Bridging the Pedestrian Accessibility Informational Gap: User-Facing Applications and Large-Scale Virtual Auditing

ccessmap OpenSidewalks 

Manaswi Saha, Nick Bolten

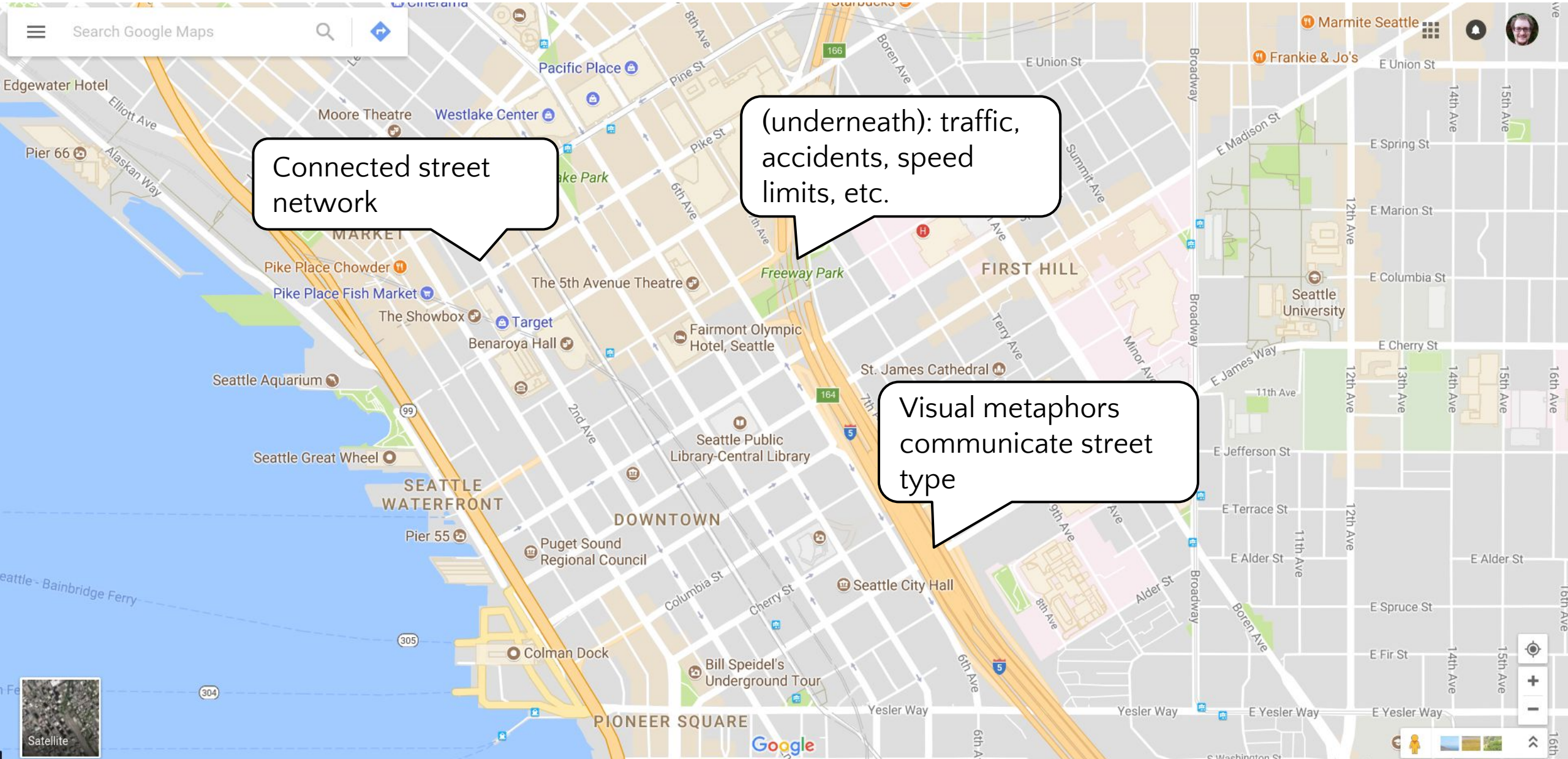
November 15, 2017

54.5 million People in the USA need assistive devices or have trouble walking more than a quarter mile.

”

Using a tool like directions on Google Maps doesn’t really help me get around. Actually sometimes this does more harm than good. I’m sent down streets I can’t cross, or up inclines that are impossible to climb. It can be deeply frustrating.

Google Maps solves problems for cars



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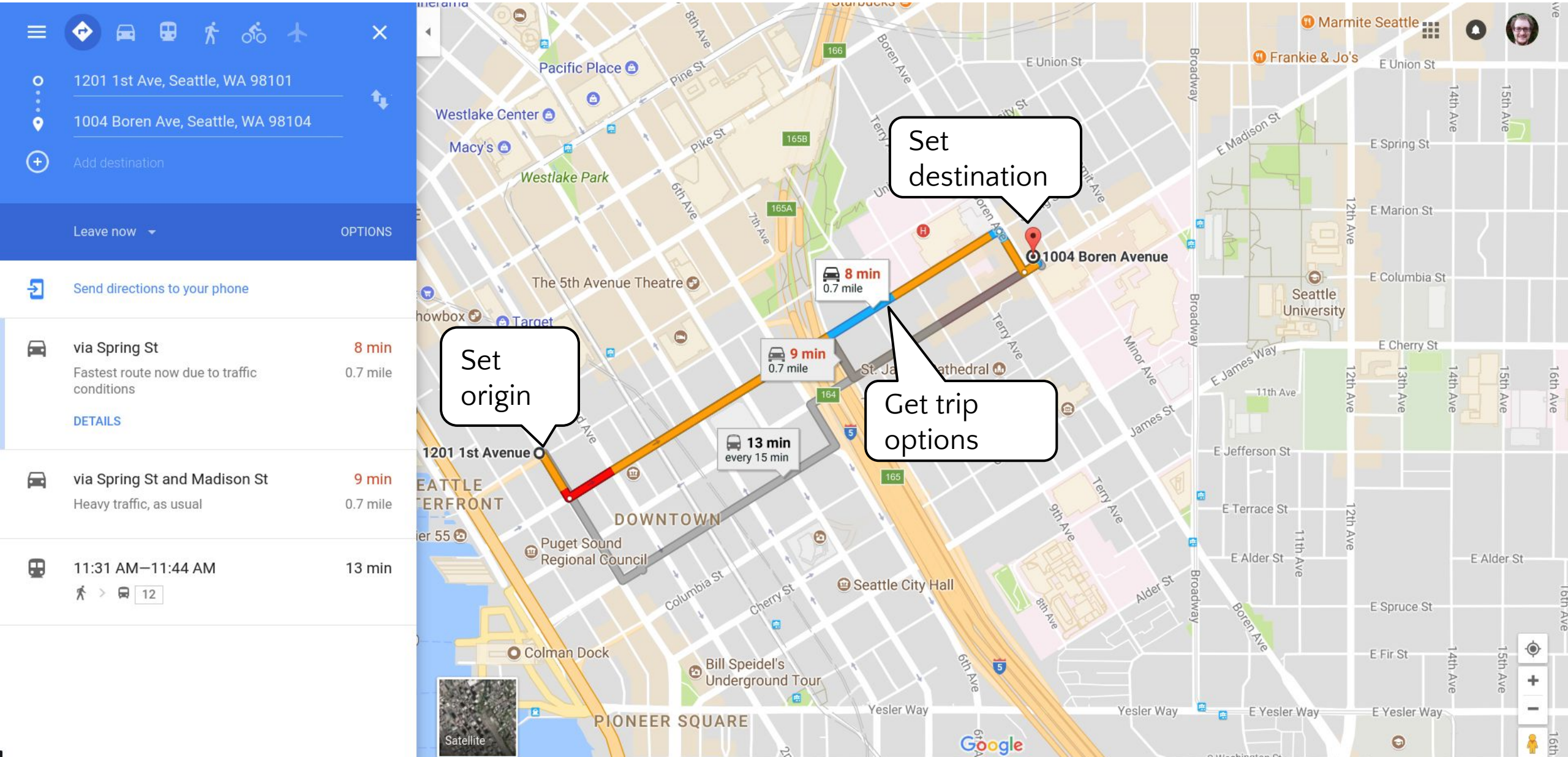

What about **pedestrians**?

What information would we need?

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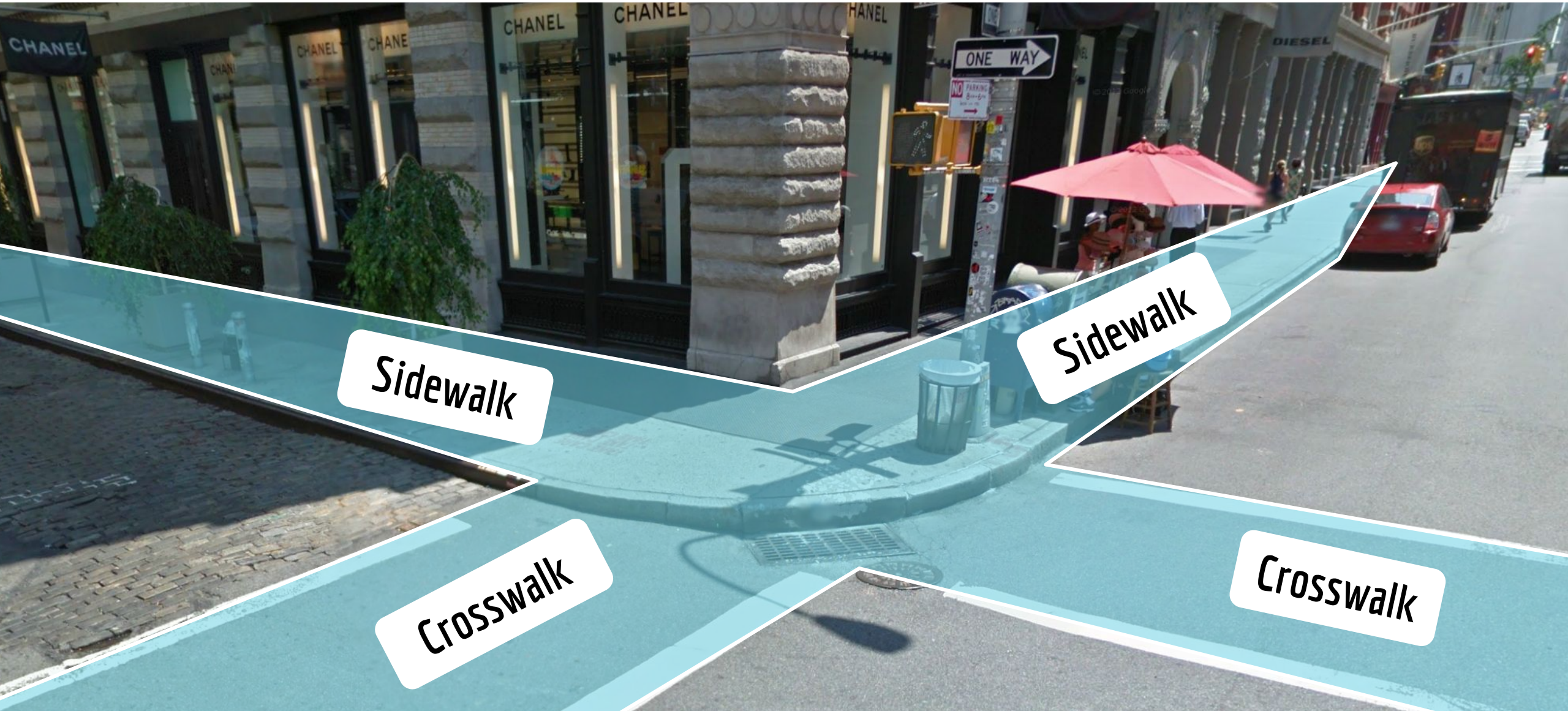
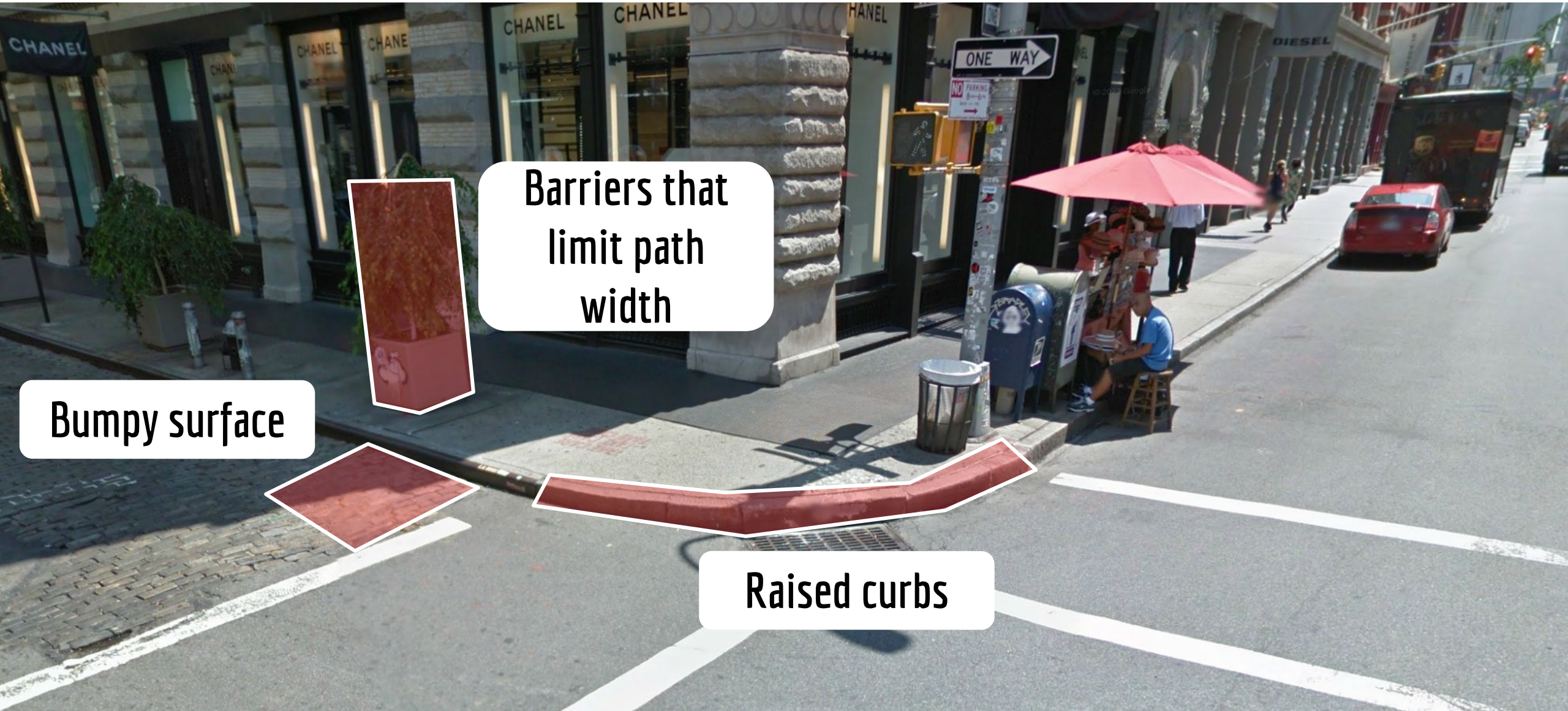
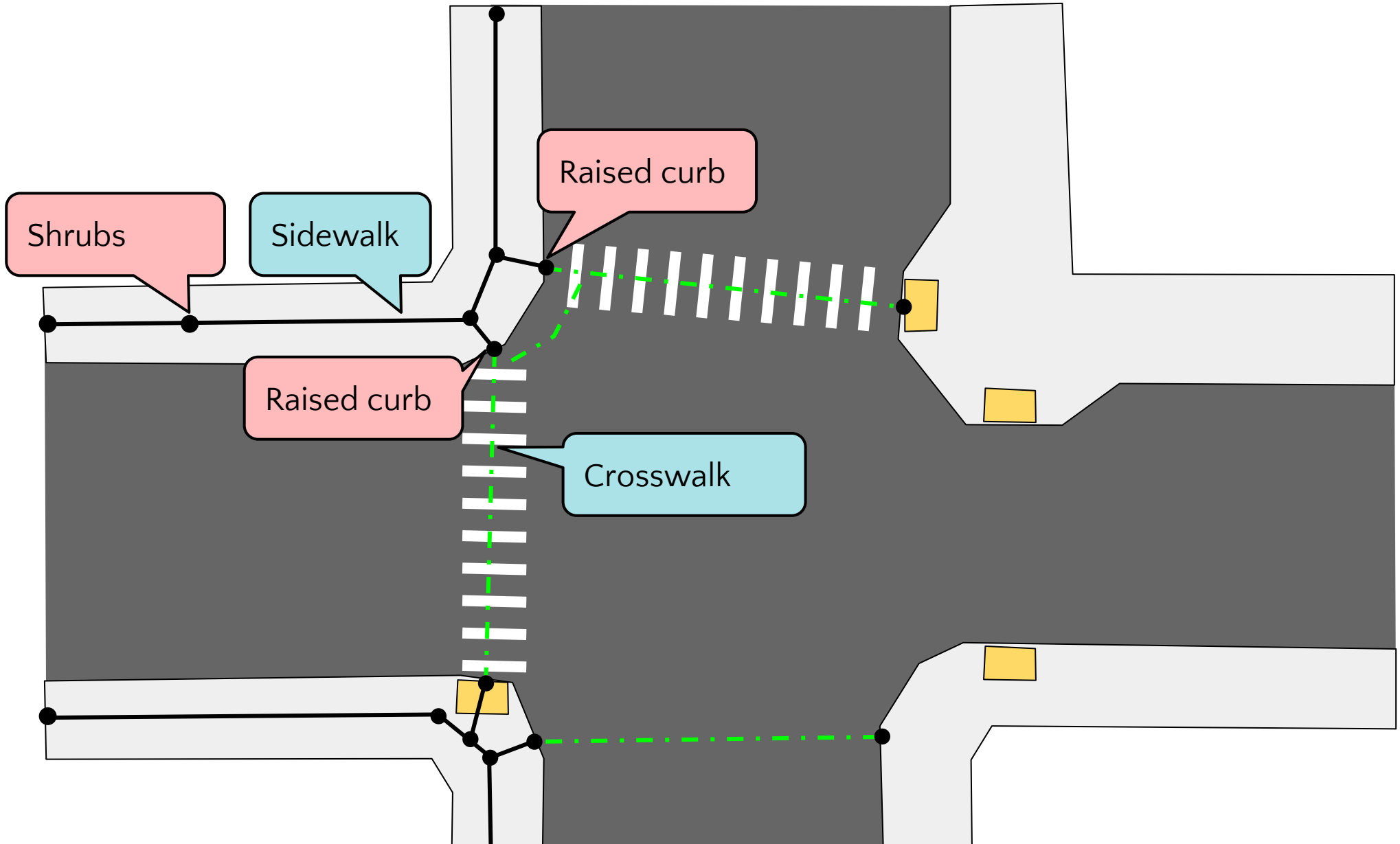
Traversable Infrastructure



What information would we need? Barriers.

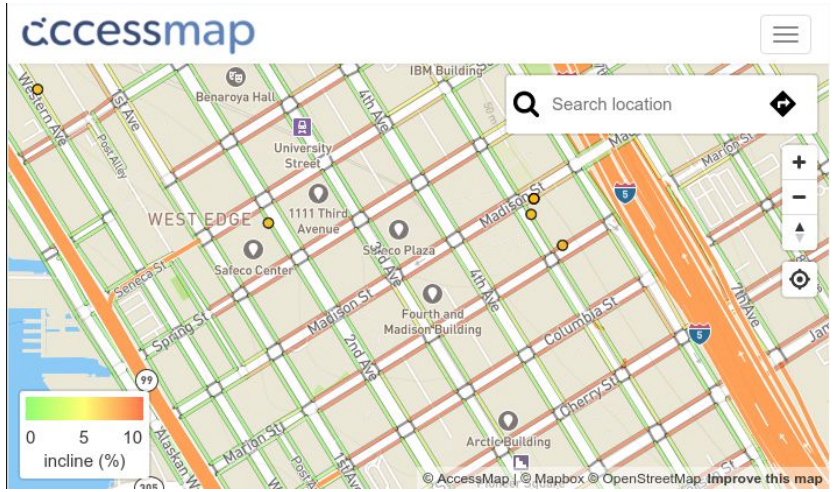


An annotated pedestrian network

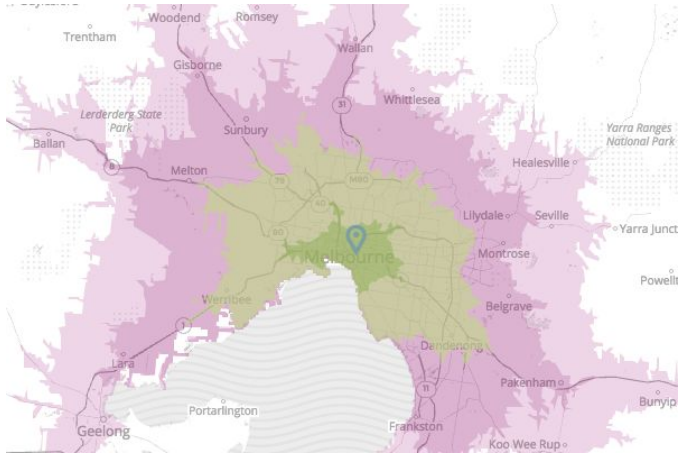


Potential Applications

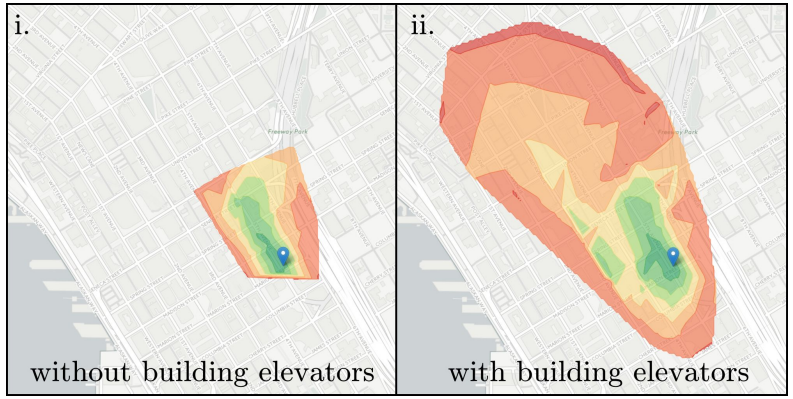
User-facing maps and automatic trip planning



Transit planning



Advocacy

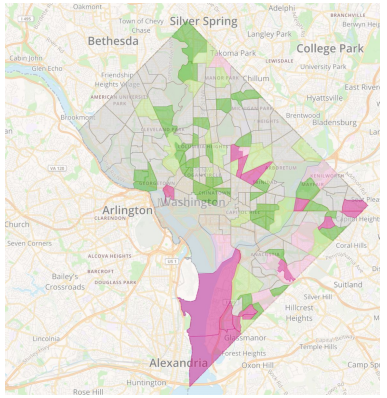


City comparisons & Viz

DC

vs

NYC



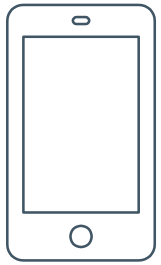
Where would we get the data?

Cities

SDOT
Seattle Department of Transportation

Satellite imagery

On-site surveys



Local knowledge

Collect our own imagery

Crowdsource from imagery

PROJECT SIDEWALK

Outline

ccessmap

Trip planning with accessibility in mind

OpenSidewalks

Describing, sharing, and collecting pedestrian-centric data

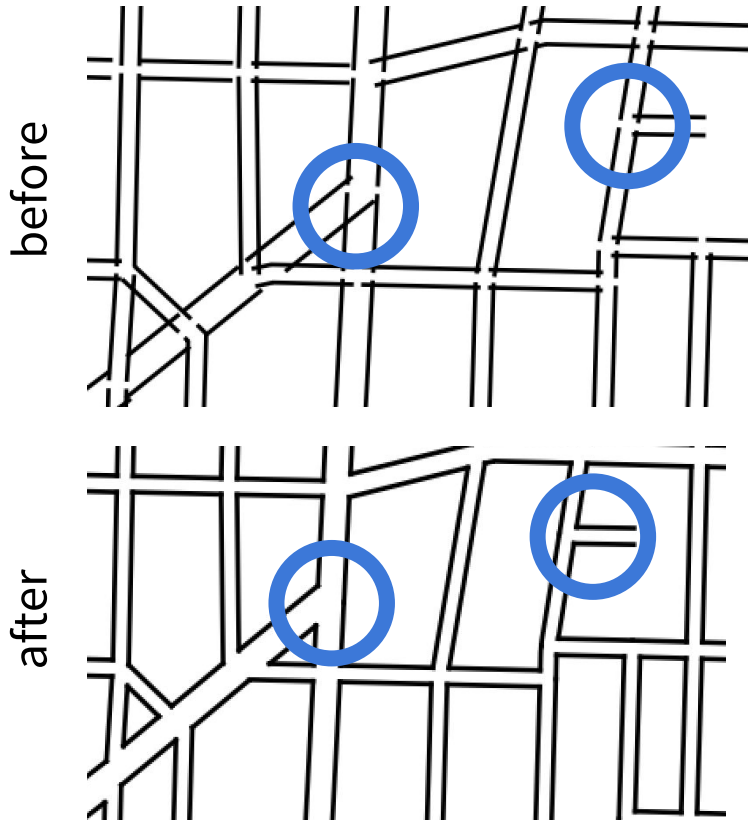
PROJECT SIDEWALK

Crowdsourcing accessibility data from street-level imagery

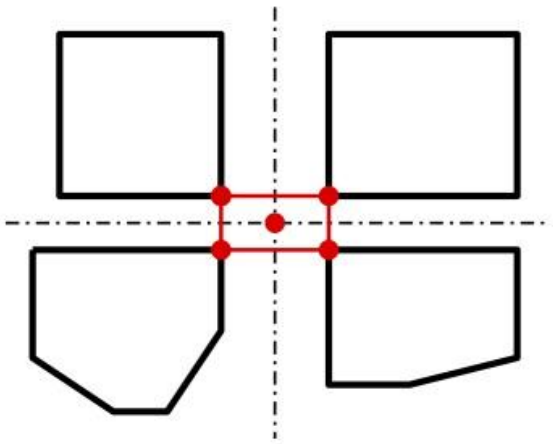
https://www.accessmap.io

AccessMap

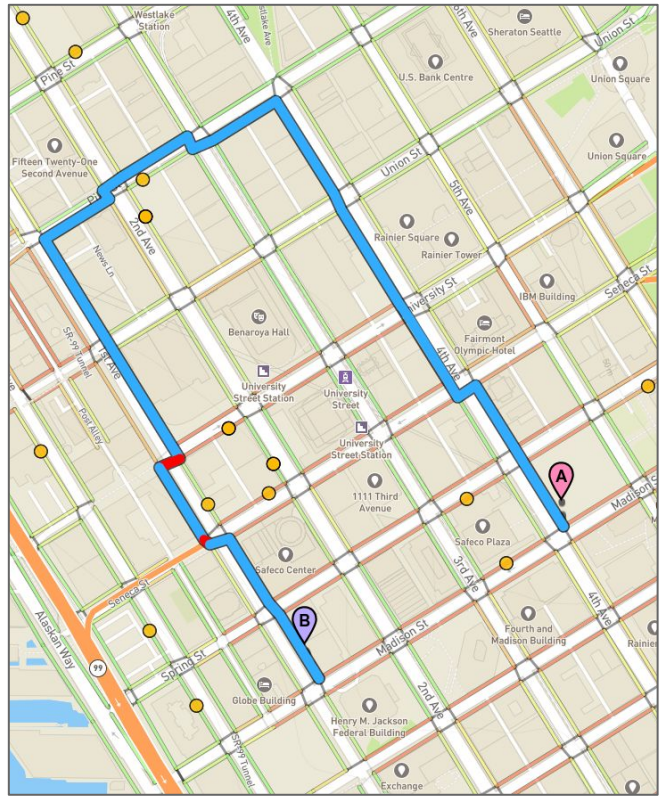
Synthesizes a pedestrian network from municipal data.



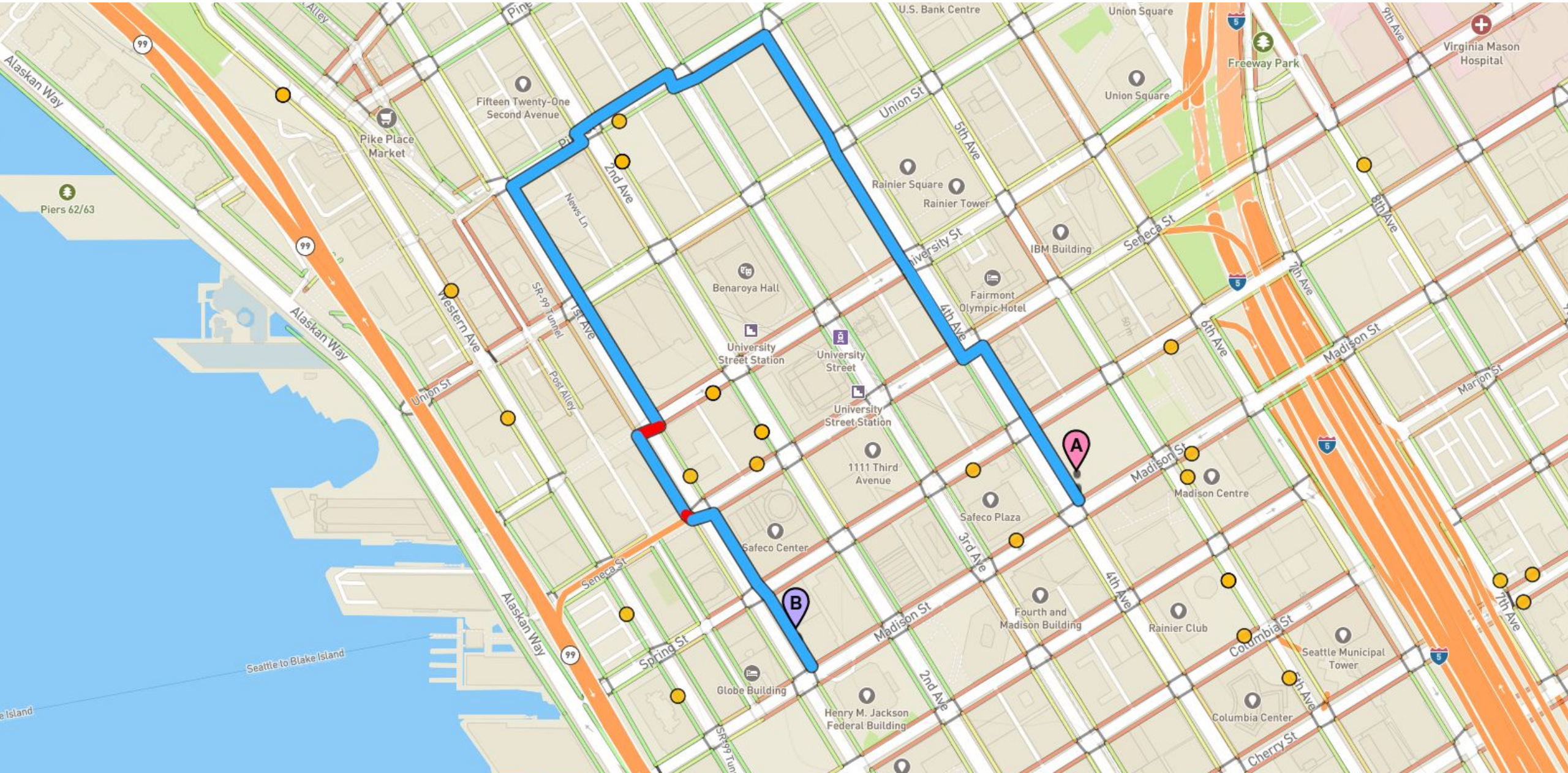
Algorithmically fills in gaps



Displays the data with visual metaphors and provides trip planning

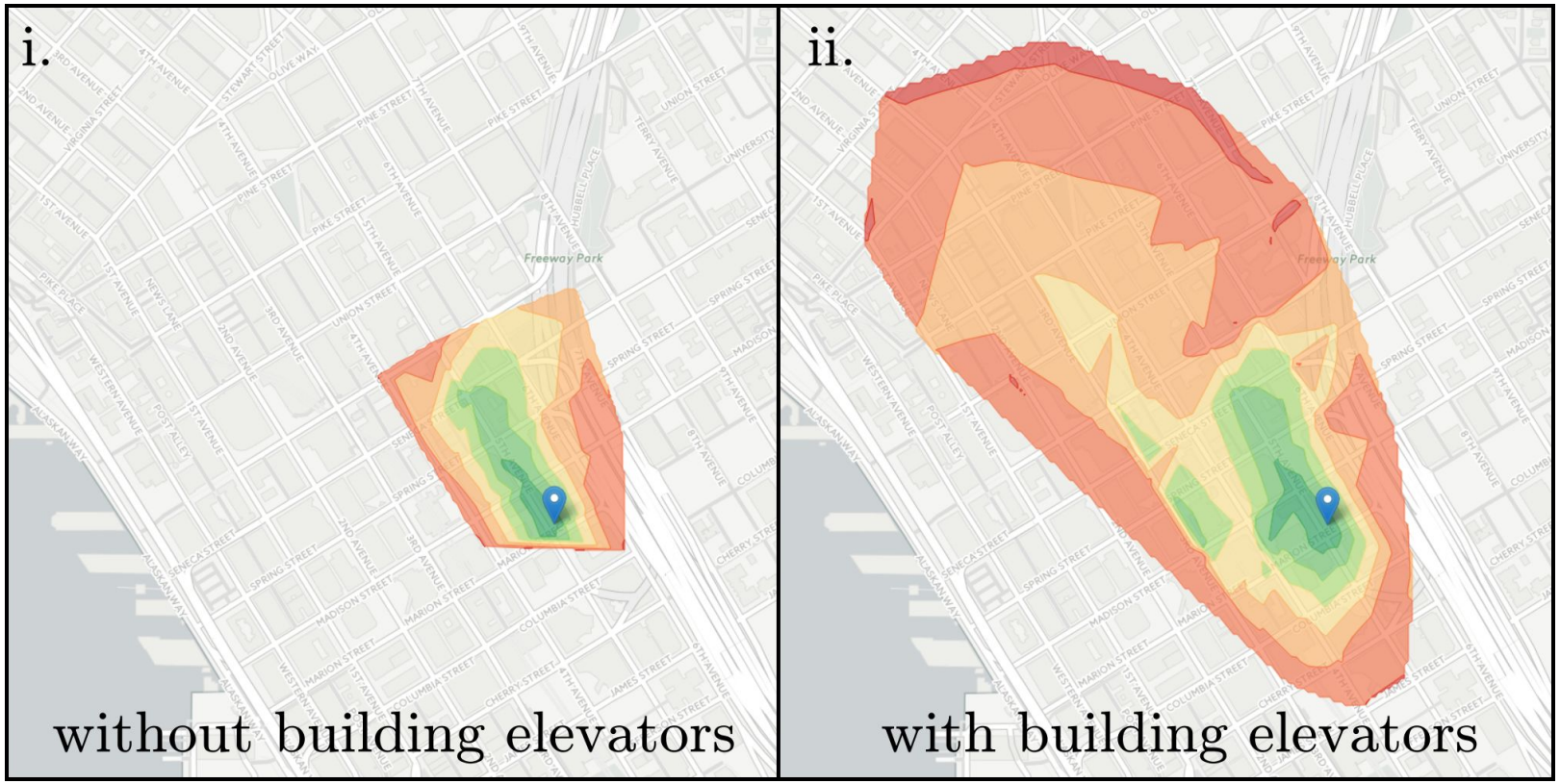


Accessible Trips with AccessMap



Advocacy and Analysis with AccessMap's Network

Where can a manual wheelchair user get in X minutes, starting a city hall?

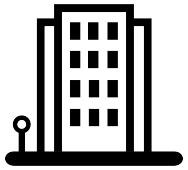


Future Work for AccessMap

More cities and regions

- ccessmap San Jose
- ccessmap New York
- ccessmap World?

More data

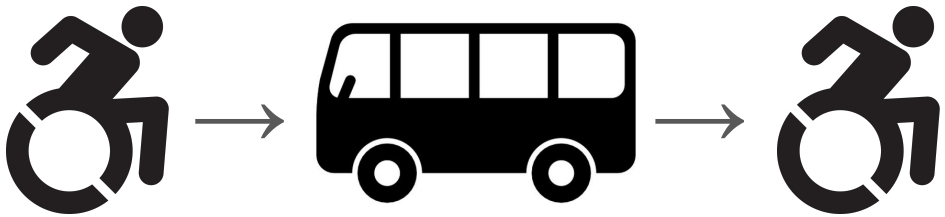


Paths through buildings

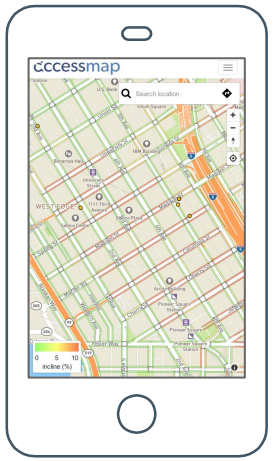
Parks

Elevators

Multi-modal trip planning



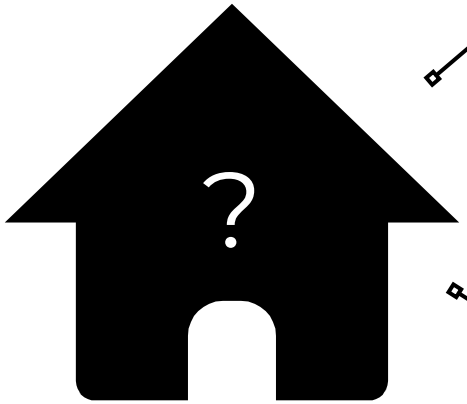
Mobile apps



Challenges

We need to describe more kinds of data and have it all related together

We need efficient methods for collecting the data



Stakeholders need to communicate:

municipalities
transportation
the public
AccessMap

Our approach needs to scale

https://www.opensidewalks.com

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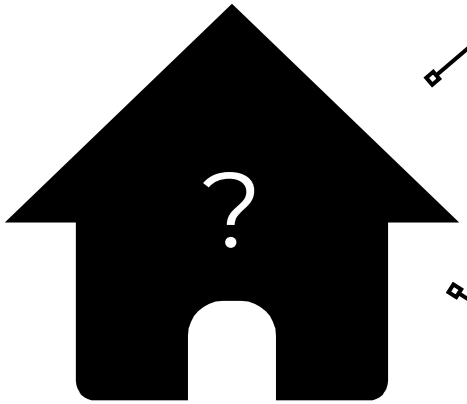

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OpenSidewalks Solution

We need to describe more kinds of data and have it all related together

We need efficient methods for collecting the data

OpenStreetMap!

Stakeholders need to communicate:

municipalities
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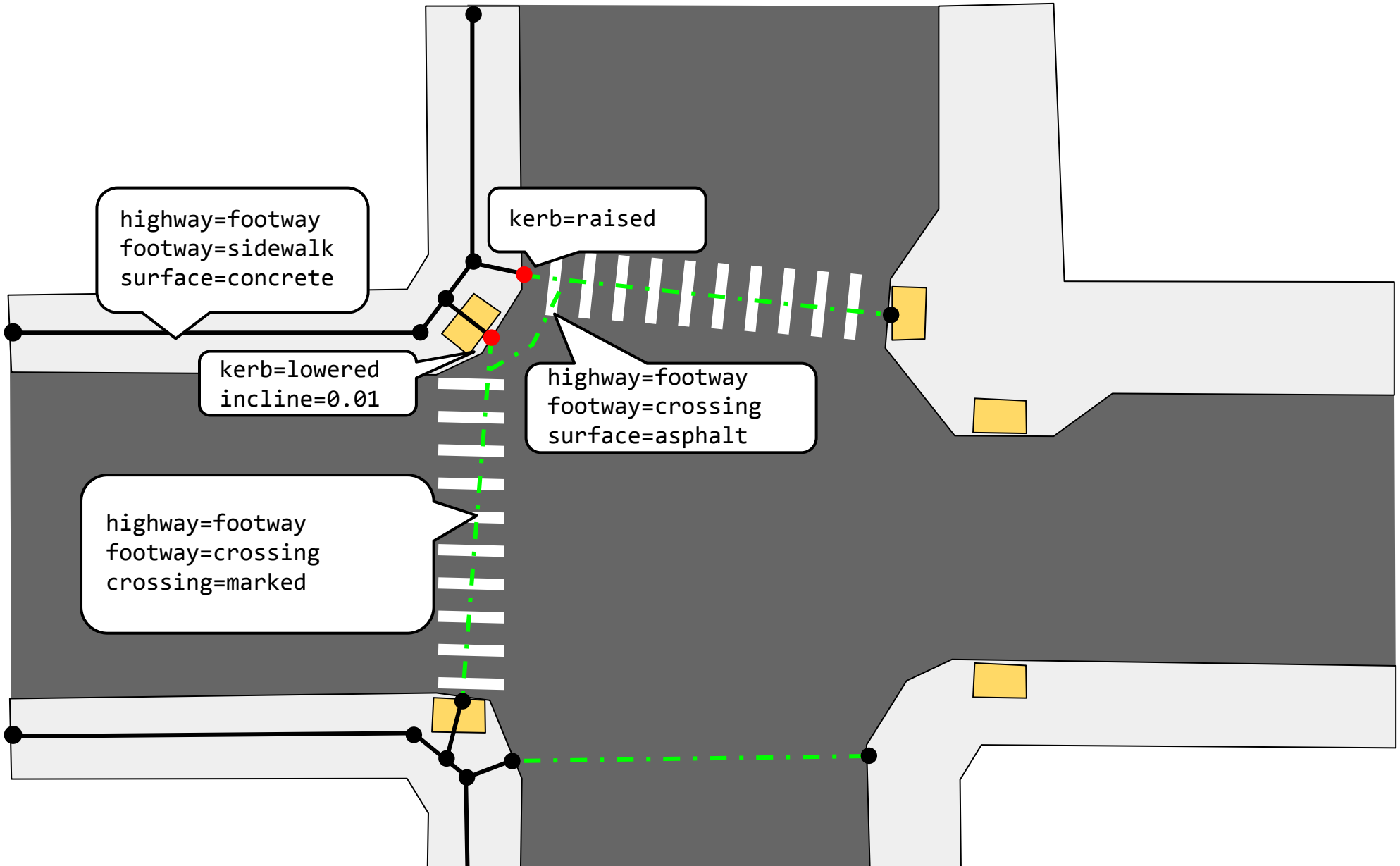
AccessMap

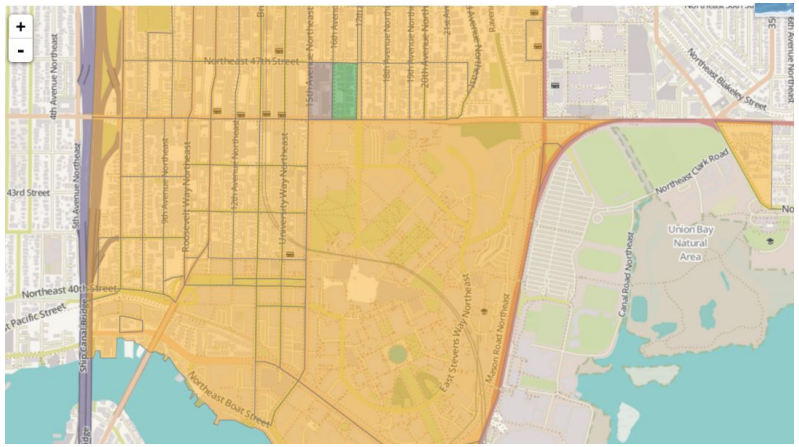
Our approach needs to scale

OpenSidewalks Schema: Data Standard

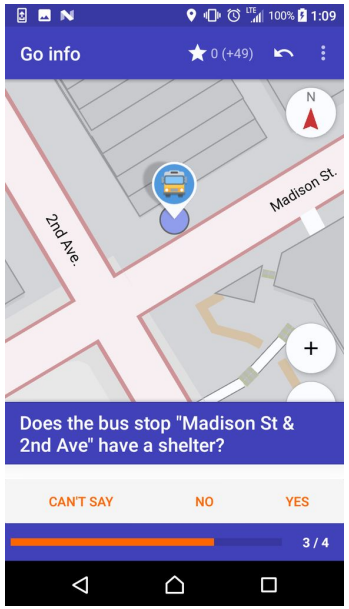


OpenSidewalks Tools for Getting Data

Municipal Data Import Workflows



On-site survey app



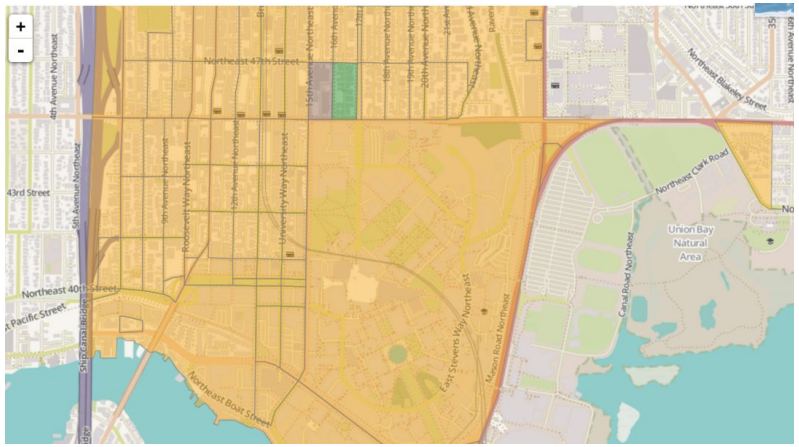
Host mapathons

Open source street view imagery

Mapillary

OpenSidewalks Tools for Getting Data

Municipal Data Import Workflows



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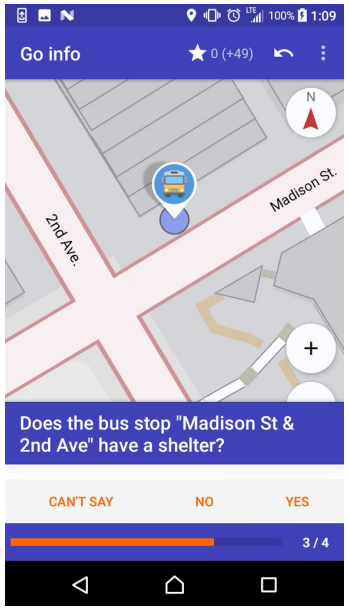


Host mapathons

Open source street view imagery

Mapillary

What can we do with this?

Project Sidewalk

Manaswi Saha, Jon Froehlich
Paul Allen School of Computer Science and Engineering

Project Sidewalk

Leveraging Google Street-View Imagery for Assessing Urban Accessibility

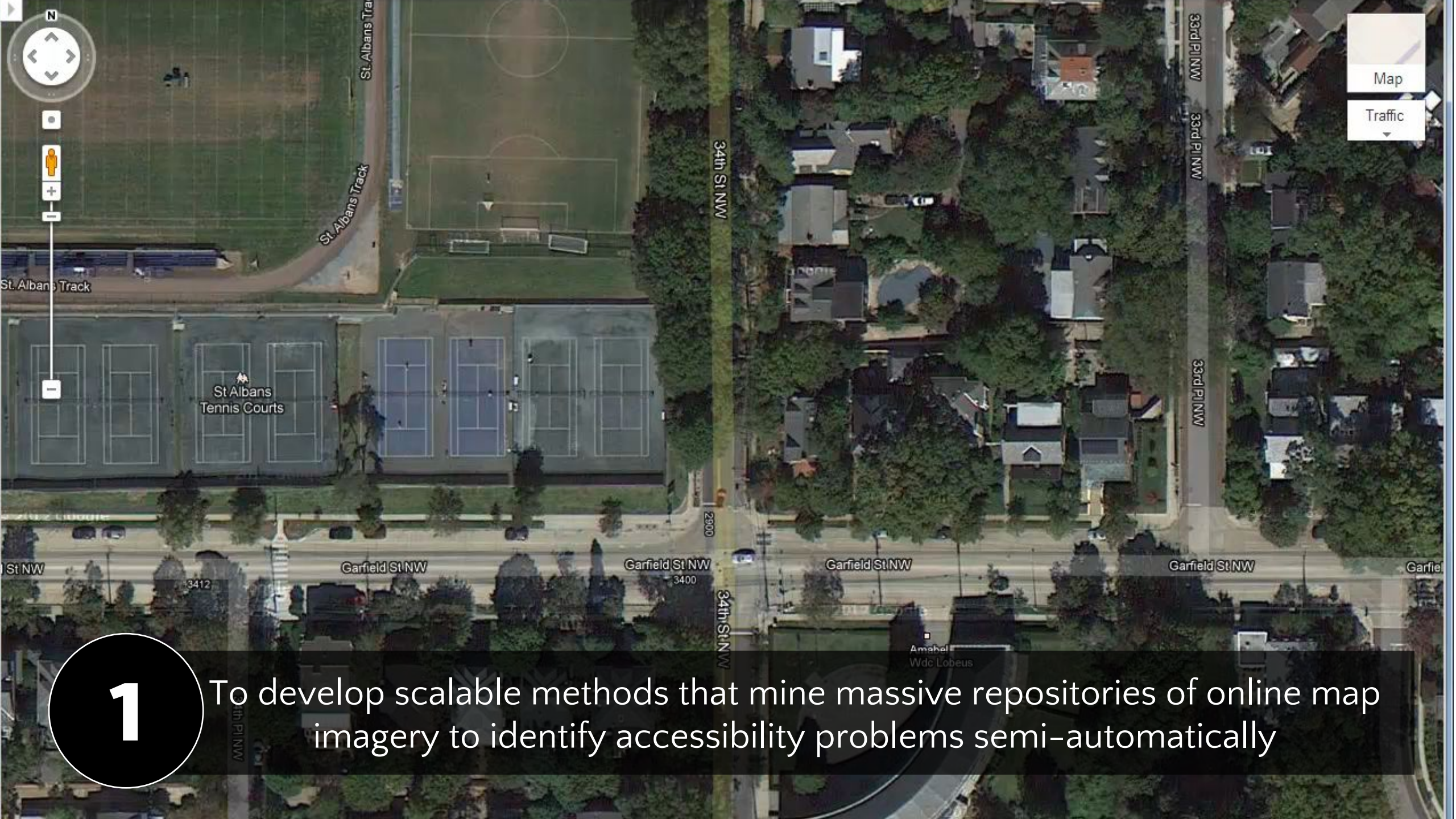
Project Sidewalk

[ASSETS'12, CHI'13, HCOMP'13, ASSETS'13 Best Paper, UIST'14, TACCESS'15, SIGACCESS'15, CHI'16, ASSETS'17]

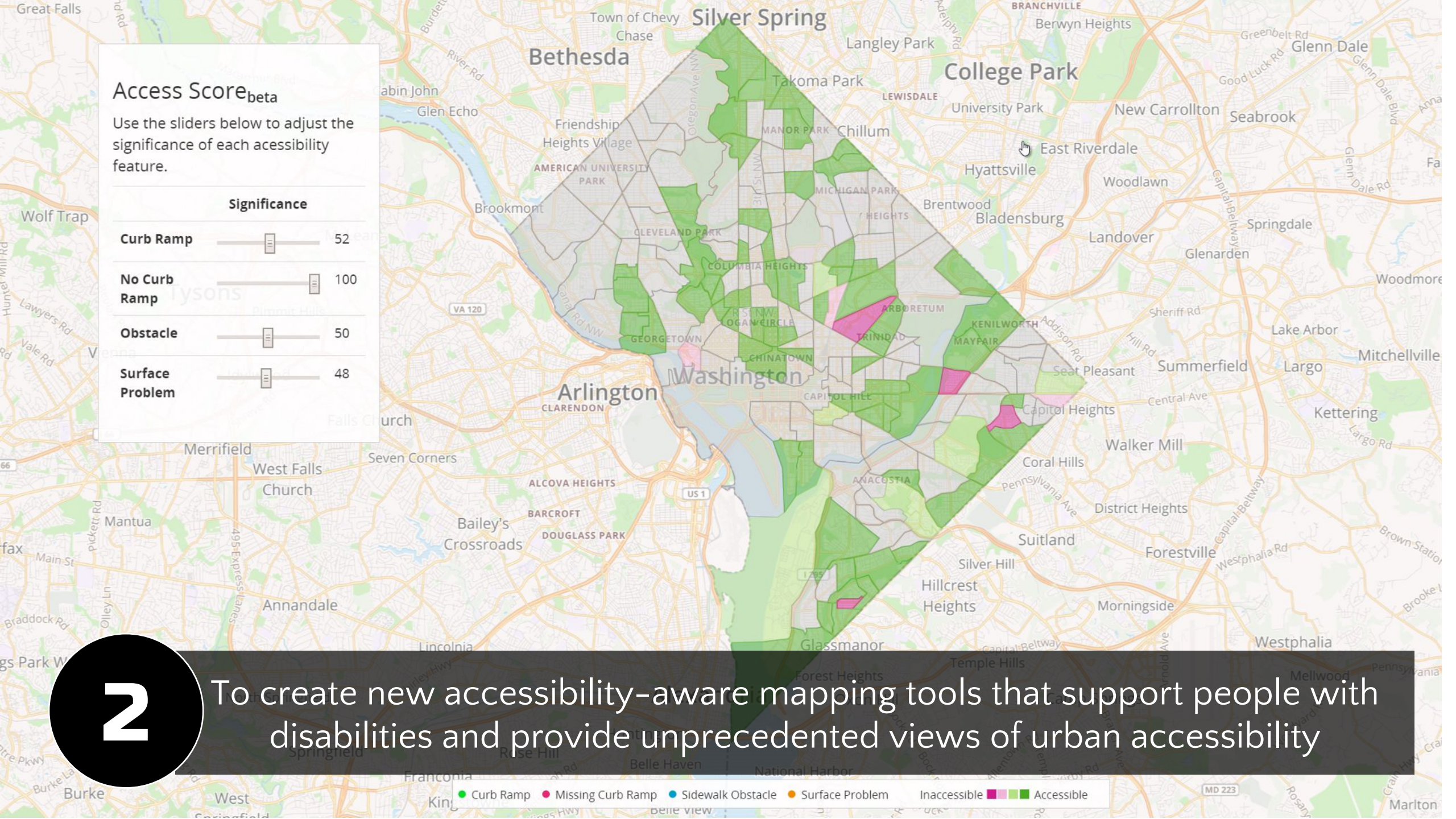
How can we...

develop scalable solutions that map the accessibility of urban infrastructure?

We are pursuing a **two-fold solution**



1 To develop scalable methods that mine massive repositories of online map imagery to identify accessibility problems semi-automatically



2 To create new accessibility-aware mapping tools that support people with disabilities and provide unprecedented views of urban accessibility

PROJECT SIDEWALK

HTTP://PROJECTSIDEWALK.IO


NO CURB RAMPS
CHANEL
ONE WAY
DIESEL


PHYSICAL OBSTACLES

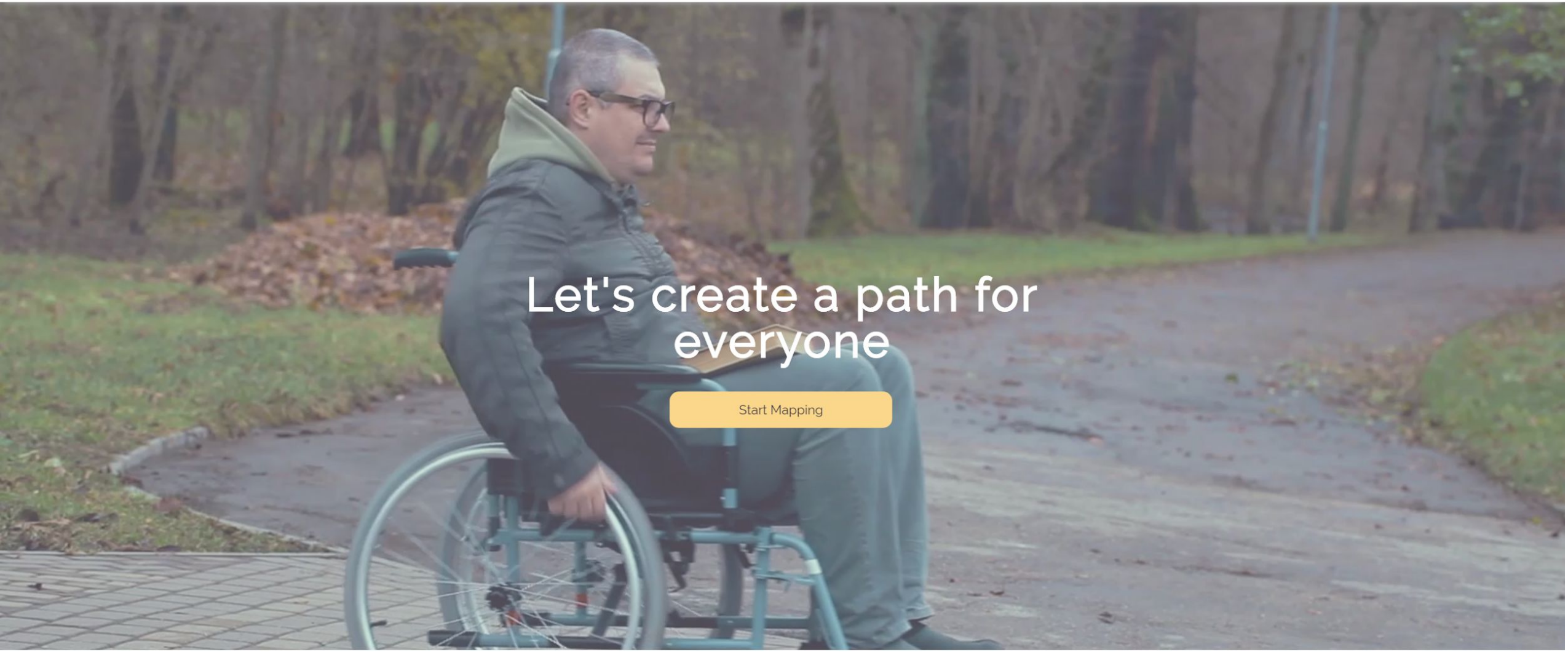

FedEx
INCOMPLETE SIDEWALKS


SURFACE PROBLEMS


PHYSICAL OBSTACLES
NO CURB RAMPS
SURFACE PROBLEMS

PROJECT SIDEWALK

Start Mapping | Jon Froehlich



How you can help

Virtually explore city streets to find and label accessibility issues in three easy steps—right from the comfort of your

Find and label the following

Explore | Curb Ramp | Missing Curb Ramp | Obstacle in Path | Surface Problem | Other

Zoom In | Zoom Out | Undo | Redo

Current Neighborhood

Mount Pleasant, D.C.

0.0 miles | 20 labels

Sound

Jump

Feedback

Audit 500ft in Mount Pleasant

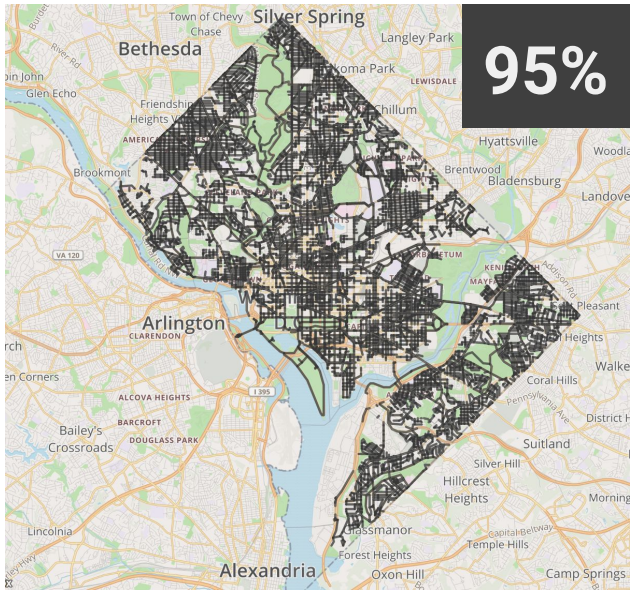
Your mission is to audit 500ft in Mount Pleasant and find all the accessibility features that affect mobility impaired travelers!

OK

Project Sidewalk Deployment

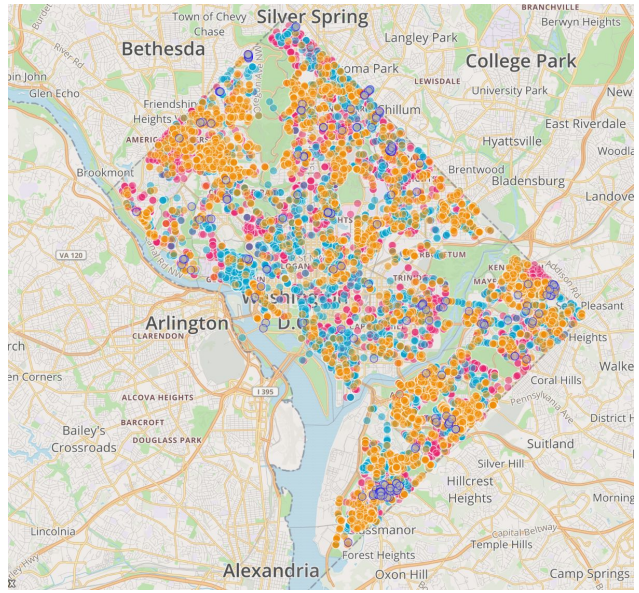
700

Users



1,031

Miles audited



~150,000

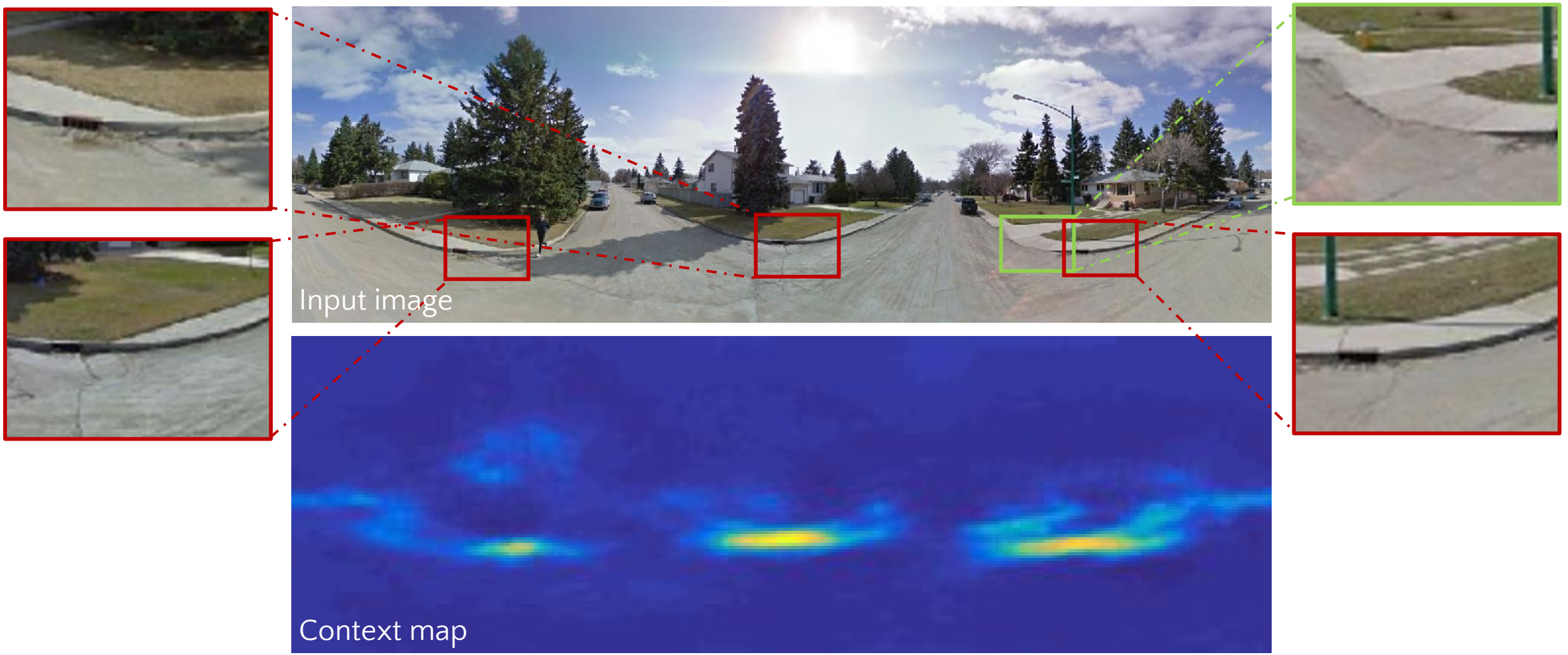
Sidewalk Labels

Current and Future Work

Current & Future work

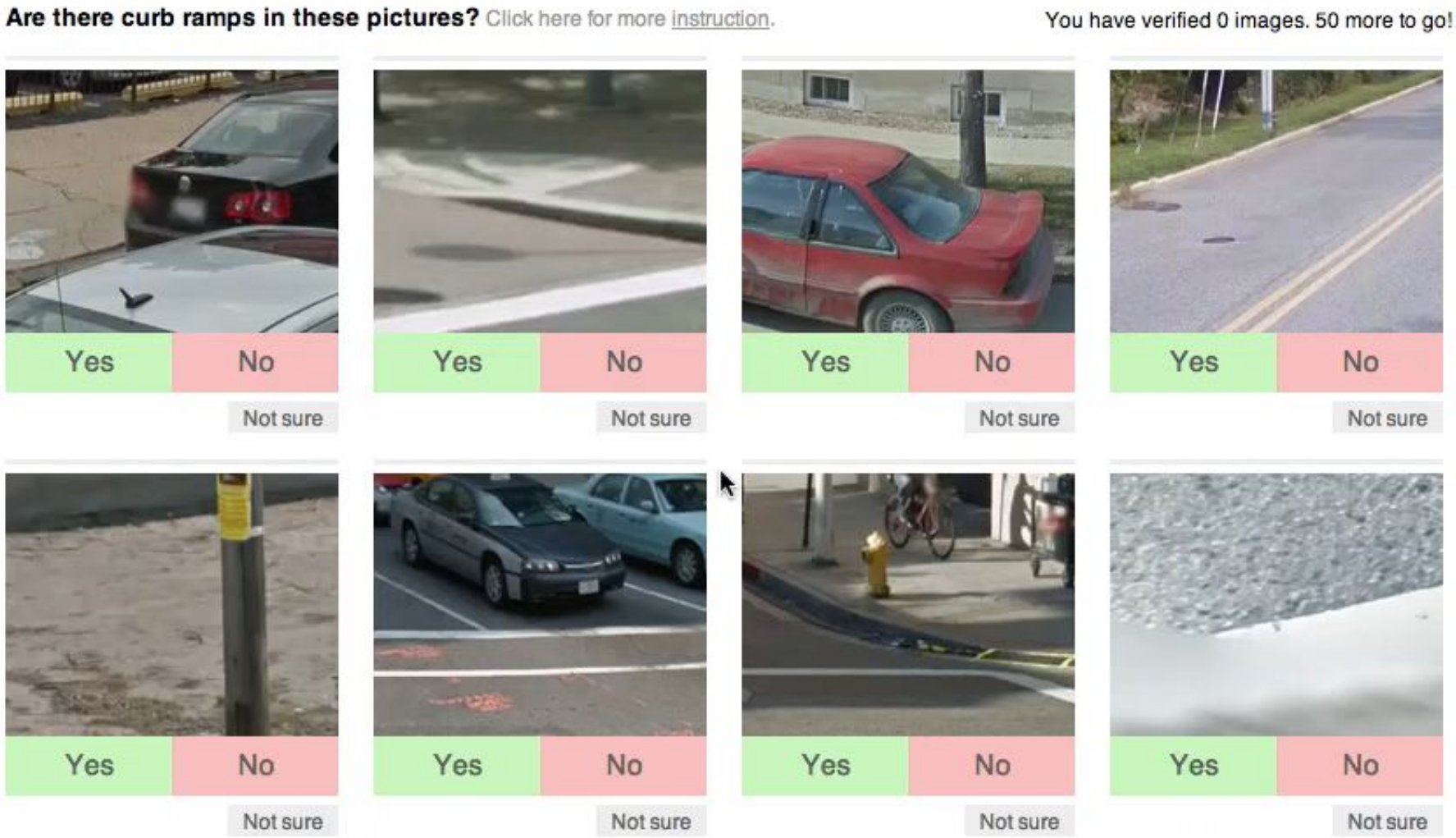
Applying Convolutional Neural Networks

Recently accepted to CVPR'17



Current & Future work

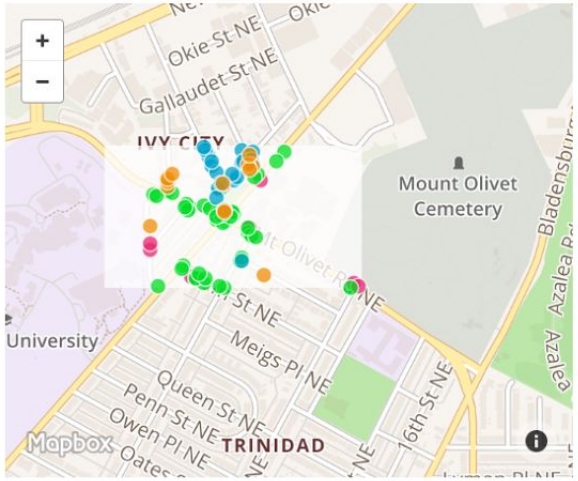
New Hybrid Workflows & interfaces



Future Work

Tracking Accessibility infrastructure over time

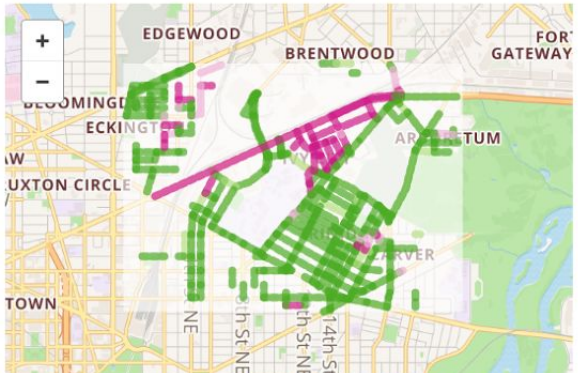
http://projectsidewalk.io/api



Access Features

This API serves point-level location data on accessibility features. The major categories of the features include "Curb Ramp," "Missing Curb Ramp," "Obstacles," and "Surface Problem." You would occasionally find an accessibility feature like "No Sidewalk."

URL	`/v1/access/features`
Method	GET
Parameters	**Required:** You need to pass a pair of latlng coordinates to define a bounding box, which is used to specify where you want to query the data from. • `lat1=[double]` • `lng1=[double]` • `lat2=[double]` • `lng2=[double]`
Success Response	**200** The API returns all the available accessibility features in the specified area as a Feature Collection of Point features.
Example	`/v1/access/features?lat1=38.909&lng1=-76.989&lat2=38.912&lng2=-76.982`



Access Score: Streets

This API serves Accessibility Scores of the streets within a specified region. Accessibility Score is a numerical value between 0 and 1, where 0 means inaccessible and 1 means accessible.

URL	`/v1/access/score/streets`
Method	GET
Parameters	**Required:** You need to pass a pair of latlng coordinates to define a bounding box, which is used to specify where you want to query the data from.

The Team

Professors

Jon Froehlich

David Jacobs

Grad students

Kotaro Hara

Ladan Najafizadeh

Hanuma Teja Maddali

Jin Sun

Manaswi Saha

Soheil Behnezhad

Michael Saugstad

Undergraduate Students

Vicki Le

Robert Moore

Christine Chan

Maria Furman

Daniil Zadorozhnyy

Zach Lawrence

Alex Zhang

Sage Chen

Steven Bower

Aditya Dash

Chirag Shankar

High School Students

Jonah Chazan

Anthony Li

Niles Rogoff

Ryan Holland

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Microsoft

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