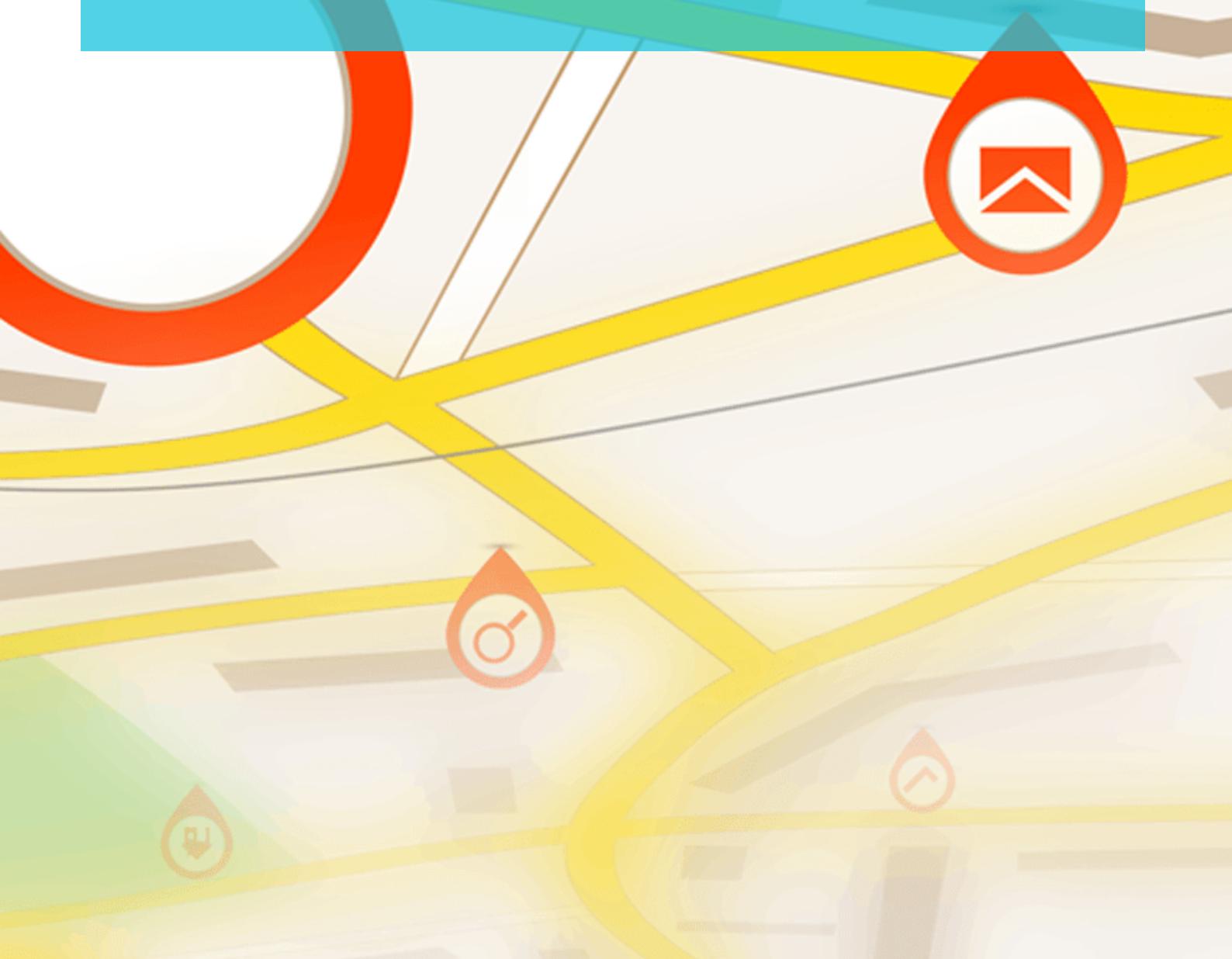


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# GOOGLE GLASS NAVIGATION: DESIGN BOOK

NOVEMBER 2019

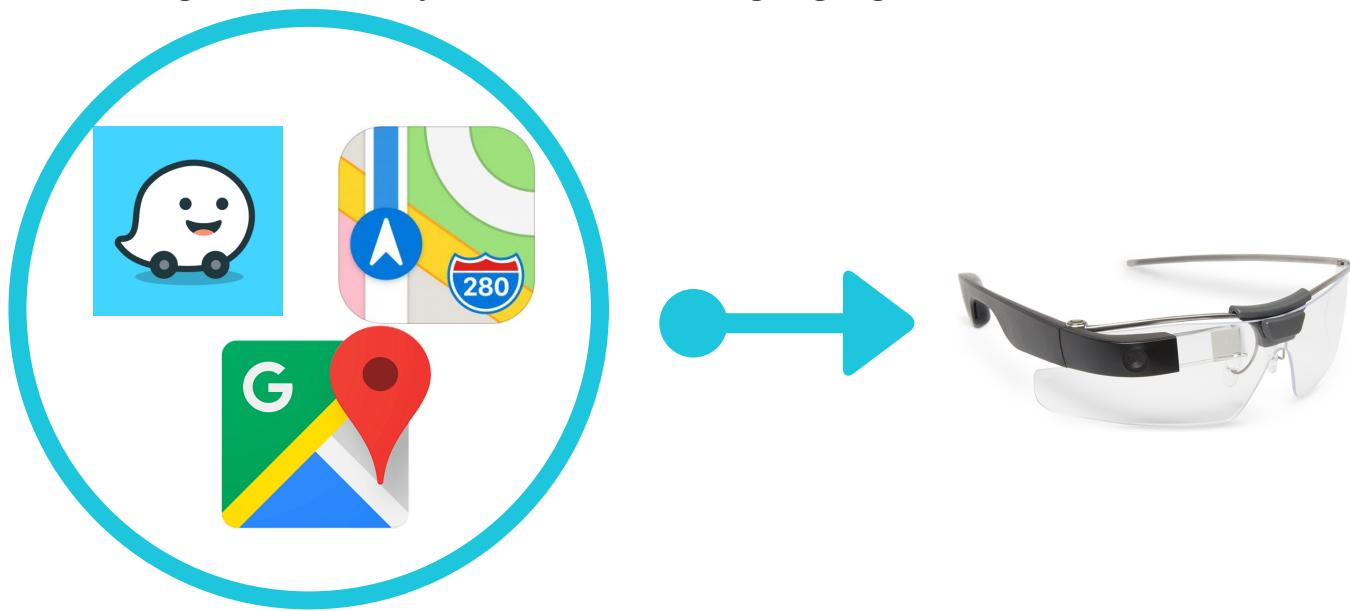
EMMA SUN  
CONNIE HE  
ZIXUAN YAO



# DESIGN FOCUS & PROBLEM SPACE

Whereas in the past people were forced to use physical maps when traveling to a new location, the advent of smartphones and GPS navigation has dramatically streamlined transportation. People rely heavily on navigation apps such as Google Maps, Apple Maps, and Waze for guidance when traveling from one location to another. Our team decided to redesign the interface for these widely-used apps by incorporating the navigation functionality into the Google Glass device, which is a type of smart glasses. When the technology was first launched by Google, it was meant to act as a "ubiquitous computer". Google Glass can conveniently display information in a smartphone-like, hands-free manner. We initially considered projecting navigation directions on the windshield of the car, but then we realized that using a google glass would allow our product to be adaptable to any form of transportation (e.g. walking, scootering, biking, etc.).

One of the main issues with navigation apps on smartphones is that when the user is driving, it is often difficult to multi-task. Users often have to split their attention between focusing on the road ahead and interpreting the instructions that the GPS app is providing. Our product would improve user experience when driving by seamlessly integrating the two tasks mentioned above, using the augmented reality environment that google glass creates.



# PROBLEM UNDERSTANDING: CULTURAL PROBE

My name is \*

Short answer text

Last time I drove was \*

Month, day, year



Inconveniences using search: \*

Long answer text

Inconveniences using navigation: \*

Long answer text

Inconveniences when parking:

Long answer text

Where do you put your phone while navigating? \*

Short answer text

The Map App I used \*

- Google Map
- Apple Map
- Waze
- Other...

We asked our cultural probe users to fill out a google form every time they used some maps app for navigation.

With the cultural probe, our goal is to collect user data to gain further insight into our problem space. Since the users' interaction with navigation apps is intermittent and they do not always drive on a regular basis, it is impractical for us to observe our users as they drive every time. Therefore, a non-invasive cultural probe can be used to collect data without being physically present with the user. Additionally, the two users differ slightly in their driving habits and regularity, so we designed two sets of cultural probes for them. Using the cultural probe, we collected data on inconveniences that the users experienced while using search and navigation, as well as during parking. We also collected data on the frequency of map usage, which map apps were used most often, and phone placement while navigating. During the interviews, we asked the cultural probe users to describe their experiences using various map applications, focusing on their frustrations/perceived missing functionalities, as well as the useful features that they like about each app.

# PROBLEM UNDERSTANDING: CULTURAL PROBE

Our first cultural probe user is a senior double majoring in Computer Science and Applied Mathematics & Statistics, Yuchen Ding, and she has driven for three years. She lives close to campus so she does not need to commute everyday, so she normally drives off-campus to eat or shop for groceries or eat out a few times a week. She normally uses Google Maps for navigation while driving.

From the cultural probe and interviews, these are the comments that she has about using Google Maps for navigation:

- Navigation:
  - "I missed a right turn today because the road forked into two different streets on the right and I went onto the wrong one - map was unclear about which one to take."
  - "Looking at phones is inconvenient. Sometime my phone falls off while driving. That's a safety concern if no one else is in my car. I have to pick it up myself while driving."
  - "It's hard to change a destination while I am driving. I found it very annoying."
  - "I like how google maps tells me which lane to be in before turning!"
- Parking:
  - "I take pictures after I park. It helps to remind me where I have parked but sometime it's not that helpful. I cannot figure out where I have parked sometime."
  - "I had trouble parallel parking between two cars today on a busy street."

# PROBLEM UNDERSTANDING: CULTURAL PROBE

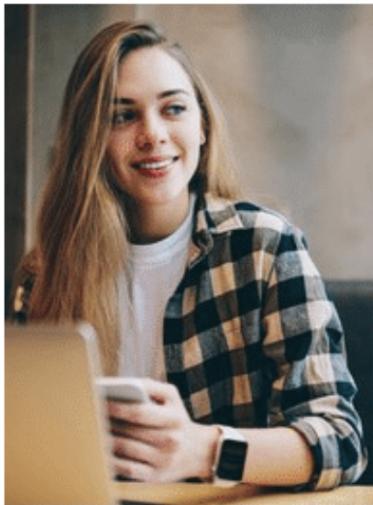
Our second user, Neo, lives far away from Homewood campus and needs to commute around 20 minutes every day. He needs to drive to school and back home every day and night. Furthermore, he is a new graduates student so he is still familiarizing himself with the campus and surrounding city area. He uses Google Maps to help him find a parking spot and navigate from his home to campus and vice versa.

From the cultural probe and interviews, these are the comments that he has about using Google Maps for navigation:

- Navigation:
  - "The navigator won't give me the speed limit, which is useful sometimes."
  - " I like how google maps shows traffic jams and accidents."
- Parking:
  - "I need to mark the parking spot by myself, which is very inconvenient when I forget to do so. I hope the map can mark it automatically by some algorithm tech."
  - "Street parking is not marked. I don't know whether it is allowed to park or not. If the Map can show that kind of information, such as: you can park on this street, it costs 50 cents per hour, it would be great."

# PROBLEM UNDERSTANDING: PERSONA

## Mary Moriarity



**Age:** 23

**Work:** Software Developer

**Status:** Single

**Location:** Mountain View, CA

Traveler

Outgoing

Dog Person

Tech Savvy

Confident

Adventurous

### Goals

- Find an easier way to navigate to new places
- Travel to all 50 states
- Save up enough money to purchase Tesla

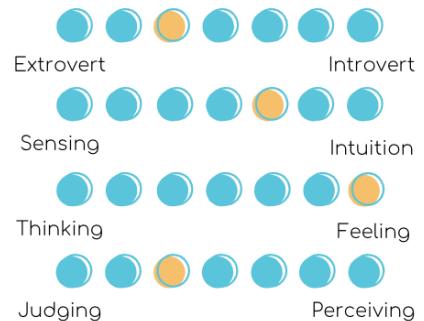
### Frustrations

- Not having enough time to travel to faraway locations
- Habit of stress-eating when deadlines approach
- Frequently gets lost while using gps navigation
- Finds multi-tasking while driving difficult

### Bio

Mary grew up in Chicago, Illinois and graduated with a degree in Computer Science at Carnegie Mellon University in 2018. She is now working at Facebook as a Software Developer. Mary is passionate about traveling and has visited over thirty countries spanning six different continents. She has recently been going on road trips with her coworkers to various locations in California, including Yosemite National Park and Big Sur. Mary doesn't mind driving long distances, but she sometimes finds it difficult to follow google maps' instructions, especially when navigating to new places. She doesn't have a sturdy dashboard phone stand, so she usually just holds her phone while driving.

### Personality



### Hobbies

- Road tripping with friends
- Surfing
- Attending dog conventions
- Shopping

### Most Used Apps



# IDEATION & PROTOTYPING

After analyzing data from the cultural probes and interviews, we identified the core features that we wanted to include in our product. One of the most common issues that people have when using a mobile navigation app such as Google Maps is that it is difficult to multitask between looking at the screen for directions but also paying attention to the road/where they're walking. Therefore, we decided to create an interface that displays directions in the user's field of view without obstructing it, as shown below in the prototype.

We focused on two general use cases for our application: (1) user is in transit and (2) user is parking. For each use case, we adapted features already present in map apps and also added some new functionality that we felt would improve user experience while driving or parking. These features are illustrated in the prototypes.

## Transit

- Speed limit and user speed
- Arrows to indicate directions (go straight, turn right, turn left)
- ETA
- Distance until next turn
- Display next direction
- Set/switch destination via voice command
- Real-time road conditions

## Parking

- Find nearest parking lot or parking spot
- Automatically save user parking location
- Provide step-by-step instructions on how to park
- Guide user back to parking location

# IDEATION & PROTOTYPING

## Prototype #1:



Prototype #1 shows the general interface of the Google Glass navigation guide. A semi-transparent arrow is overlaid on the road to indicate to the driver that there is an upcoming left turn in 500 feet. In the upper-right hand corner, there is a left-arrow that indicates to the driver that there is another left turn after the first one. The google glass also displays real-time information about the driving speed and speed limit. Lastly, the estimated time of arrival to the destination is displayed in the lower-left hand corner.

# IDEATION & PROTOTYPING

## Prototype #2:



Prototype #2 demonstrates how the google glass navigation guide can display real-time road conditions. The device notifies the user that the street on the right is temporarily closed due to construction, so that the user knows to avoid it. The device will calculate the optimal route, taking into account traffic and road conditions.

# IDEATION & PROTOTYPING

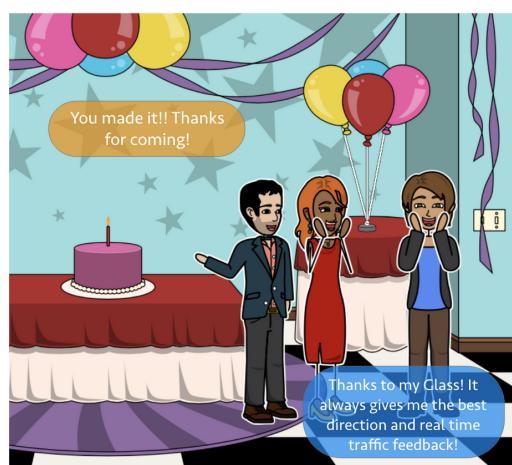
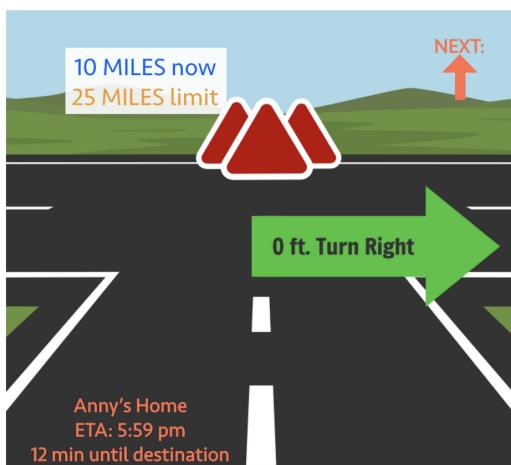
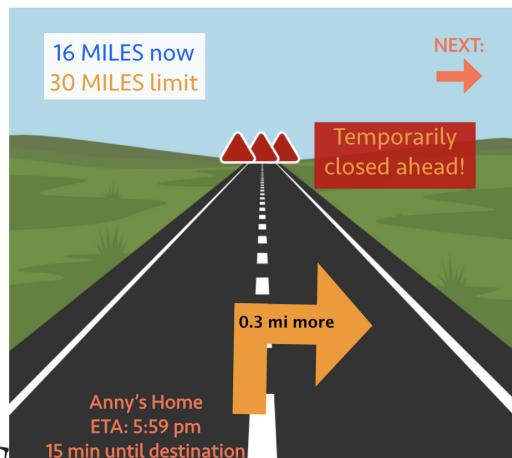
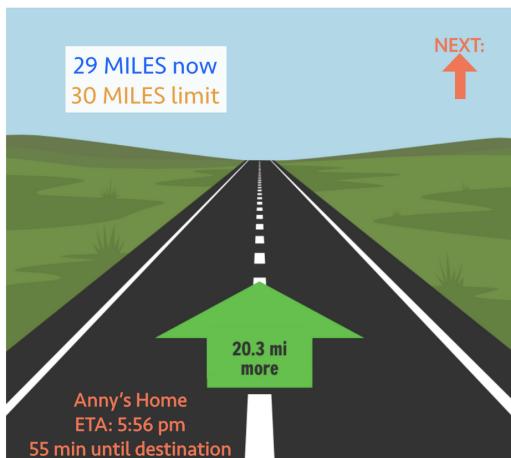
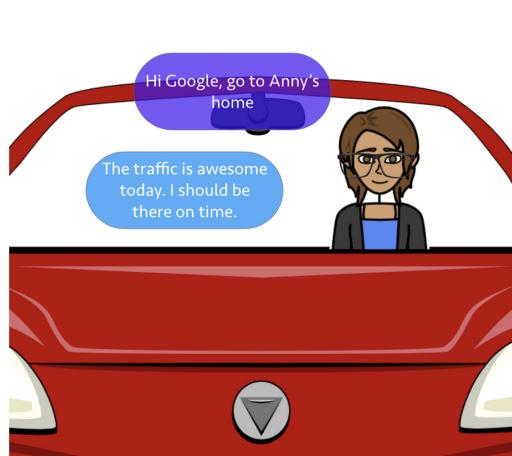
## Prototype #3:



- . Prototype #3 illustrates some of the helpful features of our interface that are related to parking. The google glass provides directions for the user when they are walking back to the car. This feature alleviates the driver's stress of having to remember where they parked. When the driver is approaching their car, a red flag is displayed on the screen to help the user visually locate their car.

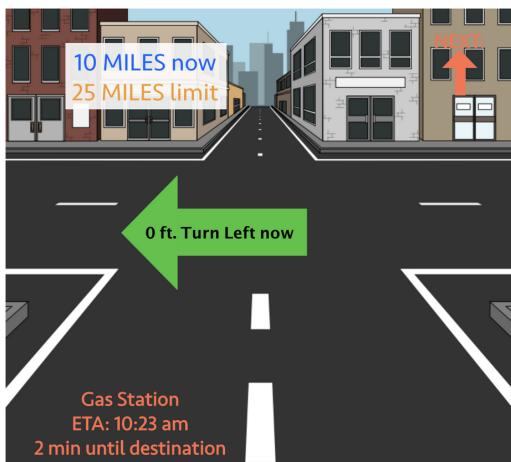
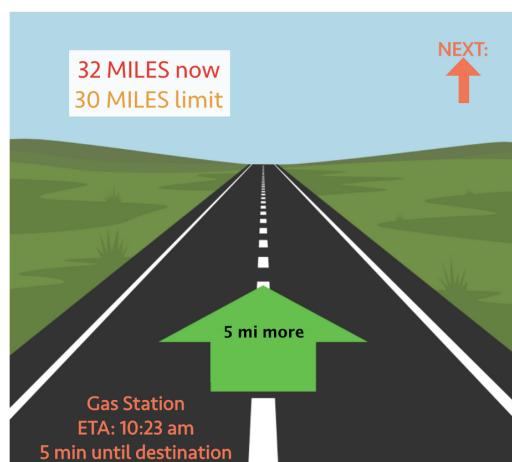
# IDEATION & PROTOTYPING

## Storyboard #1:



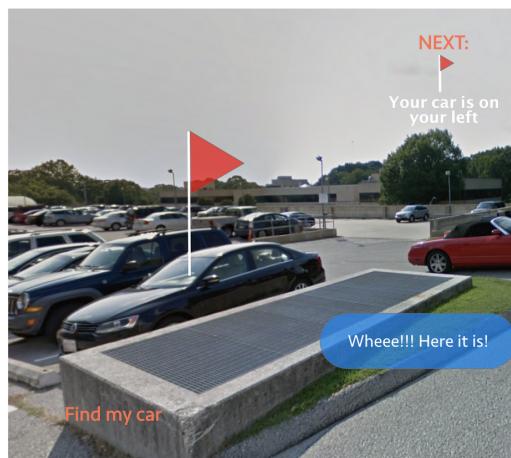
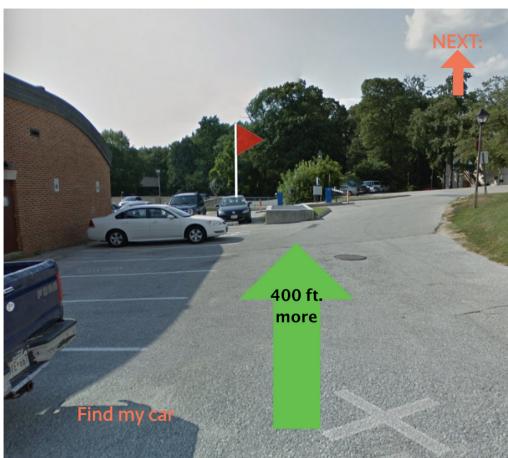
# IDEATION & PROTOTYPING

## Storyboard #2:



# IDEATION & PROTOTYPING

## Storyboard #3:



# USER FEEDBACK & REFLECTION

## User 1 Feedback

The first user, Yuchen, said, "O-M-G this is amazing!" and "This system looks very smart to me. I really want to try it out now. I will be a big fan." She is very happy that our smart navigation system is able to show her guide both on the road and when finding where she parks. She loves the voice control as well, because according to her, switching a destination while driving is very hard.

She had a concern in the end as well. For instance, the navigation system for now is not able display and account for traffic conditions. "Maybe you can try to show traffic on the navigation?" Users have to trust that the system gives the best route. But she is fine with what we have right now. She thinks this is perfect, and she would love to see this product in the real world.

## User 2 Feedback

The second user, Neo, loves this product. "Best thing ever," he commented. Our design solves the two problems he had with the map application. It reminds him of the speed limit and shows him the direction when he is driving. It is also smart enough to help him find where he parked his car easily without manually marking the location.

However, he also mentions a few possible drawbacks of designing on google glasses. Would the battery be light enough to be assembled on the glasses and also durable enough to support a whole day usage? The only control is voice control. It is convenient during driving but limited in other circumstances requiring silence. "Maybe you can figure out other ways to give commands?" In addition, he mentioned, "It would be nice to display street parking information" (i.e. cost, availability, etc.). Overall, he does think it is a great design as a supplement to the normal map.

# TAKEAWAYS

After finishing the design of our Google Glass Navigation System, we felt like we had a clearer understanding of cultural probe and persona, and we really enjoyed using storyboard to demonstrate our ideas and we were able to realize our design through the video prototype. We loved showing users the end result, and we were glad to find that they enjoyed our product as much as we did. To improve our design further, we could conduct cultural probe inquiry on a wider variety of users, including people who use maps when riding scooters, bikes, or motorcycles, or just walking, to ensure that our application is designed to facilitate all types of transportation. We could also gather information from people who use different maps apps besides Google Maps so that we could incorporate the best features of each app into our navigation guide.

We would love to include traffic, as Yuchen suggested, into our design, and solve the concern that Neo has raised by maybe using gaze tracking or a mobile keyboard (connected via bluetooth) to type information during situations where our users cannot talk. We would also love to create a more high-fidelity video prototype, illustrating some of the proposed features that we didn't get to show (i.e. step-by-step parking instructions, how the user searches and selects correct destination) and have an even prettier interface.

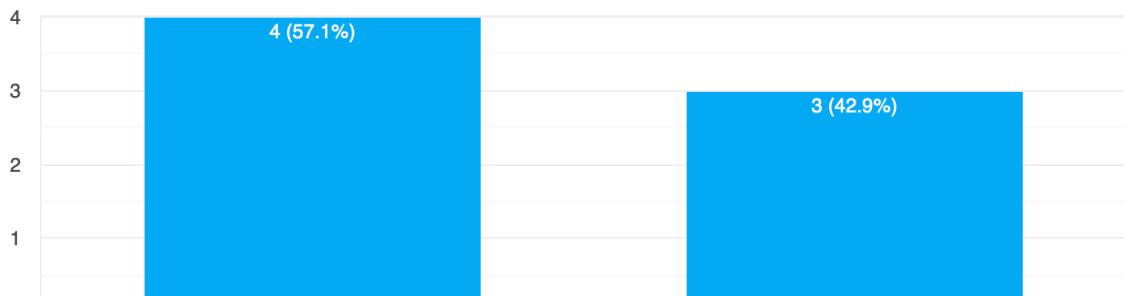
Overall, we enjoyed the designing process a lot, and really gained insight from it. We loved seeing our users' facial expressions when they saw the video prototype: they were all shocked. We hope to see our project in real life as well, and we think it will be a game changer for the navigation industry.

# APPENDIX

Cultural Probe Outcomes for A & B:

My name is

7 responses



Last time I drove was

7 responses



Inconveniences using search on map:

7 responses

I think search is perfect.

It's hard to change a destination while I am driving. I found it very annoying

You cannot search while in the navigation mode.

didn't have any difficulties

Can not find street parking

tried to search for nearest gas station while driving today, which was inconvenient

Search function is generally good

# APPENDIX

## Inconveniences using navigation:

7 responses

The navigator won't give me the speed limit, which is useful sometimes.

Looking at phones is inconvenient. Sometime my phone falls off while driving. That's a safety concern if no one else is in my car. I have to pick it up myself while driving.

Cannot search during navigation

I missed a right turn today because the road forked into two different streets on the right and I went onto the wrong one - map was unclear about which one to take.

I didn't have any inconveniences on navigation function today

Google Maps doesn't report speed cameras or red-light cameras, which might be helpful

navigation is fine but I have to look at the phone from time to time, it is not safe while driving

## Inconveniences when parking:

7 responses

I need to mark the parking spot by myself, which is very inconvenience when I forget to do so. I hope the map can mark it automatically by some algorithm tech.

I take pictures after I park. It helps to remind me where I have parked but sometime it's not that helpful. I cannot figure out where I have parked sometime.

It would be convenient to show how many parking slot left.

I had trouble parallel parking between two cars today on a busy street

Street parking is not marked. I don't know whether it is allowed to park or not. If the Map can show that kind of information, such as: you can park on this street, it costs 50 cents per hour, it would be great.

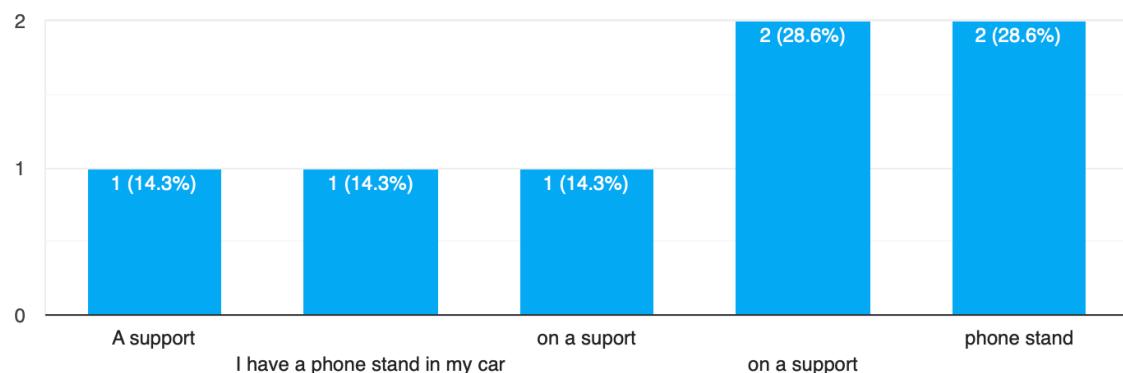
no trouble today

It's still hard to find my car in a big parking building even I've manually bookmarked the location I parked, because the GPS is not accurate enough to locate that precisely.

# APPENDIX

Where do you put your phone while navigating?

7 responses



The Map App I used is:

7 responses

