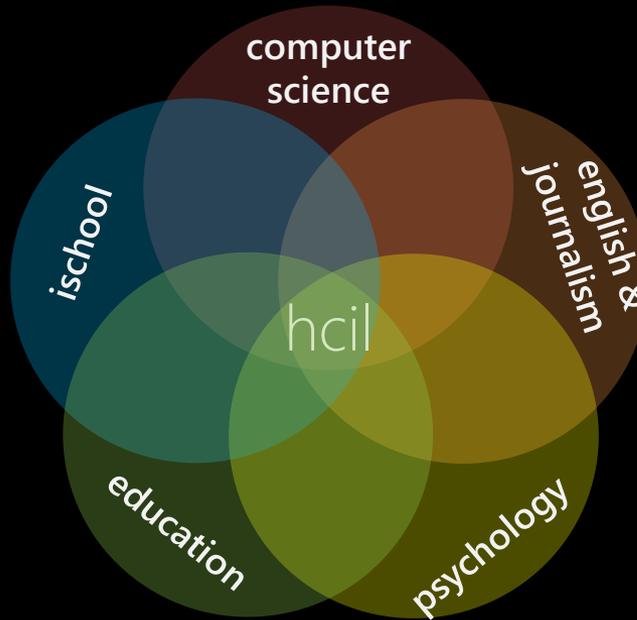
Evan Golub



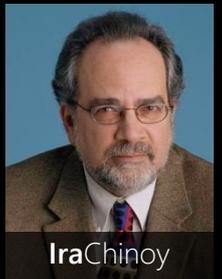
Tim Clausner



Kent Norman



Kari Kraus



Ira Chinoy

How can we make **mobile technology**
more accessible?

How can technology make **the world**
more accessible for mobility?

How can we make **mobile technology**
more accessible?

How can technology make **the world**
more accessible for mobility?

A grayscale photograph of a hand holding a smartphone. The phone is held horizontally, and the hand is positioned on the left side, with fingers resting on the screen. The background is dark and out of focus. Overlaid on the image is the text 'Intuitive', 'Natural', and 'Easy-to-use' in a large, white, sans-serif font, stacked vertically. In the bottom right corner, the word 'Always?' is written in a smaller, orange, italicized font.

Intuitive
Natural
Easy-to-use

Always?

New Accessibility Problems

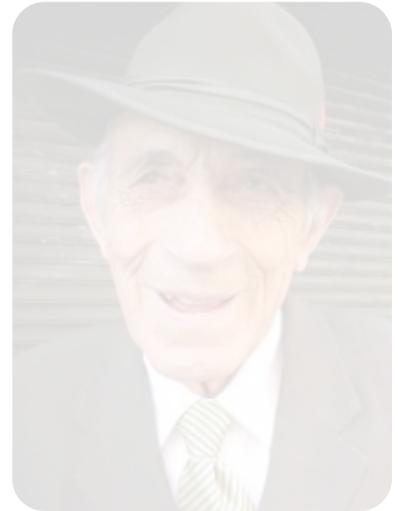
(e.g., Biswas & Langdon 2012, Duff et al. 2010, Guerreiro et al. 2010)



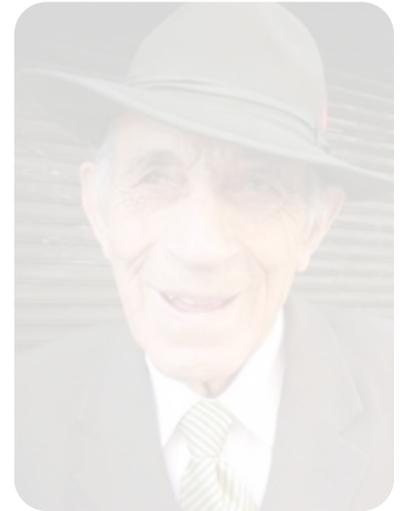
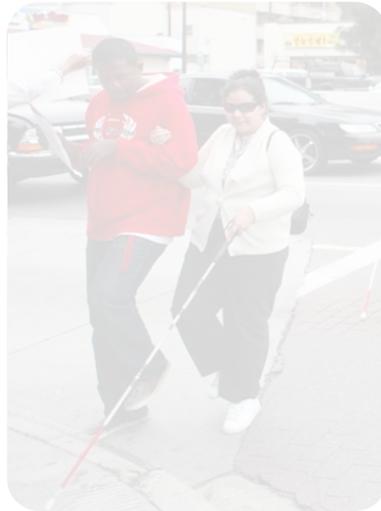
How can we design inclusive technology?



How can we design inclusive technology?



How can we design inclusive technology?



Motor Impaired Touchscreen Use

with Lisa Anthony and Yoojin Kim

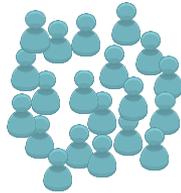
What are mainstream touchscreen devices being used for on a daily basis?

What adaptations are users making to improve accessibility?

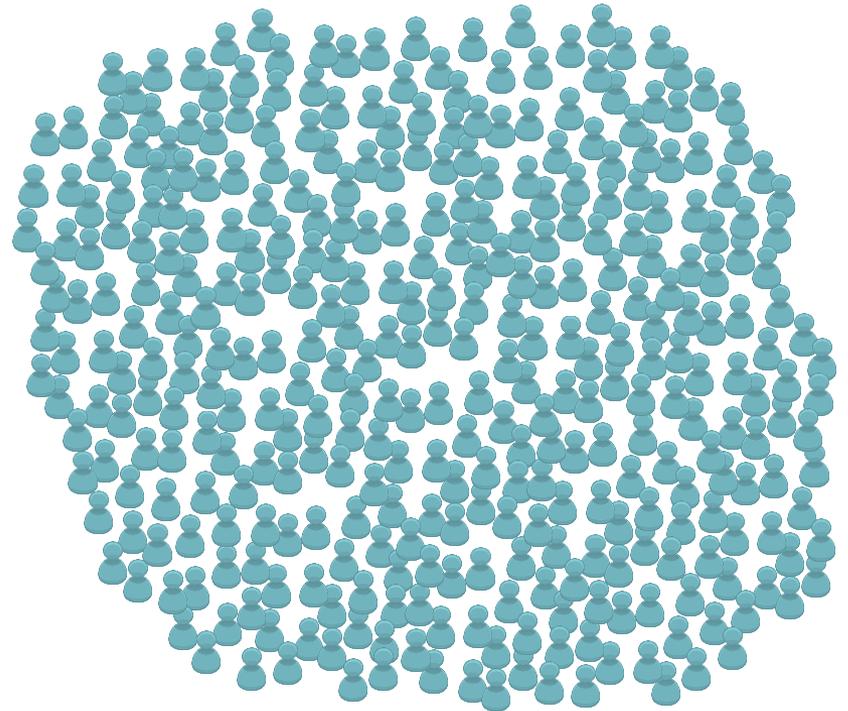
Most studies on accessibility
and motor impairments:



5-20 participants

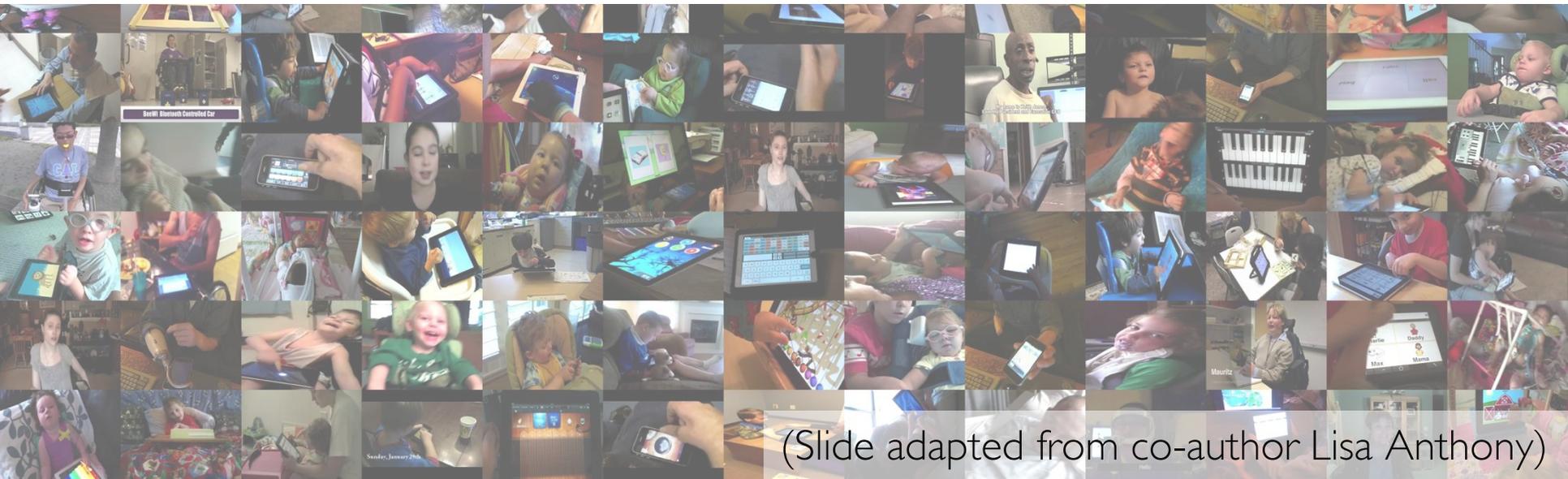


Our goal:





Approach: Find and analyze **user-generated content** (YouTube videos) of people with physical disabilities interacting with mainstream touch devices

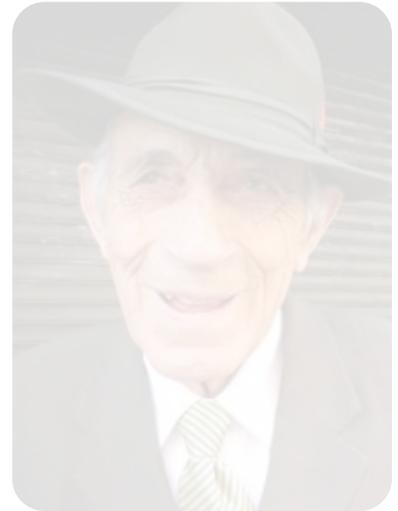
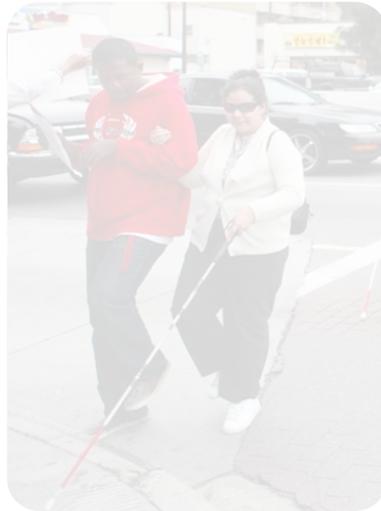


(Slide adapted from co-author Lisa Anthony)

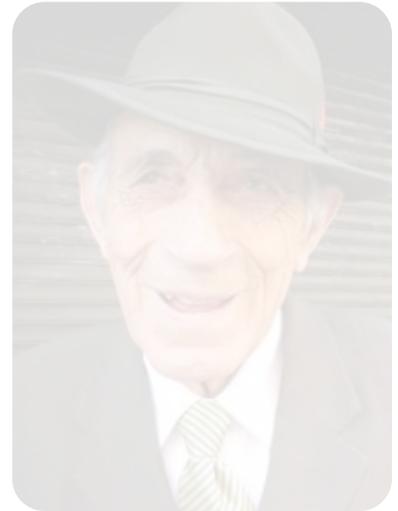


Current work: Designing to support a range of use cases

How can we design inclusive technology?



How can we design inclusive technology?





Wearable Interaction & Blind Users

with Hanlu Ye, Meethu Malu, and Uran Oh

How might wearable
interaction impact users?

Interviews and online survey
(235 people in total)

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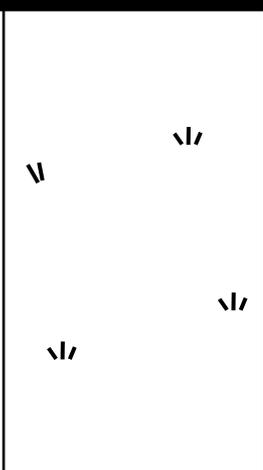
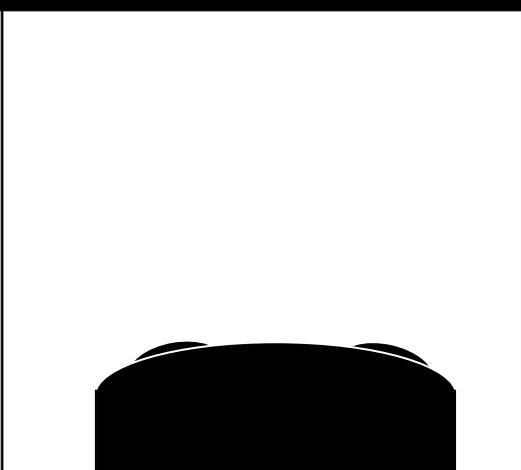
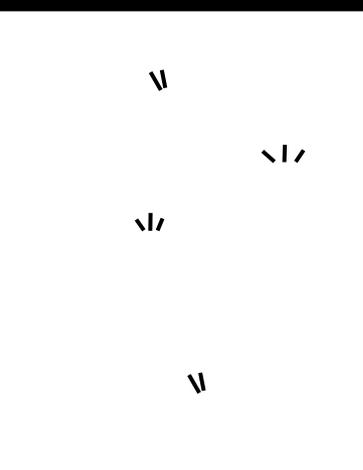
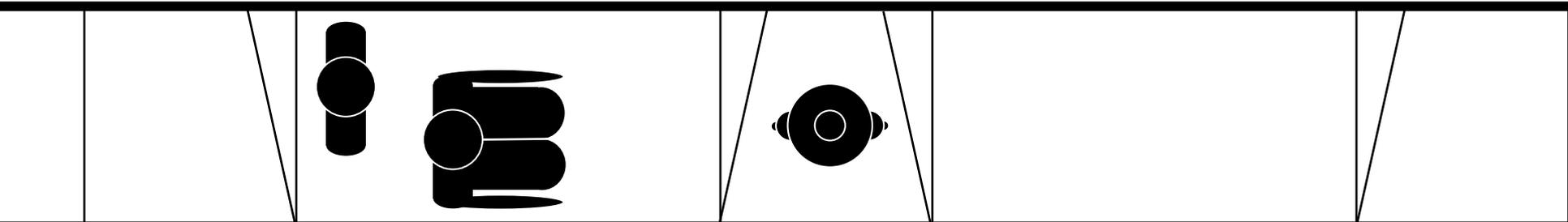
I want to start with **a story**...

You



Your Friend







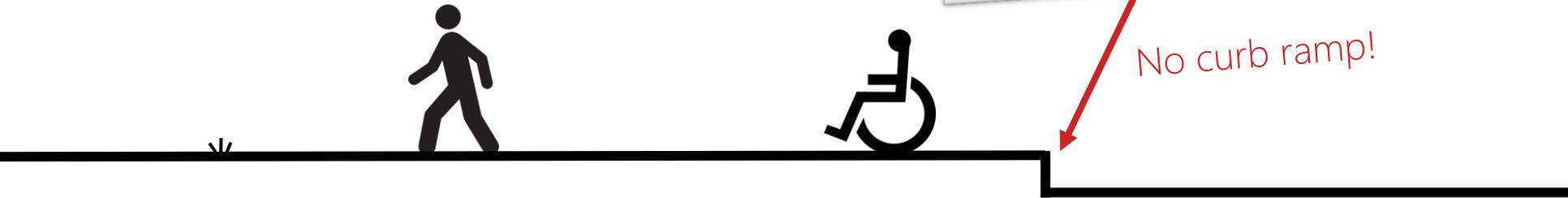
No curb ramp!



The problem is not just that there are inaccessible areas of cities, but also that there are currently few methods to determine them *a priori*



No curb ramp!



The National Council on Disability noted that there is **no comprehensive information** on “the degree to which sidewalks are accessible” in cities.



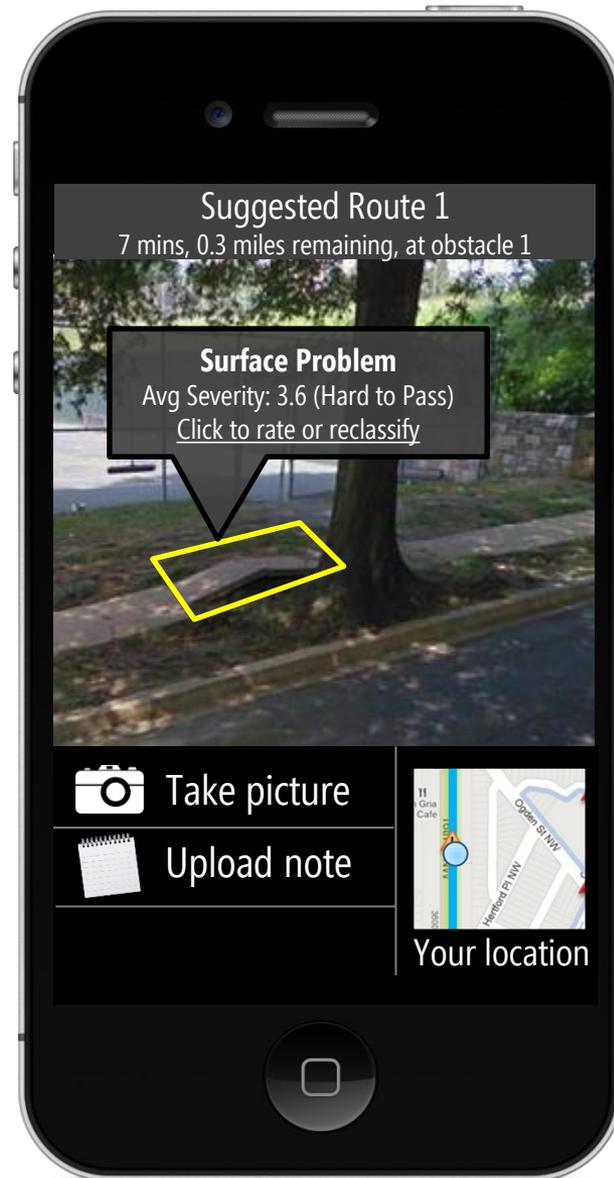
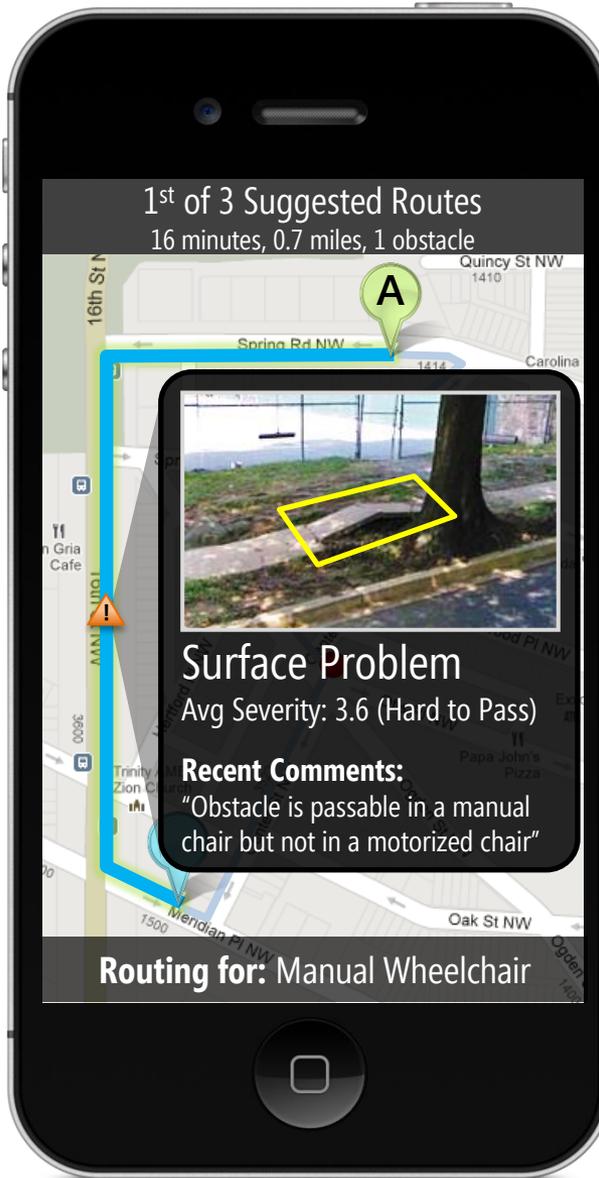
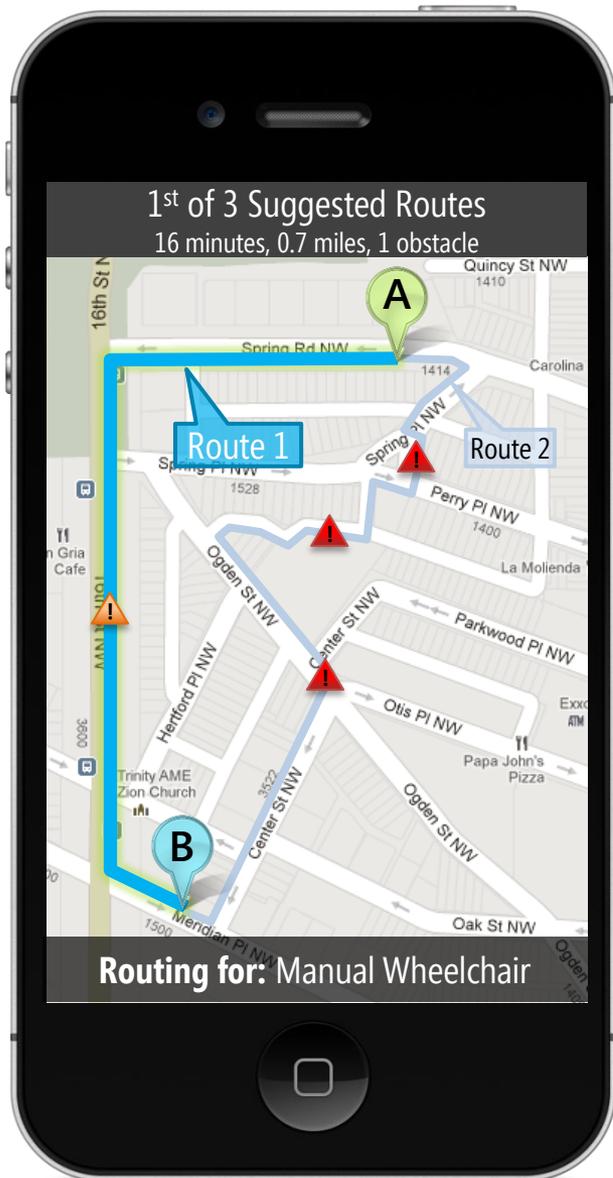
National Council on Disability, 2007

The impact of the Americans with Disabilities Act: Assessing the progress toward achieving the goals of the ADA

Two Goals

- 1) Invent new methods to gather information on the **accessibility of the physical world** at unprecedented levels
- 2) Build new types of **accessibility applications never before possible** with this data

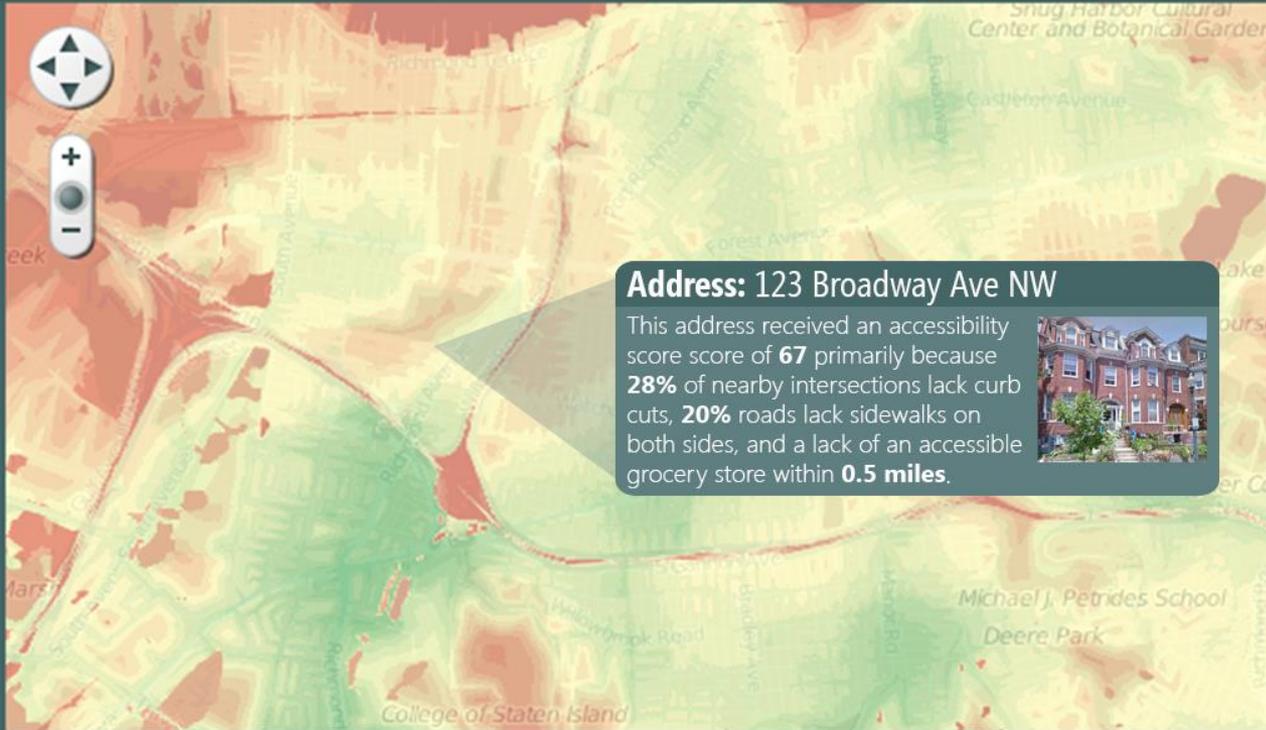
Route Recommendations Based on Ability





Address Search

123 Broadway Ave NW



Less Accessible More Accessible

Adjust Mobility Factors

Settings

Recalculate Score

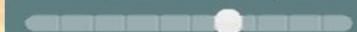
Rate Your Mobility Level



Rate No Curb Cuts Importance



Rate Object in Path Importance



Rate Sidewalk Coverage Importance



Rate Accessible Grocery Importance



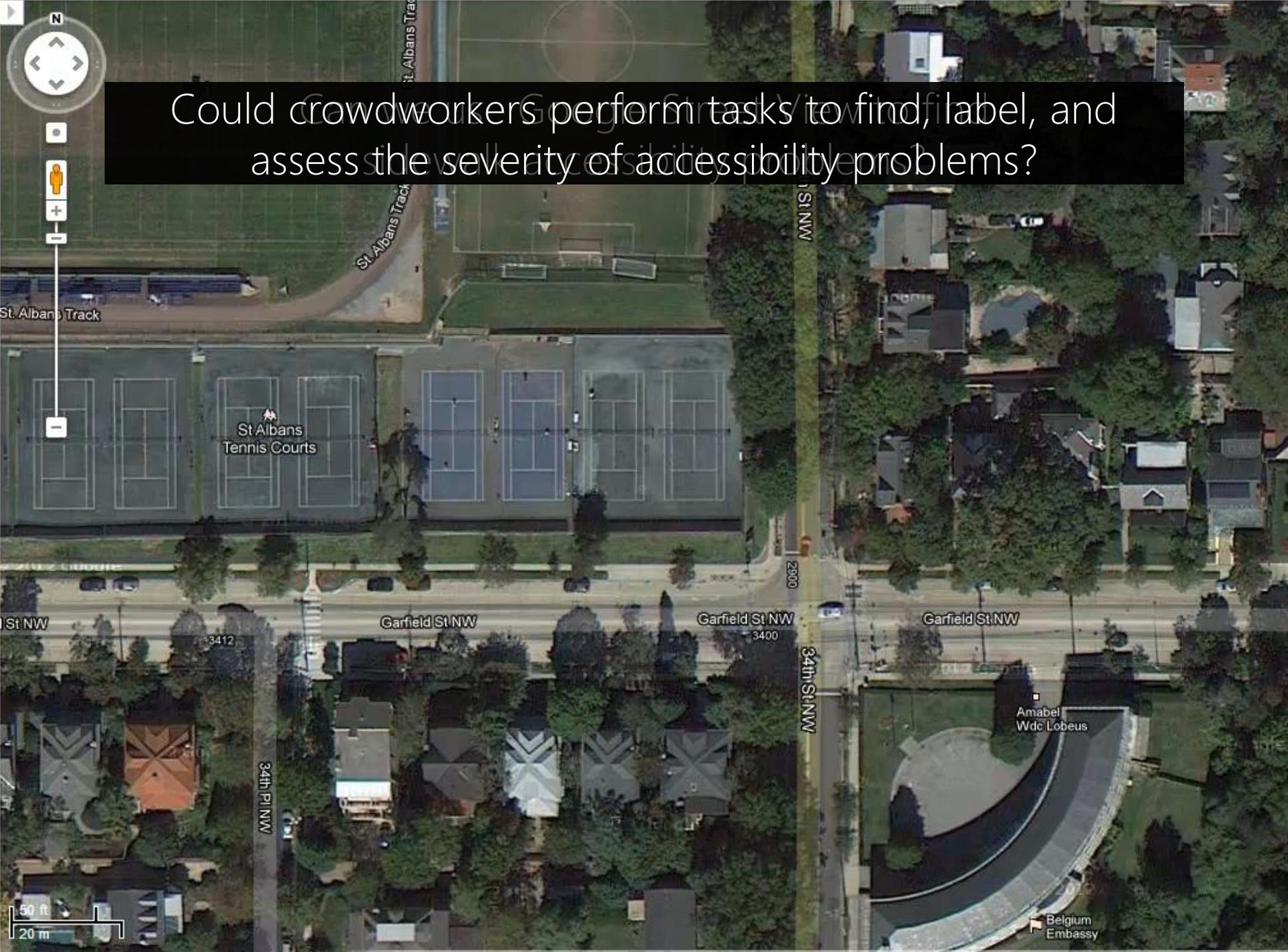
Rate Accessible Transit Importance



Open in Google Earth

How can we **gather this data scalably?**

Could crowdworkers perform tasks to find, label, and assess the severity of accessibility problems?



Submit HIT

Return HIT

Automatically accept the next HIT

University of Maryland: Help make our sidewalks more accessible for wheelchair users with Google Maps

Requester: Kotaro Hara

Reward: \$0.05 per HIT

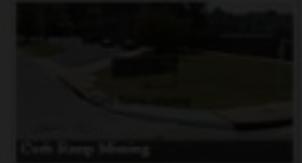
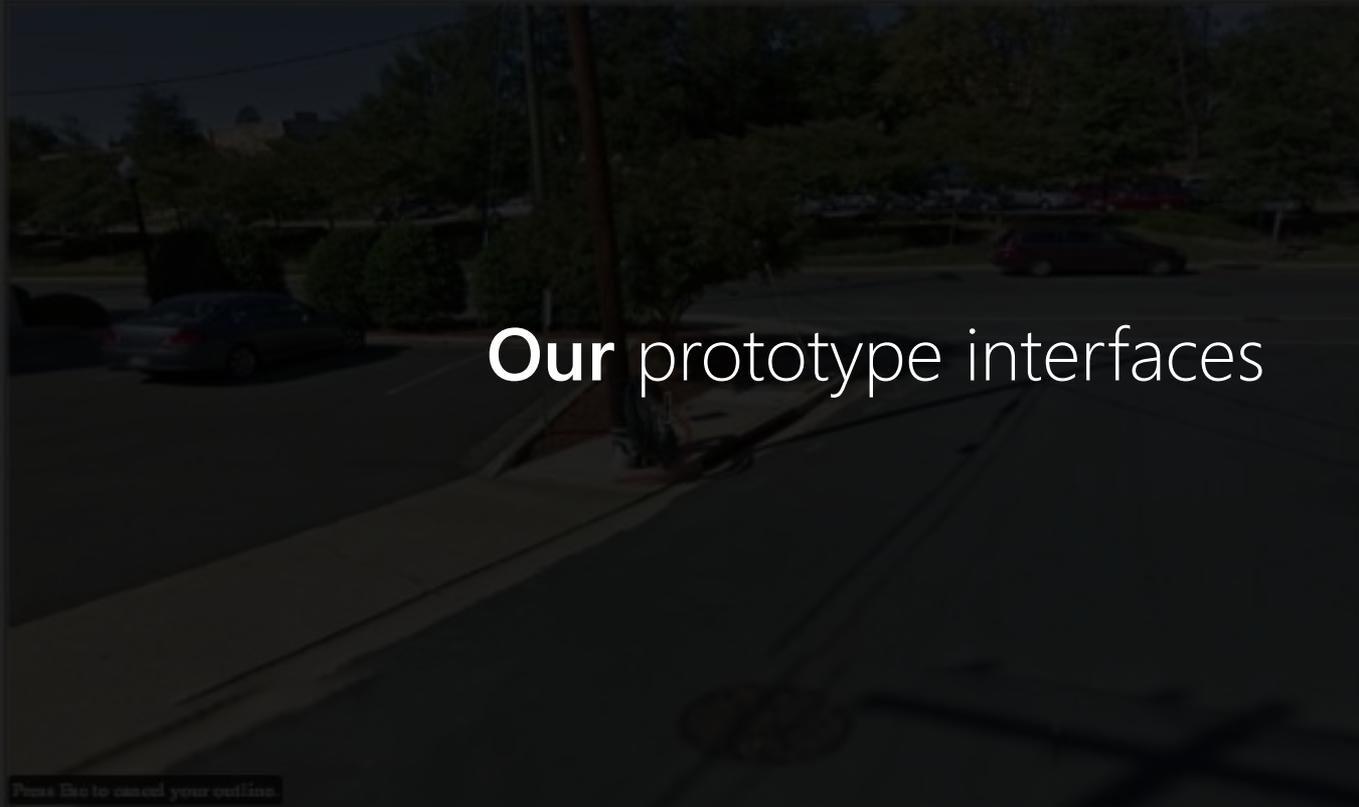
HITs Available: 10

Duration: 3 hours

Qualifications Required: None

Show instruction

You are now working on the Default task out of Default required for this HIT.



Press Esc to cancel your outline.

Problems found: Curb Ramp Missing (0) Object in Path (0) Surface Problem (0) Prematurely Ending Sidewalk (0) Other (0)

Please enter any additional comments about this street or sidewalk that may affect mobility impaired persons or feedback on the hit itself (optional)

Skip the image

There are no accessibility problems in this image

Our prototype interfaces

Submit HIT

Return HIT

Automatically accept the next HIT

University of Maryland: Help make our sidewalks more accessible for wheelchair users with Google Maps

Requester: Kotaro Hara

Qualifications Required: None

Reward: \$0.05 per HIT

HITs Available: 10

Duration: 3 hours

Labeling Interface

Show instruction

You are now working on the Default task out of Default required for this HIT.



Press Esc to cancel your outline.



Problems found: Curb Ramp Missing (0) Object in Path (0) Surface Problem (0) Prematurely Ending Sidewalk (0) Other (0)

Please enter any additional comments about this street or sidewalk that may affect mobility impaired persons or feedback on the hit itself (optional)

Skip the image

There are no accessibility problems in this image

Some **results**



TURKER LABELING EXAMPLES

Curb Ramp Missing



TURKER LABELING EXAMPLES

Curb Ramp Missing



TURKER LABELING EXAMPLES

Object in Path



TURKER LABELING EXAMPLES

Object in Path



TURKER LABELING EXAMPLES

Prematurely Ending Sidewalk



TURKER LABELING EXAMPLES

Prematurely Ending Sidewalk

overall accuracy

90%

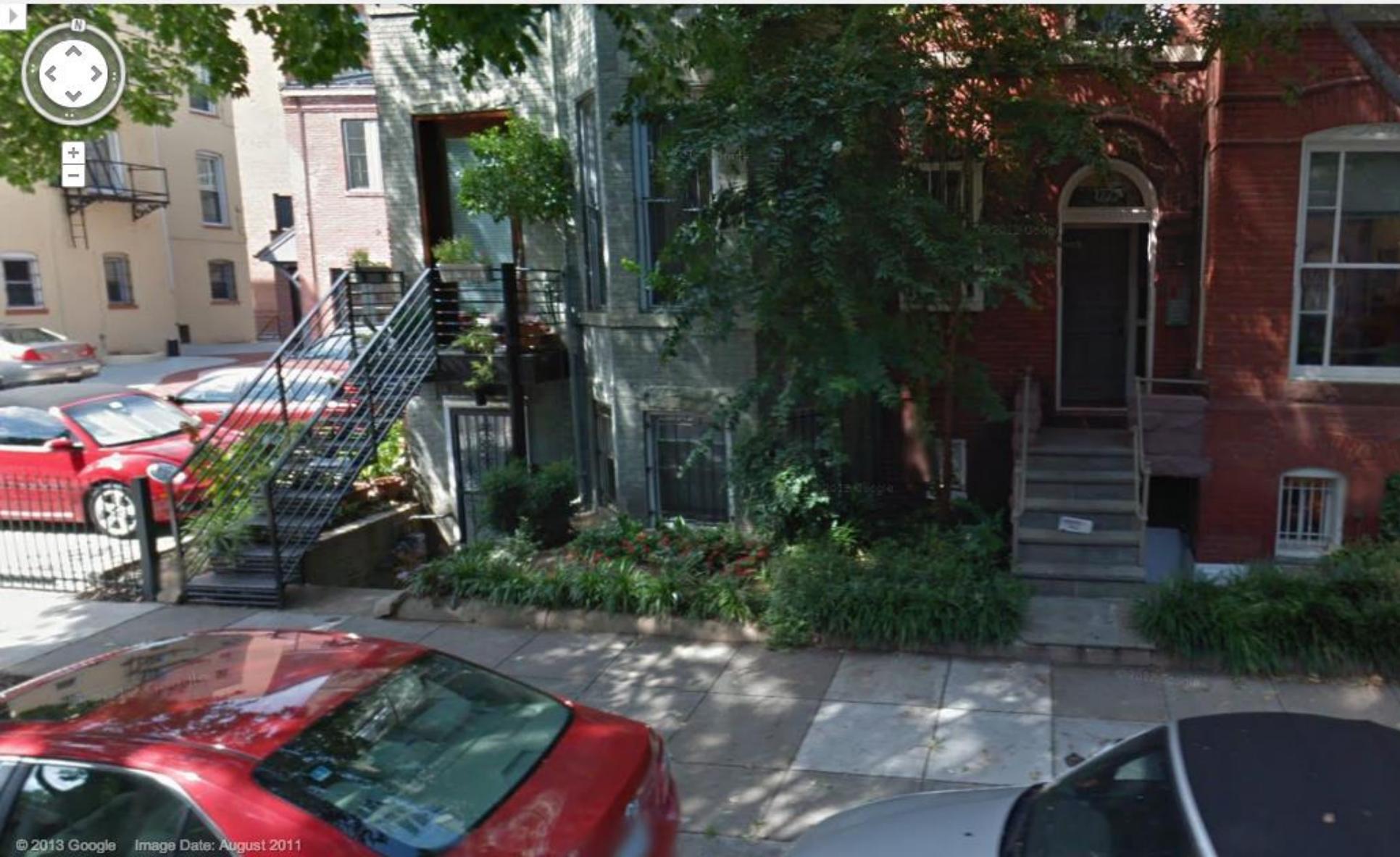
future
work

Current Work: Automatic Curb Ramp Detection





dupont circle



Just won "Best Paper"
Oct 23rd at ASSETS'13

Improving Public Transit Accessibility for Blind Riders by Crowdsourcing Bus Stop Landmark Locations with Google Street View

Kotaro Hara[†], Shiri Azenkot[§], Megan Campbell[§],
Cynthia L. Bennett[§], Vicki Le[†], Sean Pannella[†], Robert Moore[†],
Kelly Minckler[§], Rochelle H. Ng[§], Jon E. Froehlich[†]



The Crowd Powered Street View Accessibility Team!



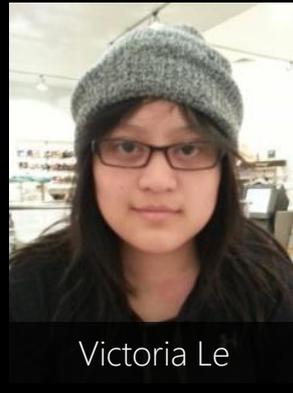
Kotaro Hara



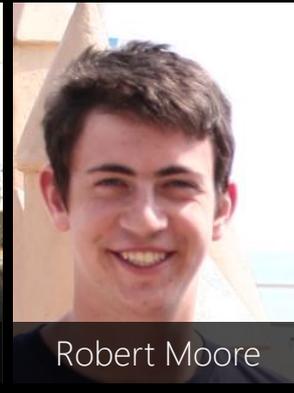
Jin Sun



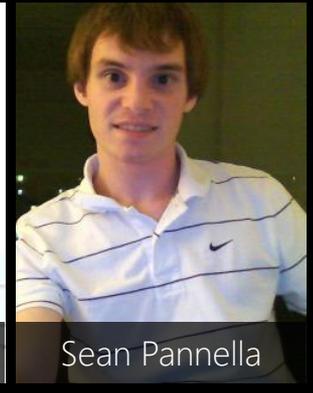
Ruofei Du



Victoria Le



Robert Moore



Sean Pannella



Jonah Chazan



David Jacobs



Jon Froehlich

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Thank you to our sponsors: Google, Nokia, NSF, and 3M



Come join us!

Students, partners, participants



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