HandiGo

Enhancing Rideshare Services for the Visually Impaired

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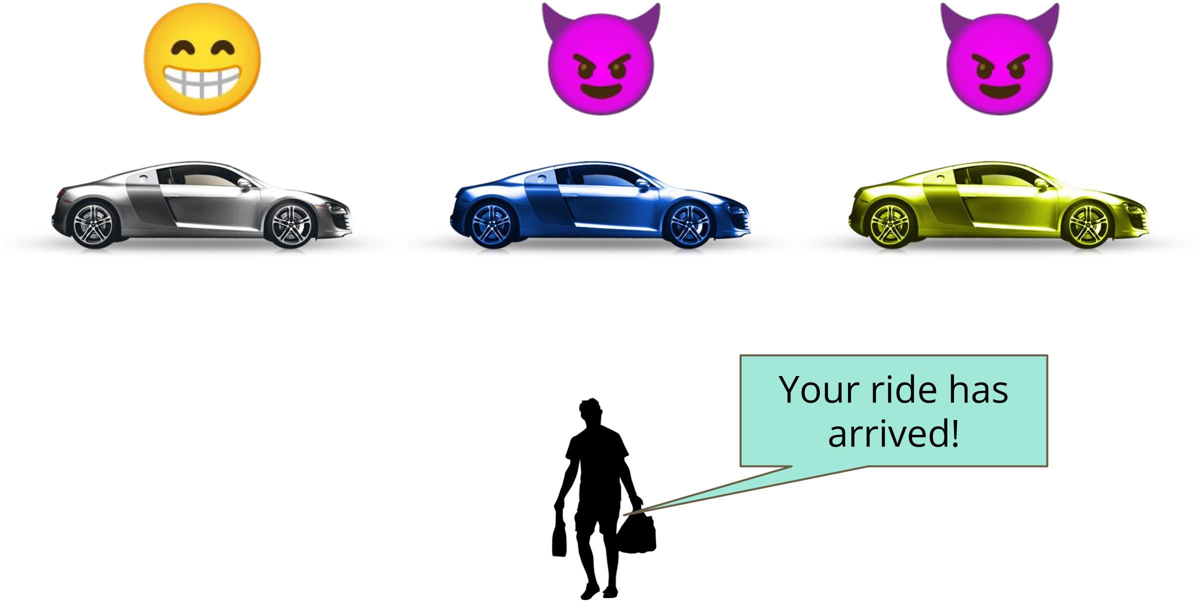
Rideshare: a Potential for Danger



Rideshare: a Potential for Danger

Which car is for me?

With rideshare, bad actors can *pretend* to be your driver.

How can we ensure that a disabled person can enter the right vehicle when there is no easy way for them to verify?

A blind person cannot check the license plate or the make/model of the car.

A deaf person would have trouble verifying with the driver when entering the vehicle.

Problems in the Real World

- Uber ordered to pay $1.1 million because of discrimination and harassment of drivers against a blind woman
  - https://www.businessinsider.com/uber-pay-1-million-blind-passenger-arbitration-discrimination-ada-2021-4
- Often have to rely on other people or guessing to verify that you’re in the right vehicle, which can make people more susceptible to adversaries
  - https://www.youtube.com/watch?v=Z162aqV6JcU

Our Solution is...HandiGo!

- The main interface is similar to that of any rideshare application — passengers can request rides, drivers can view potential rides and accept the ride that they would like to be the driver on
- Once the driver has arrived, their phone starts advertising as a beacon (using iBeacon, bluetooth, and location services)
- Once the passenger starts monitoring for beacons, they can visually see the distance they are away from the beacon, but their phone also vibrates and plays a sound when they are heading in the correct direction (distance decreases)
- For an extra step of verification, when the driver and passenger touch phones, the passenger's phone vibrates multiple times, an acceptance sound is made, and the passenger can confirm the ride

HandiGo Tools

- **SwiftUI/XCode -** Using the iOS development platform allowed us to more easily integrate core location services, core bluetooth, and the iBeacon packages
- **iBeacon -** This is an iOS package that allows you to emit your device as a beacon, monitor beacons around you, and calculate the distance between you and the beacon
- **MongoDB -** This allowed us to create a database that stored collections of passengers and active rides
- **ngrok -** This allowed us to re-route our localhost link so that anyone could access it

Challenges We Faced

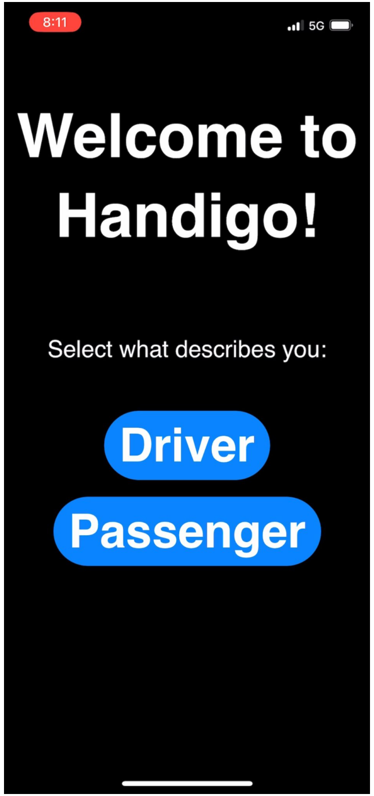
- **Personal challenges -** None of us knew anything about ANY of the tools we used, so there was a HUGE learning curve
- **iBeacon -** distances are more inaccurate as you get further away and have more obstacles in your path
- **Bluetooth privacy -** How can we ensure that the bluetooth connection is secure and active only when necessary to prevent bad actors from extracting any personal information?
    - **Solution:** generating temporary UUID's for the driver
- **Navigation -** How can we guide someone who is visually impaired to the correct car after the driver has arrived?
    - **Solution:** Using sounds and vibrations

HandiGo in Action

Driver Perspective

Passenger Perspective

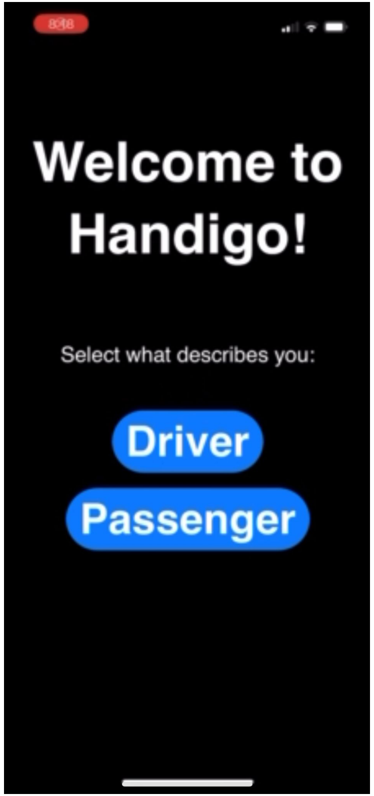
Driver



Welcome to Handigo!

Select what describes you:

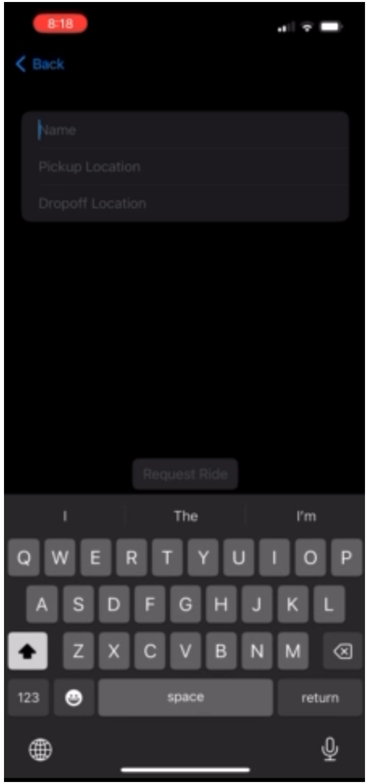
Passenger



Welcome to Handigo!

Select what describes you:

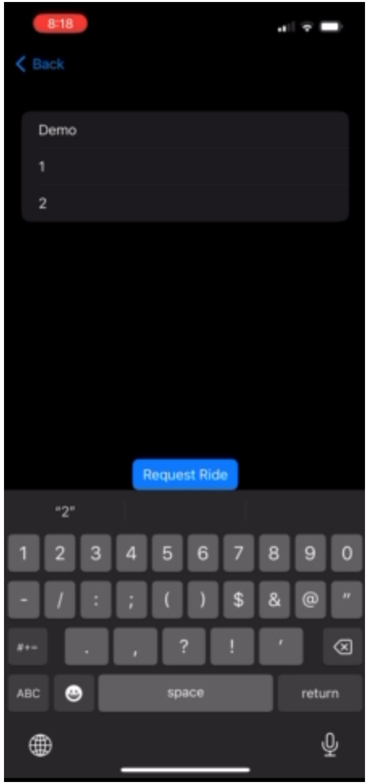
Passenger - Requesting a Ride



Name

Pickup Location

Dropoff Location

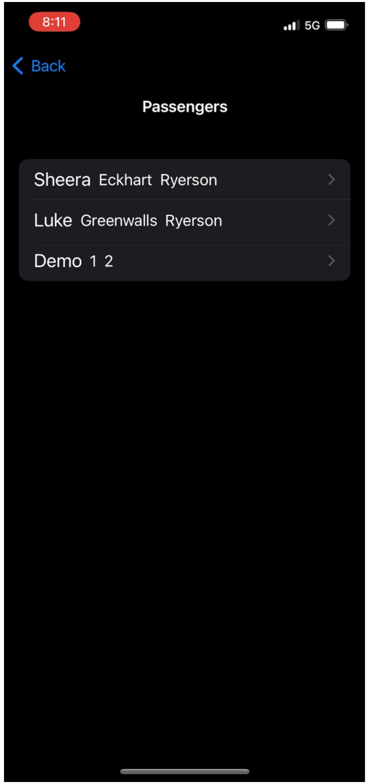


Demo

1

2

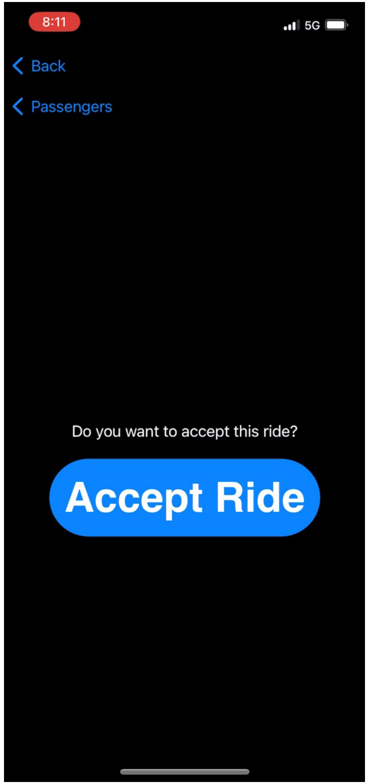
Driver - Accepting a Ride



Sheera Eckhart Ryerson

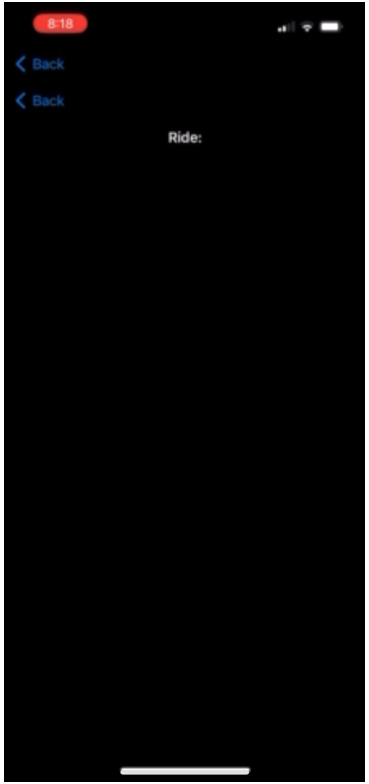
Luke Greenwalls Ryerson

Demo 1 2



Do you want to accept this ride?

Passenger - Viewing their Ride

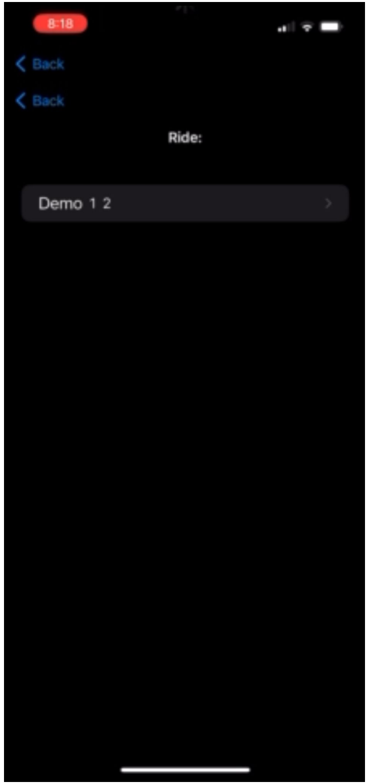


8:18

Back

Back

Ride:



8:18

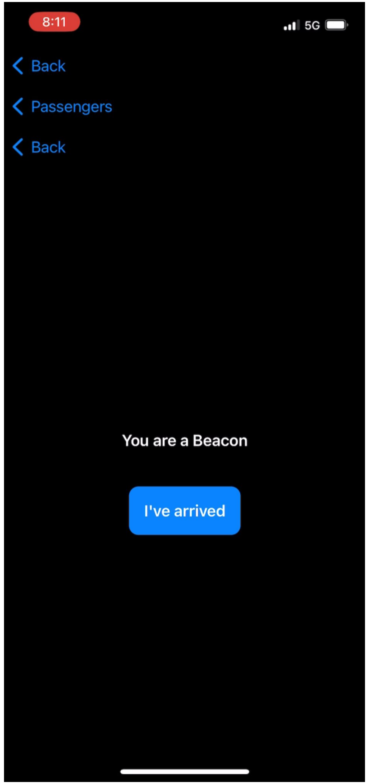
Back

Back

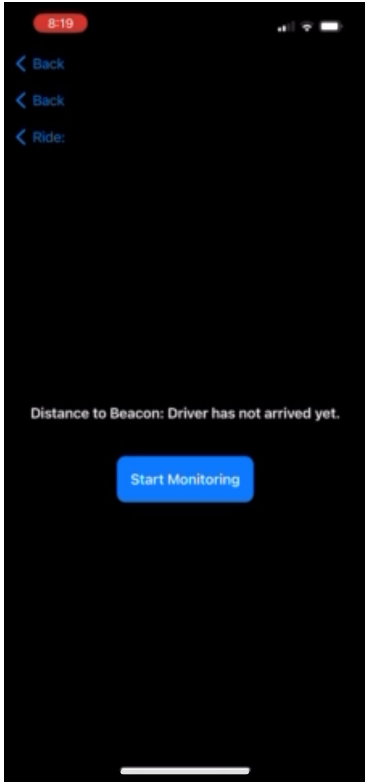
Ride:

Demo 1 2

Driver & Passenger - Advertising & Monitoring Beacons

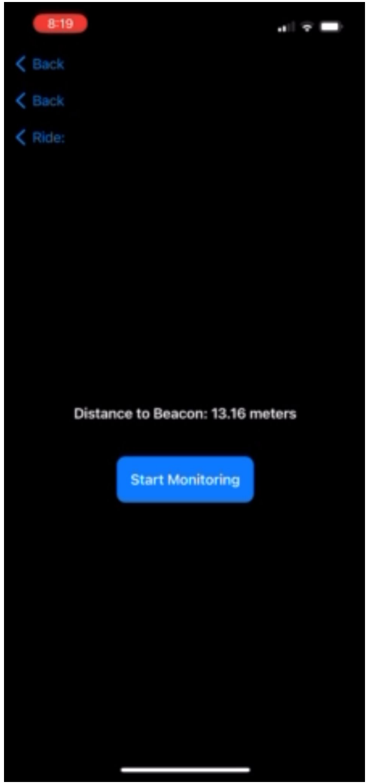


You are a Beacon

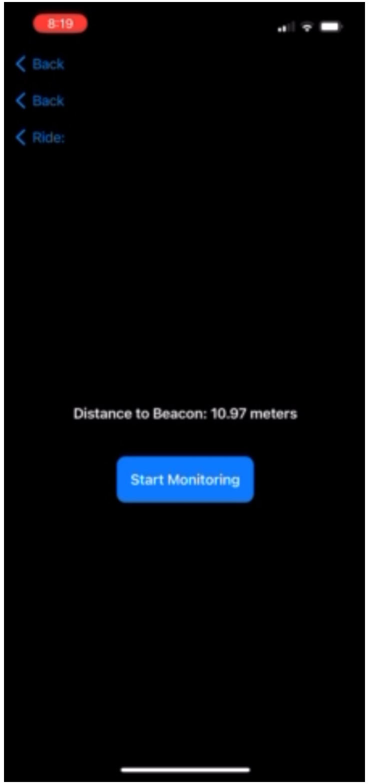


Distance to Beacon: Driver has not arrived yet.

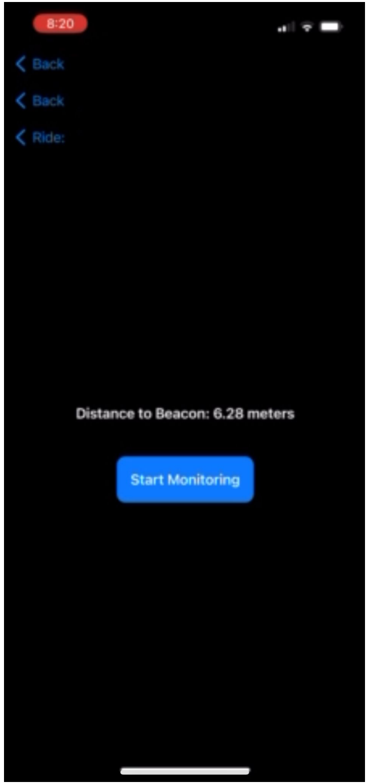
Passenger - Navigating to the Car



Distance to Beacon: 13.16 meters

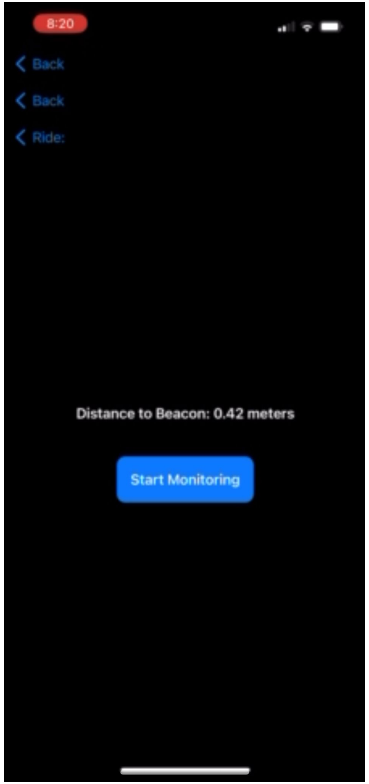


Distance to Beacon: 10.97 meters

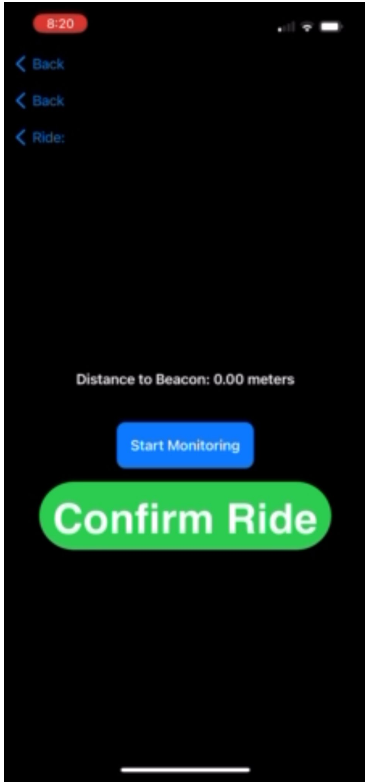


Distance to Beacon: 6.28 meters

Touching Phones to Verify Driver and Passenger

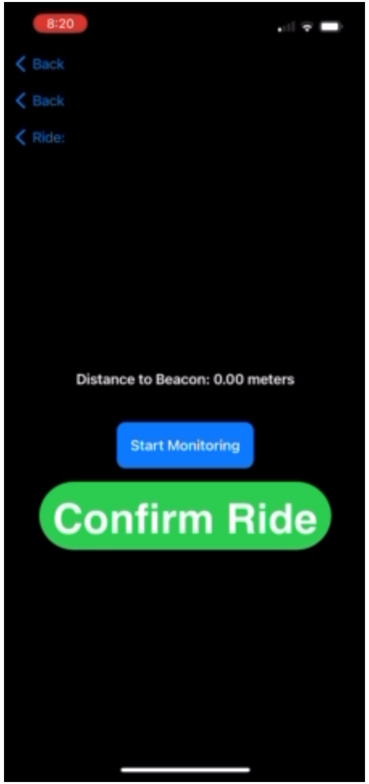


Distance to Beacon: 0.42 meters

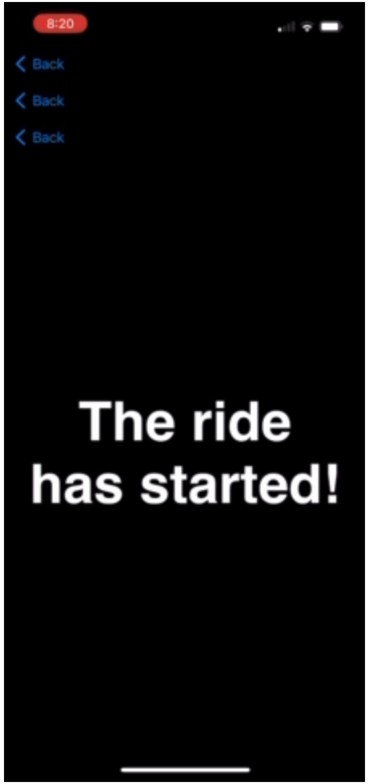


Distance to Beacon: 0.00 meters

Passenger - Confirming the Ride



Distance to Beacon: 0.00 meters



The ride has started!

Limitations & Looking Towards the Future...

- Limited by the free versions of the database, so the server (with IP address listed in the database) and ngrok have to be running in the terminal and we cannot use the localhost on any device without using ngrok, which is a little less secure because anyone in the world can view items in the database with the ngrok link
- Limited by our knowledge of SwiftUI so the UI could be better and we could add the ability for people to hear all of the text/buttons
- We would like to implement more features of a typical rideshare and add features like location monitoring and SOS text messages