Virtual Interpretation of Areas

VIA is a web application for people with visual impairments to explore Boston independently. It demonstrates using data and AI to make Smart Cities inclusive.

Olin College of Engineering
SCOPE

Microsoft

Lynn Andrea Stein
SCOPE Advisor

Michael Heyns
Microsoft Liaison
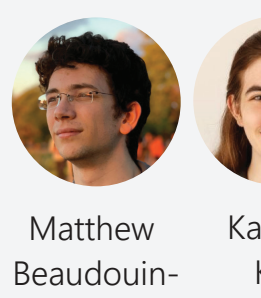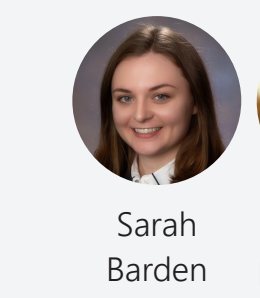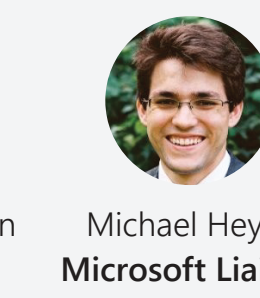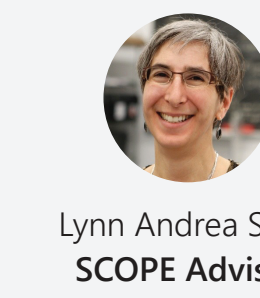
Sarah Barden

Matthew Beaudouin-Lafon

Kaitlyn Keil

Andrew Pan

Rachel Yang
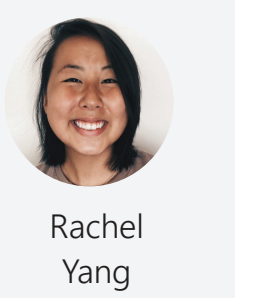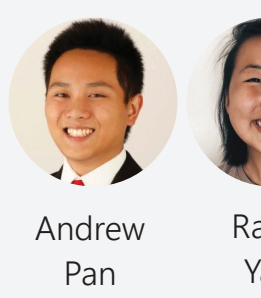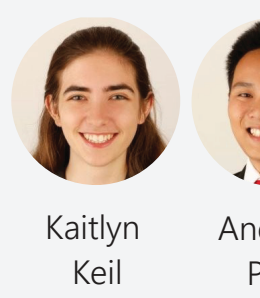
Project Goal and Introduction

Project Goal

Microsoft invited the Olin SCOPE team to use Microsoft's Cognitive Services tools and Boston's open data platforms to **improve inclusiveness in Boston for people with disabilities** or the aging population with an aim to **make Boston a more inclusive Smart City.**

Inclusive Smart Cities

A Smart City **uses open data and technology** to build relationships and interactions between people and the city. Inclusive Smart Cities **ensure the participation of all citizens.**

Microsoft's Role

Microsoft supports the Smart Cities for All initiative, which **increases inclusion through accessible technology solutions.** Microsoft has also committed to using artificial intelligence for accessibility.

User Research Methods and Outcomes

Methods

The team used (1) background research, (2) interviews with stakeholders, and (3) a user survey, to better understand our stakeholders.

Main Insight

Many people use maps applications or street images for planning trips or exploring an area for points of interest. These tools are not very accessible for people with visual impairments, leaving them with **few comprehensive tools for trip planning and exploration.**
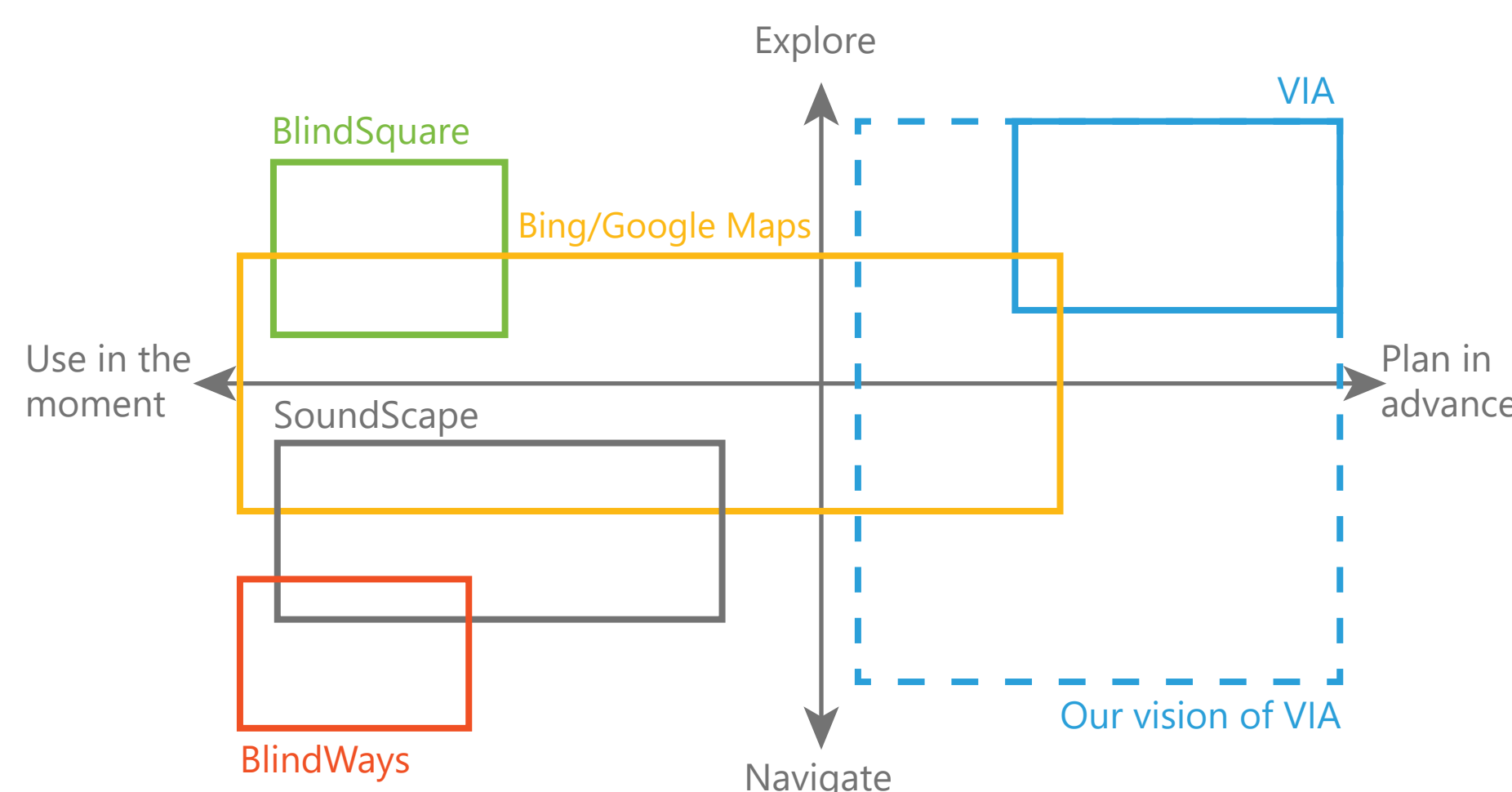
VIA Interface Breakdown

Controls. Moves user on the map. On screen buttons are discoverable to screen readers.

Search bar. Allows users to drop themselves anywhere in Boston.

Map. Designed for people with low vision to complement the information on the left side.

where in Boston would you like to explore?

OverView

Moved forward. You are facing North. Now on Bowdoin Street.

- Boston City Hall, 1340 feet away at 3 o'clock.
- Faneuil Hall Marketplace, 2220 feet away at 3 o'clock.
- Boston Commons, 2310 feet away at 7 o'clock.

Transit
- Bowdoin
- Bowdoin - Cambridge St
- Cambridge St @ Bowdoin St

Businesses
- Dunkin' Donuts, fast food, 58 feet away to your left at 8 o'clock.
- Rite Aid, pharmacy, 75 feet away to the right at 4 o'clock.
- Yummy Express, fast food, 82 feet away directly to your left at 9 o'clock.

Callouts. Displays information about the user's location. Displaying information in a text box makes it screen reader accessible. Headers classify information, making it easier for a screen reader user to navigate.

Design Requirements

- Users must be able to navigate large areas quickly and have access to information about the local environment.

- VIA should have a low barrier to entry, be discoverable, and not require learning new tools.

- VIA must be useful for people with different levels of vision. It must work with a screen reader, but not entirely rely on it.

- VIA must comply with web accessibility standards for people with visual impairments.

Open Street Maps for navigation and data about street details.

Bing Maps to retrieve StreetSide images for analysis.

Microsoft Cognitive Services to recognize objects in StreetSide images.

Additional data from **MBTA** and **Analyze Boston**

Frontend with **ReactJS**

Backend with **Python Flask**
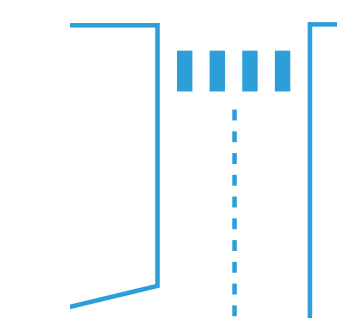
VIA's Zoom Levels

OverView

Navigating in this level is akin to driving around the neighborhood. The user steps from intersection to intersection, which helps users get a general sense of how streets are laid out and intersect.

Featured information:
Location relative to landmarks (*e.g.* Boston Common), nearby transit, businesses.
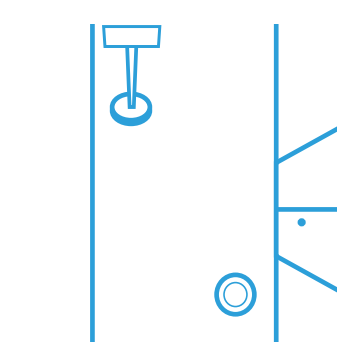
EarShot

This level mimics quickly walking down the street. A forward movement displaces the user 45 feet, which is enough to quickly understand how points of interest are laid out on a block.

Featured information:
Adjacent business, detailed transit information, information about the street (*e.g.* number of lanes).

TouchPoint

When most zoomed in, the user moves by 3 feet. We aim to show information that is roughly within cane's reach.

Featured information:
Presence of obstacles or landmarks (*e.g.* lamp posts), details about intersections.

Next Steps for VIA

Send explored area to phone
to make virtual exploration persist in the real world.

Interactive callouts
using the Knowledge Cognitive Services to allow users to learn more about points of interest.

Improve data for crosswalks
using computer vision on satellite images to detect locations.

Explore map with touch
similar to Seeing AI's explore photos with touch feature.