Project 1 & 2 Documentation

Parking for Waze

CGT 256

Team 8: Erin Cook, Nicole Dwenger, Akhila Komakula, Saswat Mishra, Kelly Tucker

Contents

Project Overview

Introduction to the Project

The main goal of this project is to understand the needs of Purdue University drivers and design a campus parking option in the Waze app. The Waze app already has parking in its functionality, but it is limited and doesn't meet the unique needs of campus drivers. In order to complete this project, there will be various stages including — discovery and exploration, ideation and design, and prototyping and testing.

To meet the project goals and ensure the user is at the center of our design, we will begin with user interviews to understand design requirements and discover the root problem. Next, we will ideate solutions to the root problem by sketching possible solutions and creating scenarios. Finally, we will test and receive feedback on our prototype from representative user groups.

For our particular project, we want users to visually understand parking availability in parking lots, garages, and street spots on Purdue's campus. We will discover various new functionalities for the app that will allow users to save time and reduce stress in the process of parking on campus. These functionalities will allow users to reserve spots, select general availability for parking, and audio navigation and rerouting for parking availability.

The purpose of Project 2 was to create and test the structure of the product using task flows and wireframe screen layouts. We conducted two sprints based off of Google's sprint method and completed the testing protocols on our mid-fidelity prototype. We received feedback and looked further into areas for design improvement.

Meet the Team

Erin Cook

Erin Cook is a senior double majoring in Animation and Game Development and Design with a minor in Communication.

Nicole Dwenger

Nicole Dwenger is a senior majoring in Web Programming & Design and Public Relations & Strategic Communication.

Akhila Komakula

Akhila Komakula is a senior majoring in Web Programming & Design.

Saswat Mishra

Saswat Mishra is a senior majoring in Web Programming & Design.

Kelly Tucker

Kelly Tucker is a senior majoring in Web Programming & Design.

Team KWHL chart

As part of our research to better understand our user's root problem and help frame our design, the team completed a KWHL chart.

K: What we know

- There are various parking passes based on distance from campus and employment (A, B, C, etc.).
- Parking pass times differ based on the type of pass, so some locations may fill up faster than others.
- Purdue students are active on their phones, so utilizing an app has less resistance.
- With special events on campus, parking becomes more restrictive on which spots are available.
- Parking on campus can be confusing as signs aren't always in the most visible locations.
- There are 3-4 parking garages in which two are paid and one is free.
- There is more A parking than C parking.
- Purdue has a reputation for giving out a lot of parking tickets.
- Parking on campus can be cumbersome and frustrating for students
- Waze is a crowd-sourcing app.

W: What we want to know

- What percentage of college students drive to classes?
- What incentives do university drivers need to update conditions within an app?
- What percentage of university drivers have parking passes? Which ones?
- Typically, how much time do drivers spend looking for parking spaces?
- What are the biggest barriers to driving on campus? Parking, traffic, restrictions?
- How does searching for parking spots affect a driver's day?
- Are students inconvenienced by the current parking situation?
- Are students usually aware of where they are allowed to park?

H: How will we learn it

- Each of our members will interview someone that fits our user group resulting in five total interviews.
- We will also look at other groups' interviews for more data and synthesize information.

L: What have we learned

- Finding C passes and spaces are difficult.

- Cars have to be moved frequently throughout the week.
- Not many use or know Waze.
- People without parking passes park in apartment or restaurant lots.
- Students would like more and closer parking areas for C permits.
- Parking garages are far away and are not worth paying for.
- Some people have parking passes but still use apartment parking since it's closer.
- People are not aware of where open spots on campus are located.
- "Bad" day parking takes about 20 minutes.
- Students risk tickets to park closer to their classes.

Information Literacy: the process of finding information and using it to effectively solve a problem. Planning and organizing ex: Big 6, KWHL, Research Logic Model

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K-W-H-L Chart: An organizer for planning to gather information.

K What I **Know**	**W** What I **Want** to Know (goal) *Research Logic Model: (purpose)*	**H** **How** Will I Learn It (method) *(action)*	**L** What I Have **Learned** (findings) *(outcome)*
- There are various parking passes based on distance from campus and employment (A, B, C, etc). - Parking pass times differ based on the type of pass, so some locations may fill up faster than others. - Purdue students are active on their phones, so utilizing an app has less resistance. - With special events on campus, parking becomes more restrictive on which spots are available. - Parking on campus can be confusing as signs aren't always in the most visible locations. - There are 3-4 parking garages (2 are paid and 1 is free). - There is more A parking than C parking. - Purdue has a reputation of giving out a lot of parking tickets. - Parking on campus can be cumbersome and frustrating for students. - Waze is a crowd-sourcing app.	- What percentage of college students drive to classes? - What incentives do university drivers need to update conditions within an app? - What percentage of university drivers have parking passes? Which ones? - Typically, how much time do drivers spend looking for parking spaces? - What are the biggest barriers for driving on campus? Parking, traffic, restrictions? - How does searching for parking spots affect a driver's day? - Are students inconvenienced by the current parking situation? - Are students usually aware of where they are allowed to park?	- Each of our members will interview someone that fits our user group resulting in five total interviews. - We will also look at other groups' interviews for more data.	- Finding C passes and spaces are difficult. - Cars have to be moved frequently throughout the week. - Not many use or know Waze. - People without parking passes park in apartment or restaurant lots. - Students would like more and closer parking areas for C permits. - Parking garages are far away and are not worth paying for. - Some people have parking passes, but still use apartment parking since it's closer. - People are not aware where open spots on campus are located. - "Bad" day parking takes about 20 minutes. - Students risk tickets to park closer to their classes.

Project Steps

To complete our design, we will utilize research methods, data analysis, design sketches, prototyping, and testing. The project steps are outlined as follows:

1. User interviews
2. Interview synthesis
3. Persona, user needs, and frustrations
4. Affinity diagramming
5. Root problem and design requirements
6. Ideation and design
7. User scenarios and feedback
8. Cognitive walkthrough
9. Prototyping
10. Prototype testing

Discover and Explore

Interview

The purpose of interviewing drivers on Purdue's campus is to gain a better understanding of our user's needs, frustrations, behaviors, and goals. We collected information through five, semi-structured interviews. These interviews helped frame the issues of our users and inform our design decisions based upon research.

Interview Questions

Background/Screening Questions:

- What is your age?
- What is your year?
- Are you affiliated with Purdue? How?
- Do you have a car? Do you carpool?
- How often do you use your vehicle?
- Do you park on campus? If so, where is your preferred location? For what reason?
- Do you use technology while you commute to campus?

Interview Questions:

- How much time does it take you to commute to campus?
- How do you feel about parking on campus?
- Can you describe your parking experiences?
- What is the perceived parking availability for you on campus?
- Can you explain step by step a typical day commuting and parking on campus?
- Have you used the Waze app before?

Interview Notes

Interview Notes #1

Demographics:

- **Age:** 22 years
- **Year:** Senior
- **Purdue affiliation:** Student and faculty member living off-campus
- **Vehicle use frequency:** Every day

Interview context:

- FaceTime video call
- Duration: 20 minutes

Insights:

- Used to park in the C lot near the Corec, but stopped because it was too far away
- Instead of using her pass, she now looks for 2-hour or unlimited street spots near Wiggins
- Takes her 10 minutes to commute to campus, but leaves her house 30 minutes before classes start to walk to class and find parking
- Feels more C passes are sold than there are spots close to campus
- Lots close to campus are always full, but those further away have openings
- Believes there are a lot of parking spaces on campus, but the open ones aren't in good locations
- If she can't find free street parking near campus, she'll park at the Corec and arrive late to class, which frustrates her
- Her concerns are less about finding spots, but about lot locations and spacing because she knows there are a lot parking spaces around campus but as she stated "there aren't much information on how to get there or the parking times availability"
- Has only used the Waze app once to recognize an accident while in the Grand Canyon

Interview Notes #2

Demographics:

- **Age:** 21 years
- **Year:** Junior
- **Purdue affiliation:** Undergraduate Student
- **Vehicle use frequency:** Everyday, except in bad weather

Interview context:

- Discord voice call
- Duration: 12 minutes

Insights:

- She parks in the Grant Street parking lot because it's near her classes. She pays $1/hr for the parking.
- She does not use technology to commute to campus
- It takes her about 10 minutes to commute to campus
- She doesn't love the parking system on campus. She believes it is a messy system. The parking card she was eligible for didn't allow her to park in the garage she wanted so she hasn't gotten a card.
- She is typically able to park on the 2nd and 3rd floors of the parking lot
- It is not bad in the mornings but crowded in the afternoon
- Her perceived parking availability changes depending on the time of day but she believes it to be roughly 40% in garages.
- She has used the Waze app before, but didn't like it so she deleted it after using it for a few months
    - "Wished the app put more emphasis on parking and a easy way to select and look for open slots"
- She typically starts out 30 min before class starts. It is a 10 min drive. It takes her about 2-10 min to find a parking space.

Interview Notes #3

Demographics:

- **Age:** 21 years
- **Year:** Senior
- **Purdue affiliation:** Undergraduate Student
- **Vehicle use frequency:** ~4 times a week

Interview context:

- Phone call
- Duration: 9 minutes

Insights:

- No longer parks on campus but did in the recent past (2019-2020 school year)
- Preferred to use street parking when possible but would park in McCutcheon parking garage if there were none available
- Usual commute around campus took ~5-7 min
- Thought residences needed more parking and more evenly dispersed
    - McCutcheon was the only parking lot dedicated to students and was inconveniently located for many students
- Didn't like moving her vehicle because she knew parking would be inconvenient afterwards (either having to find a rare space or park very out of the way)
- Thinks the amount of parking available to professors and staff is excessive
    - There is ~3 staff parking garages to the 1 student parking lot
- Mentioned that parking scarcity has caused many students to park in the Staff parking lots despite not being allowed to and just hope not to be ticketed
- At peak times (such as passing periods), she found was hard to get around campus and find a place to park
- Would do laps around streets with street parking to try to find spots
    - She usually did not find any spots despite this
- Has used Waze before
    - Mainly on long road trips to keep an eye out for police officers

Interview Notes #4

Demographics:

- **Age:** 21 years
- **Year:** Senior
- **Purdue affiliation:** Undergraduate Student
- **Vehicle use frequency:** 3 or 4 times a week but not for campus purpose

Interview context:

- In person
- Duration: 15 minutes

Insights:

- Doesn't commute to campus with vehicle prefers to walk to classes since she lives on campus
- Doesn't idea like the idea of parking on campus because she gets free parking off campus and doesn't want to pay for on campus
- Uses the vehicle mainly for outside of school
- Hates the idea of parking on campus since it takes forever find it and know the hours in certain areas
- Uses Waze app while driving far and also uses the Spothero in big cities when looking for available parking spaces
- Uses Spotify while driving
- Main concern with parking is street parking because scared that people could scratch the vehicle or be towed

Interview Notes #5

Demographics:

- **Age:** 21 years
- **Year:** Senior
- **Purdue affiliation:** Student of computer science
- **Car:** Yes
- **Vehicle use frequency:** Everyday multiples times per day
- **Parking on campus and why:** Yes, the corec to workout and Chauncey area for bars.
- **Technology during commute:** Yes, phone to call people and listen to music

Interview context:

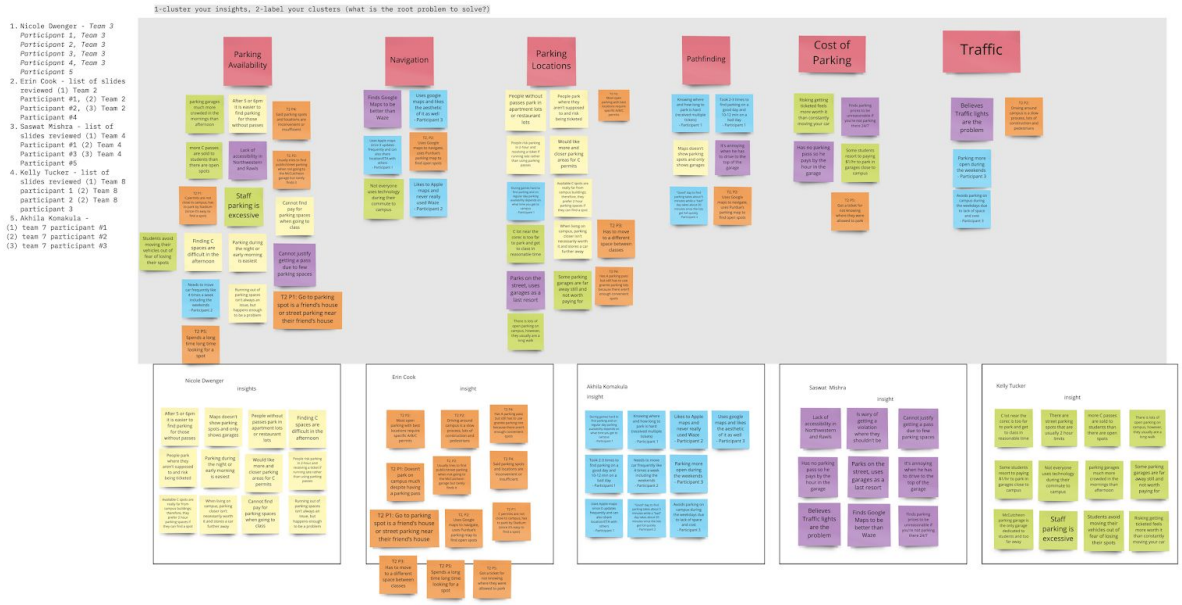
- Phone call
- Duration: 15 minutes

Insights:

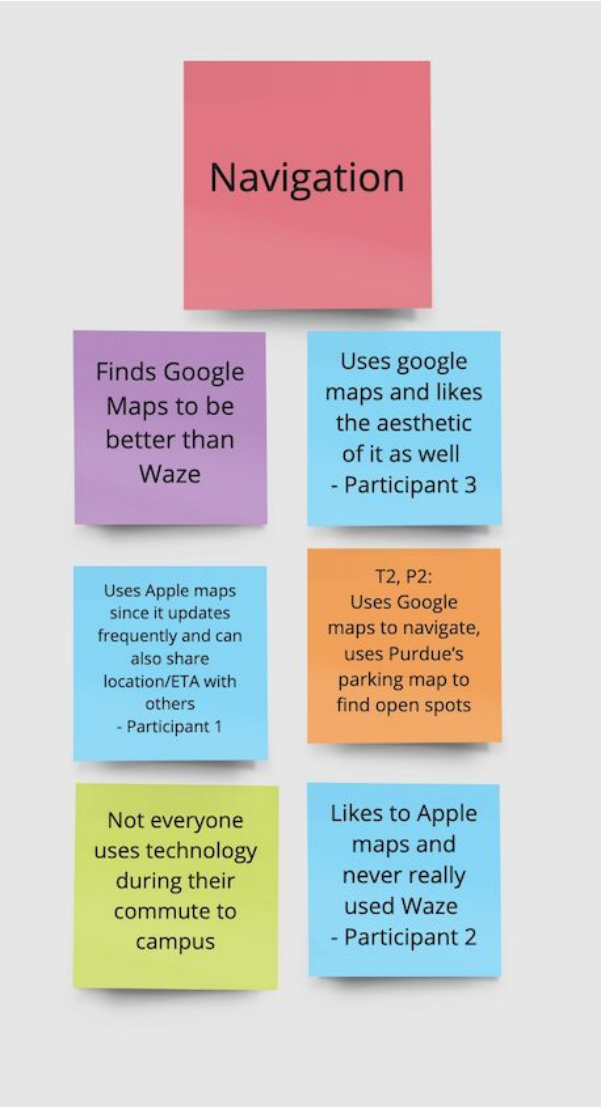
- Usually walks to class, but due to far walk will try to do online class if it is an option
- Finds paying for the meter every day to be frustrating
- Mainly uses car to go to the gym
- If there are no metered spots open, must spend 10+ minutes waiting for a vehicle to leave
- Does not use waze as it is not as good of a UI compared to apple maps
- Does use phone a lot during driving
- Fearful of parking on the street because they drive a new car and are afraid of scratches and sideswipes

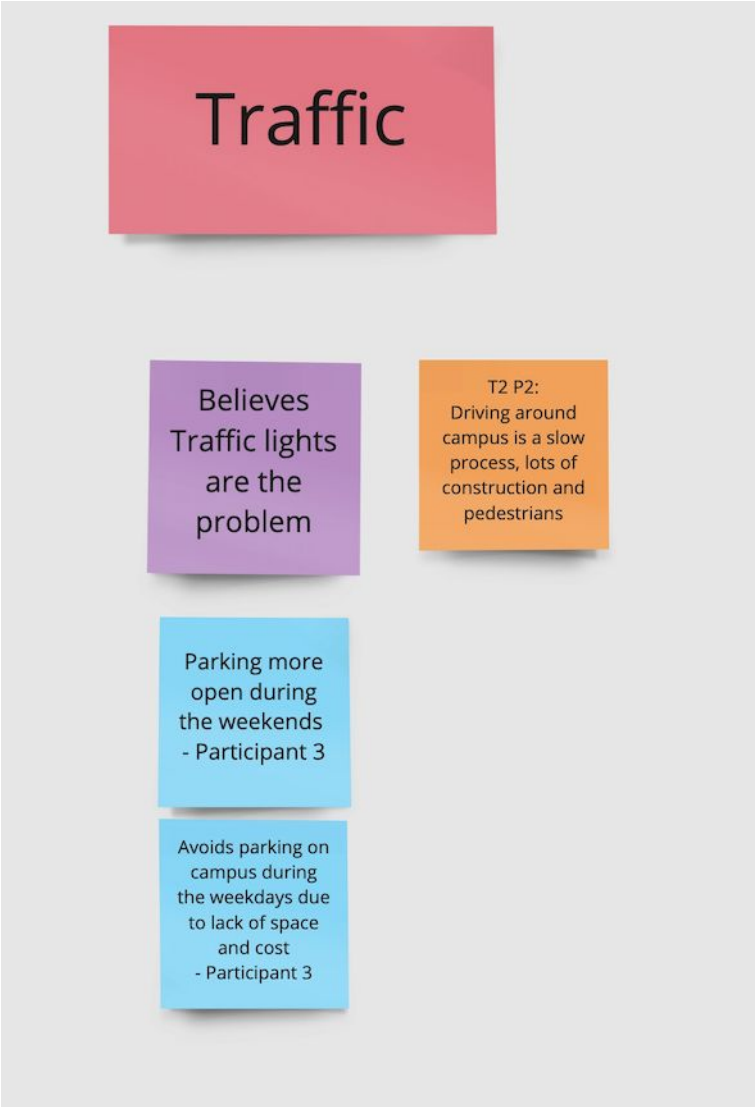
Interview Synthesis and Root Problem

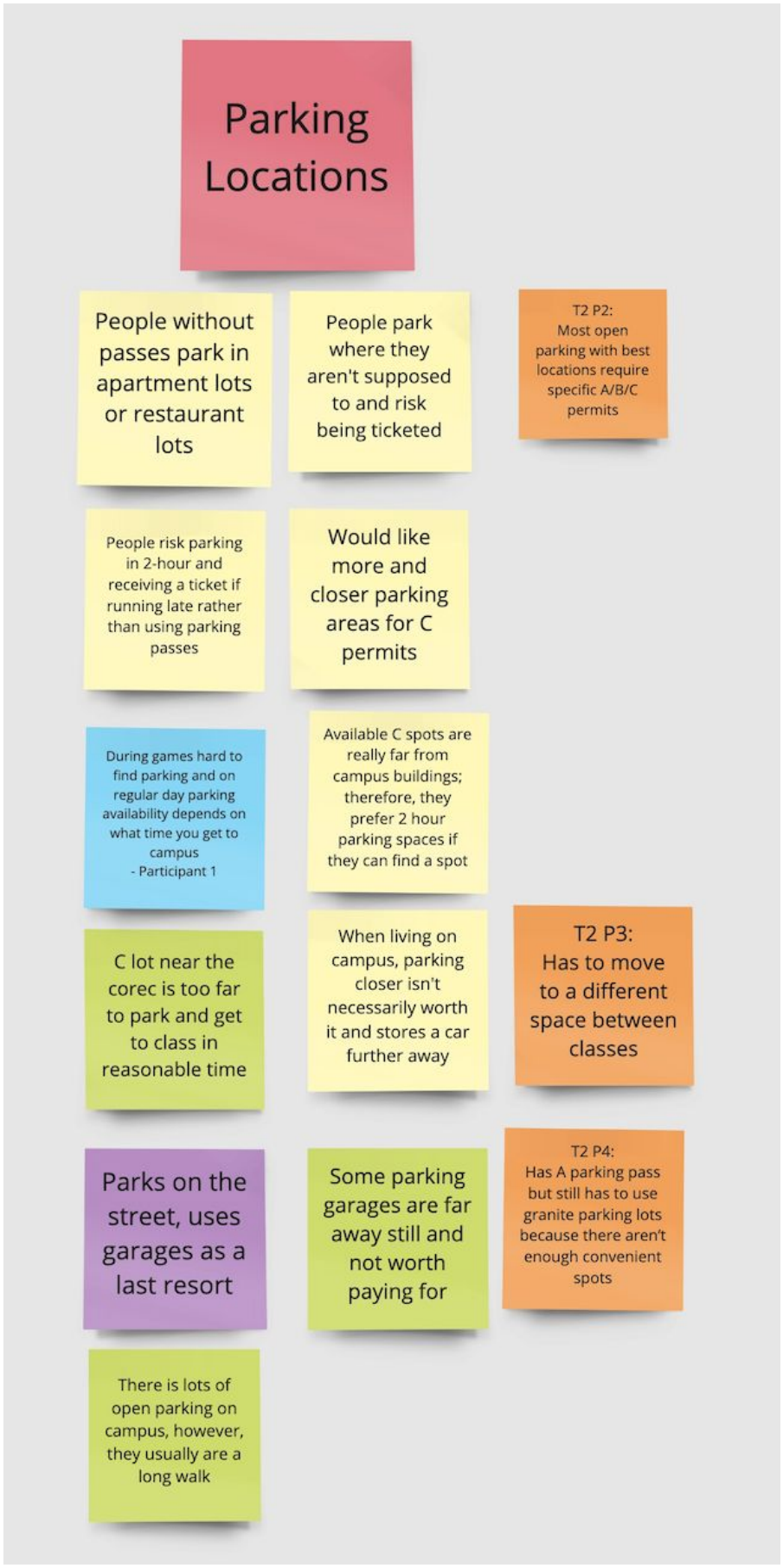
The purpose of synthesizing the five interviews is to discover actionable insights into a root problem. To find these insights, we used affinity diagramming and separated insights into six main categories: parking availability, navigation, parking locations, pathfinding, cost of parking, and traffic. After affinity diagramming, we were able to discover a root problem for our users and a list of app requirements for the new parking feature.




Parking Availability
parking garages much more crowded in the mornings than afternoon
After 5 or 6pm it is easier to find parking for those without passes
T2 P4: Said parking spots and locations are inconvenient or insufficient
more C passes are sold to students than there are open spots
Lack of accessibility in Northwestern and Rawls
T2, P2: Usually tries to find public/street parking when not going to the McCutcheon garage but rarely finds it
T2 P1: C permits are not close to campus, has to park by Stadium (since it's easy to find a spot)
Staff parking is excessive
Cannot find pay for parking spaces when going to class
Students avoid moving their vehicles out of fear of losing their spots
Finding C spaces are difficult in the afternoon
Parking during the night or early morning is easiest
Cannot justify getting a pass due to few parking spaces
Needs to move car frequently like 4 times a week including the weekends - Participant 2
Running out of parking spaces isn't always an issue, but happens enough to be a problem
T2 P1: Go to parking spot is a friend's house or street parking near their friend's house
T2 P5: Spends a long time long time looking for a spot


Navigation
Finds Google Maps to be better than Waze
Uses google maps and likes the aesthetic of it as well - Participant 3
Uses Apple maps since it updates frequently and can also share location/ETA with others - Participant 1
T2, P2: Uses Google maps to navigate, uses Purdue's parking map to find open spots
Not everyone uses technology during their commute to campus
Likes to Apple maps and never really used Waze - Participant 2


Traffic
Believes Traffic lights are the problem
T2 P2: Driving around campus is a slow process, lots of construction and pedestrians
Parking more open during the weekends - Participant 3
Avoids parking on campus during the weekdays due to lack of space and cost - Participant 3


Parking Locations
People without passes park in apartment lots or restaurant lots
People park where they aren't supposed to and risk being ticketed
T2 P2: Most open parking with best locations require specific A/B/C permits
People risk parking in 2-hour and receiving a ticket if running late rather than using parking passes
Would like more and closer parking areas for C permits
During games hard to find parking and on regular day parking availability depends on what time you get to campus - Participant 1
Available C spots are really far from campus buildings; therefore, they prefer 2 hour parking spaces if they can find a spot
C lot near the corec is too far to park and get to class in reasonable time
When living on campus, parking closer isn't necessarily worth it and stores a car further away
T2 P3: Has to move to a different space between classes
Parks on the street, uses garages as a last resort
Some parking garages are far away still and not worth paying for
T2 P4: Has A parking pass but still has to use granite parking lots because there aren't enough convenient spots
There is lots of open parking on campus, however, they usually are a long walk


Pathfinding
Knowing where and how long to park is hard (received multiple tickets)
- Participant 1
Took 2-3 times to find parking on a good day and 10-12 min on a bad day
- Participant 1
Maps doesn't show parking spots and only shows garages
It's annoying when he has to drive to the top of the garage
"Good" day to find parking takes about 5 minutes while a "bad" day takes about 20 minutes since the lots get full quickly
- Participant 2
T2, P2:
Uses Google maps to navigate, uses Purdue's parking map to find open spots


Cost of Parking
Risking getting ticketed feels more worth it than constantly moving your car
Finds parking prices to be unreasonable if you're not parking there 24/7
Has no parking pass so he pays by the hour in the garage
Some students resort to paying $1/hr to park in garages close to campus
T2 P5:
Got a ticket for not knowing where they were allowed to park

Key Takeaways

Category	**Key Takeaway**
Parking Availability	● Problems are overcrowding and fear of removal car from spot means loss of space ○ Need to move car frequently due to fear of getting a ticket or towed ● Finding parking overall is difficult with or without pass ● Lack of spaces in certain areas like Northwestern and Rawls ● Much easier to find parking after school hours like 5 or 6pm
Navigation	● Common navigation app is Google Maps ● Haven't used or heard of Waze before ○ For those that have used found Google Maps a better navigation tool
Traffic	● Traffic lights, construction, and pedestrians are the main issues that cause traffic ● Parking more easier to find during the weekend
Parking locations	● People usually park in apartment or restaurant lots ● When events or activities happen on campus a lot harder to find parking ● Regular days parking availability depends on the time of day ● Use garage as the last option since it might be far and expensive ● Need to move vehicle during classes
Path Finding	● Availability and hours of parking lot is difficult to know ● Navigation apps don't show parking spots and garages nearby ● Good Day = 2-3 times to find parking ● Bad Day = 10-12 min on bad day ● Don't prefer to find or park in garages
Cost of Traffic	● Moving cars during classes or throughout the day = less risk of towing or ticketing ● Parking prices unreasonable ● Hard to find parking passes

	• Lack of information where you can and cannot park

Synthesis:

1. Finding C passes and spaces are difficult
2. Car has to be moved frequently in the weekdays and weekends
3. Not many use or know Waze
a. Prefer to use Google or Apple maps because of UI or location sharing ability
4. People without parking passes park in apartment or restaurant lots, risking tickets or being towed
5. Would like more and closer parking areas for C permits
6. Parking garages are far away and are not worth paying for
7. Some people have parking passes but still use apartment parking since it's closer
8. People are not aware where spots on campus are located
9. "Bad" day parking takes about 20 minutes
10. Students risk tickets to park closer to their classes

Root Problem:
Students THINK there is a lack of spots within close proximity to campus which means there is a lack of spots. And it is VALID.

It takes too long to find an open spot in a convenient location, so students risk getting a ticket, being late to class, or opting for online.

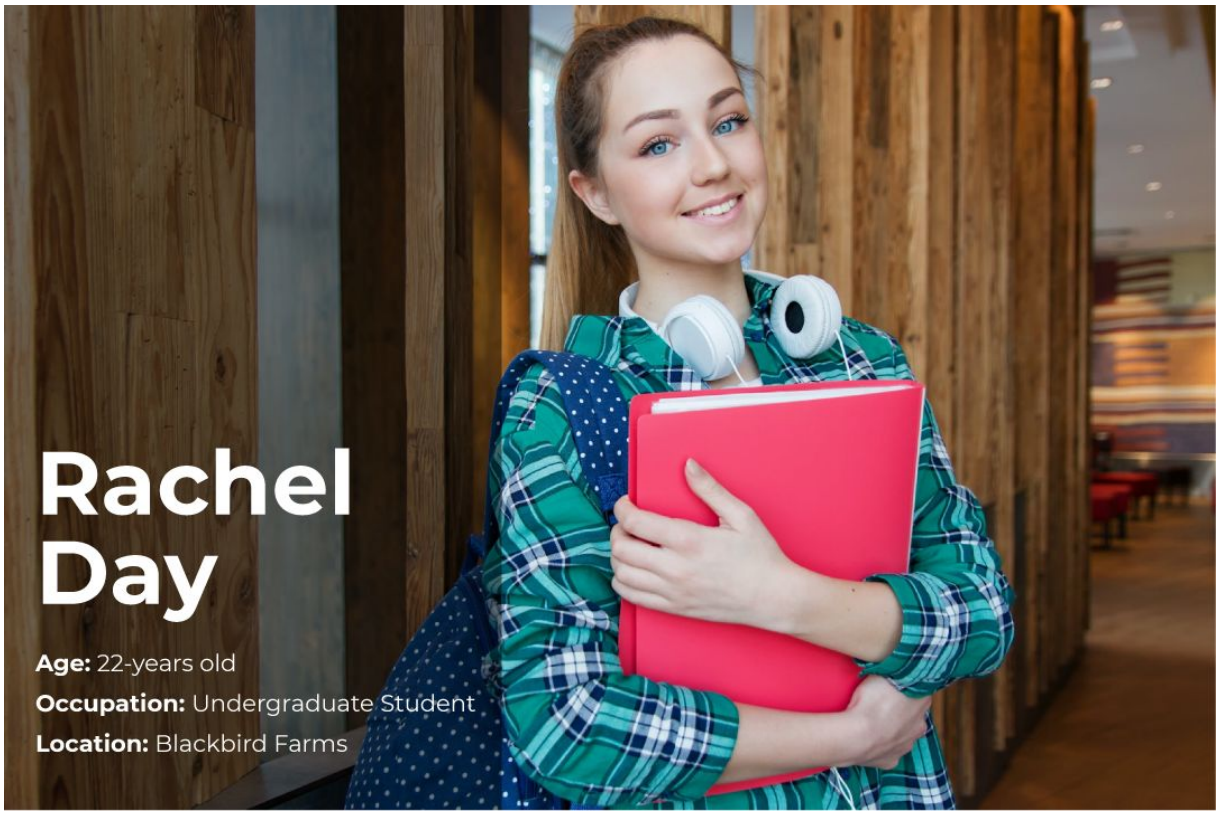
Design Requirements

Our users should be able to identify, report, and reserve available parking locations. To fulfill these tasks, we've outlined the following requirements for the interface:

- Displays parking availability by density (red, yellow, green)
- A way to patrol parking locations and state how many spots there are at a given time
- Entry for users to state how available a lot is
- Maps displaying where to park (lots, garages, street spots)
- Information about parking time limits (A, B, C passes)
- A way to estimate how long it will take someone to find parking

Persona

A persona humanizes the data from interviews and helps represent our user group in an empathic manner. From interviews, we developed Rachel Day by synthesizing behaviors, goals, needs, frustrations, attitudes, and common interactions of our users.



About

Rachel is a senior at Purdue University studying mechanical engineering. Rachel wakes up and heads to her car at 10:00 for her 10:30 class. It takes her 10 minutes to drive to campus and patrols ABC parking lots close to campus so she can utilize her parking pass; however, if she can't find a spot, she drives up Salisbury Street and looks for a free 2-hour parking spot. Typically it takes 10 minutes for her to park, but can take up to 20 minutes depending on availability.

Goals

- Wants to get to campus early enough so she has at least 10 minutes to walk to class
- Find a spot close enough to classes where she doesn't have to walk more than 10 minutes

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- Not be late to class because of parking

Needs

- Get to class on-time
- Find a space to park for a few hours
- Make it to classes safely while driving, especially in the winter
- Make her daily routine to class more predictable and less stressful

Frustrations

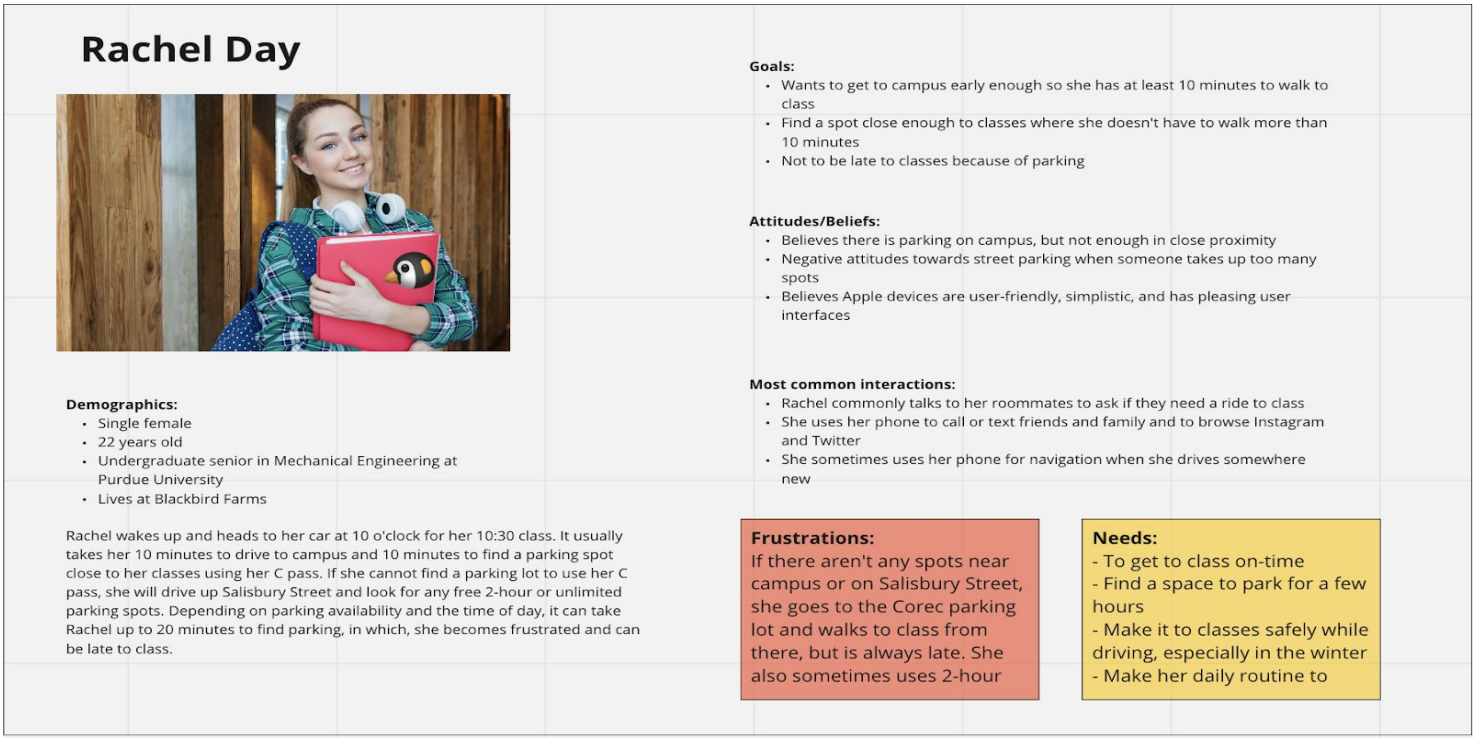
- If there aren't spots near campus or on Salisbury Street, she goes to the Corec parking lot and walks to class from there, but is always late
- Sometimes uses 2-hour parking for classes, but may get a ticket when she has two classes back-to-back

Attitudes & Beliefs

- Believes there is parking on campus, but not enough in close proximity
- Negative attitudes towards street parking when someone takes up too many spots
- Believes Apple devices are user-friendly and simplistic, pleasing user interfaces

Common Interaction

- Rachel commonly talks to her roomates to ask if they need a ride to class
- She uses her phone to call or text friends and family and to browse Instagram and Twitter
- She sometimes uses her phone for navigation when she drives somewhere new



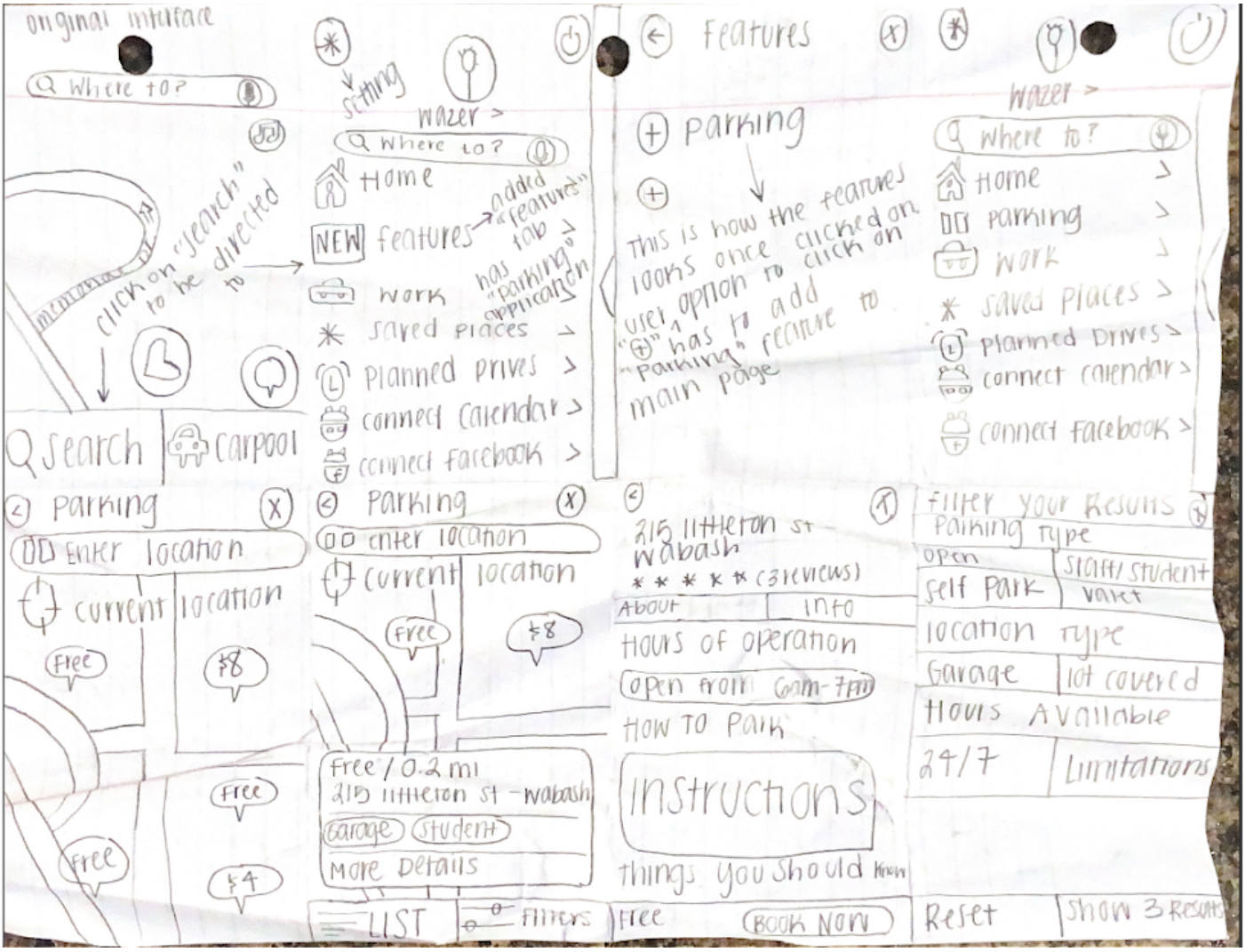
Ideate and Design

After researching our users, their needs, and understanding their frustrations, we want to ideate as many solutions as possible to help alleviate our user's problems. Depending on our designs, we identify which solutions account for the user's pain points, refine it, and acknowledge the features our design requires.

Ideation Process

We utilized the Crazy 8's method of brainstorming in which we sketched roughly 25 ideas, features, or interactions. Once we each brainstormed individually, we came together as a group organized and consolidated our ideas for the best and most feasible solution.

Sketches



1. Starts out with the original interface and user selects “Search” button
2. User navigated to the page menu page and “NEW features” tab is shown and user selects the tab
3. On the “Features” page the user select to add the “Parking” feature by selecting the “+” button
4. User navigated back to menu page to show that “Parking” feature has been added
5. User clicks on “Parking” feature and interface is shown
6. User enters a location and the bottom part of the page shows the details the following details: garage, student, distance, more details
7. User clicks on “More Details” and then is shown the following: review of space; hours of operation; additional things to know; “Book Now” button, price, and ETA.

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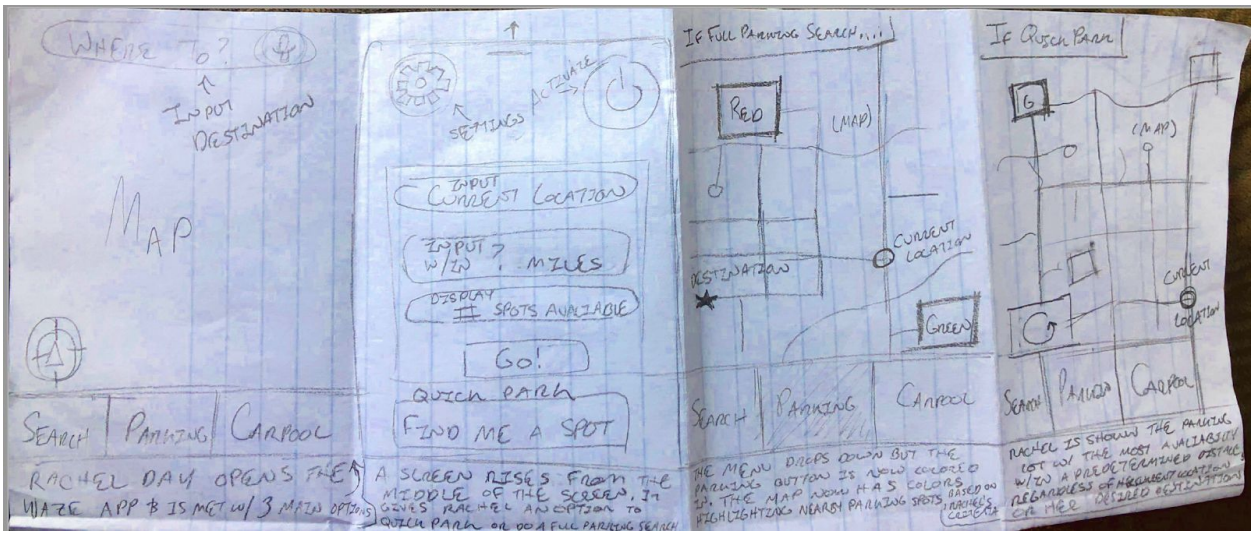
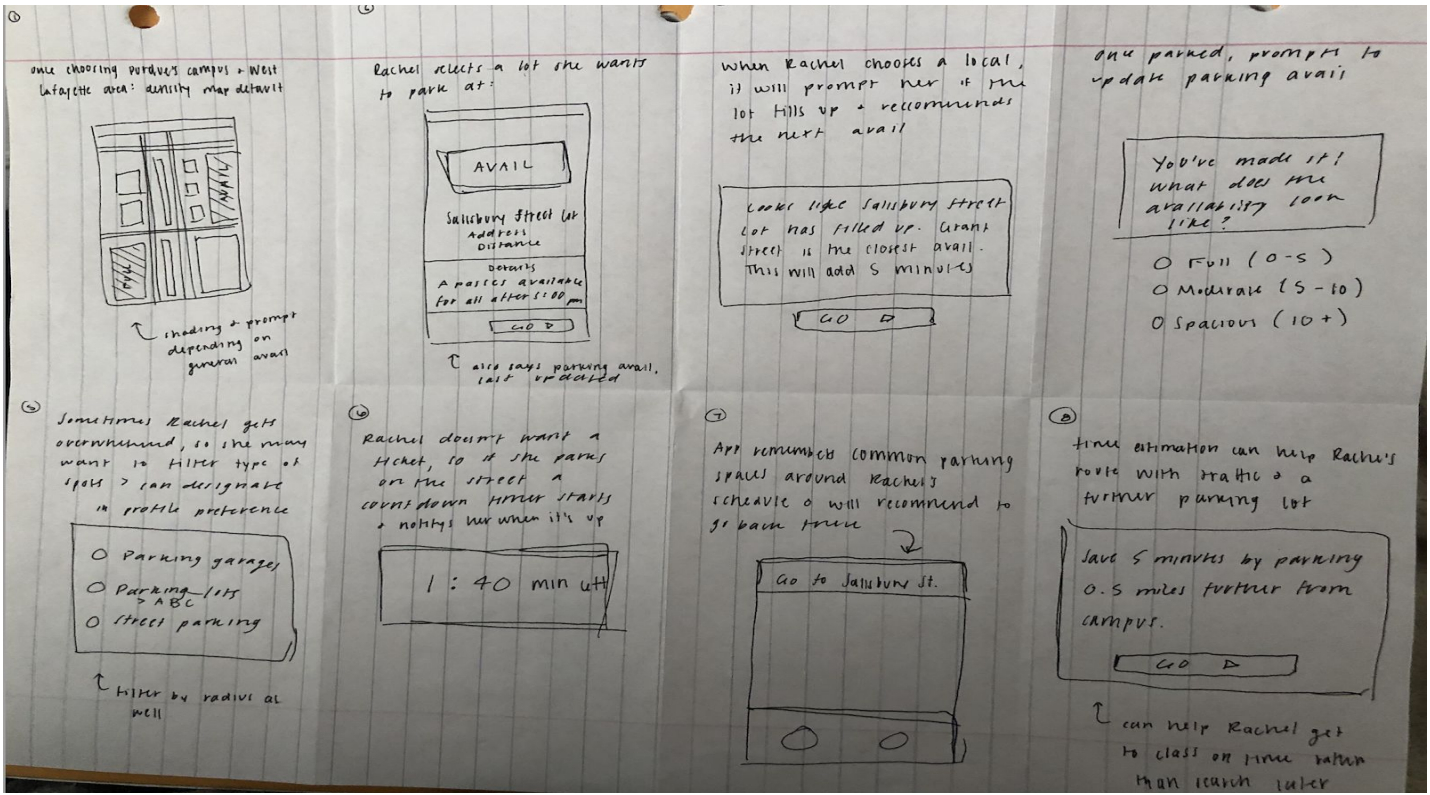
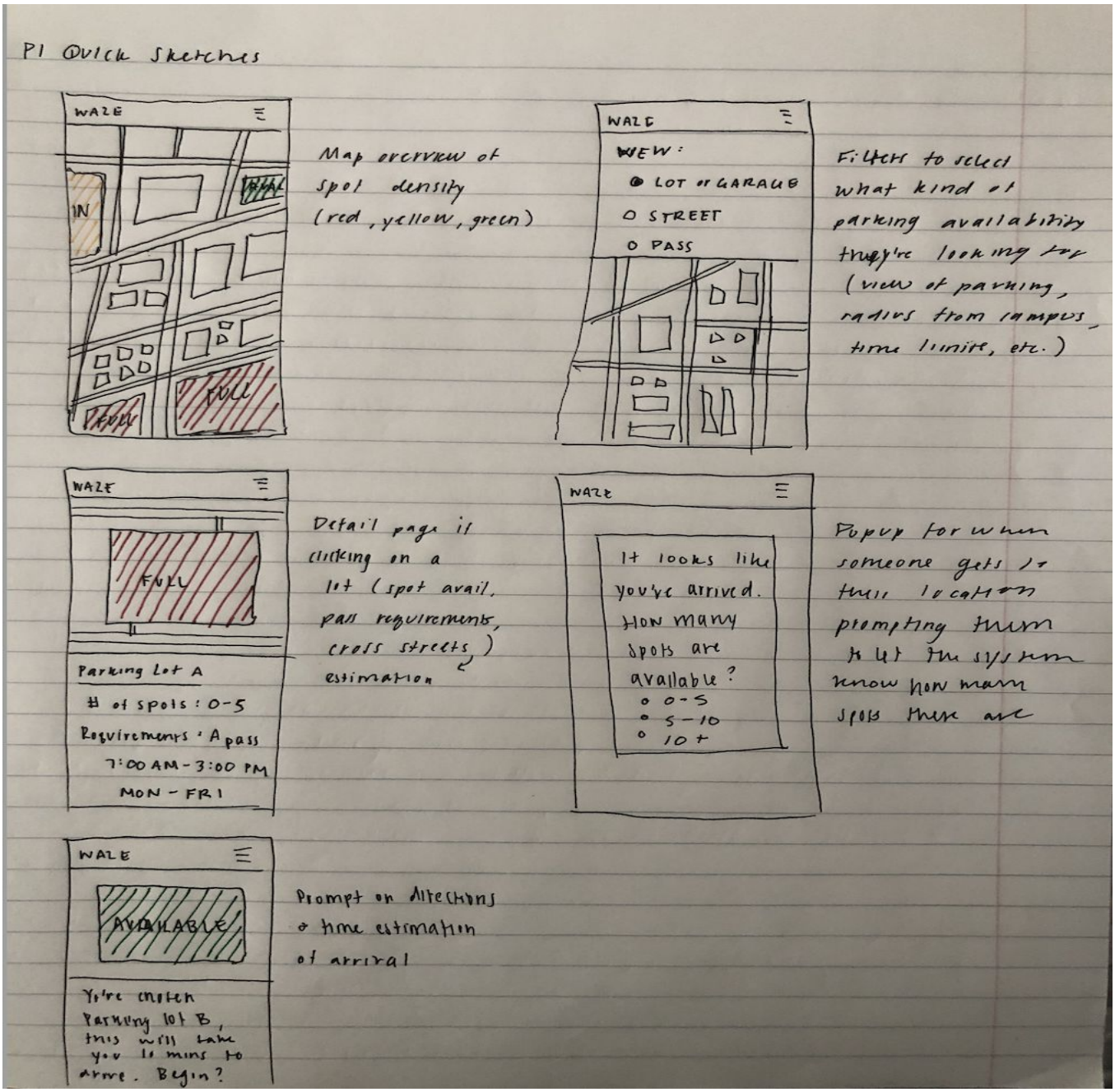
8. The last screen shows how the user can filter there searches



1. The first sketch shows how the user will input destination in the “Where to” search bar
2. Then the screen rises and provides the option to select “Quick Park” or do a full parking search
3. Then the menu drops down but the parking button is now colored in. The map now has colors highlighting nearby parking spots based on the users criteria
4. The user is now shown the parking lot with the most availability providing the

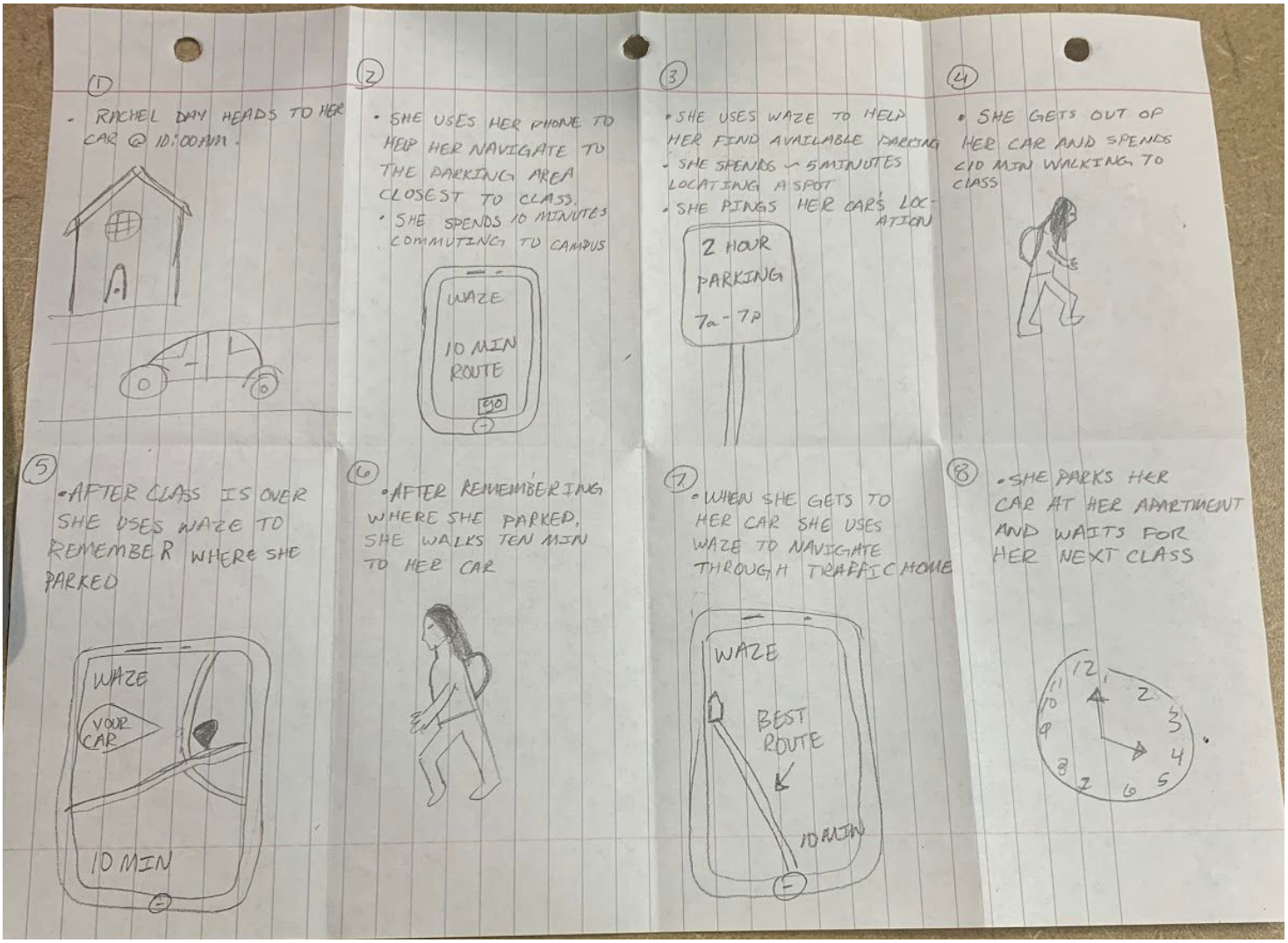


1. User selects “purdue campus + West Lafayette” area and the screen shows what it would look like
2. In that area the user selects a lot to park at. The screen shows the following: availability, address, more details, and “go” button
3. If the lot is filled it will show a message pop up box providing other closest lots and select it by clicking the “Go” button
4. Once parked the user is prompted to update the parking availability. The prompt asks “What does the availability look like?” followed by a selection from “Full, Moderate, and Spacious”
5. So the user isn’t overwhelmed by the options, they can simply select which type of parking spaces they are looking for like “garages, parking A, B, or C; or street parking”
6. If the user doesn’t want to get a ticket and the car is parked on the street a timer is shown on how long spot is available till
7. If the user wants to select previous searches, the app remembers and saves these searches to select again easily
8. Once the parking location is selected the screen provides ETA and any other routes to save time



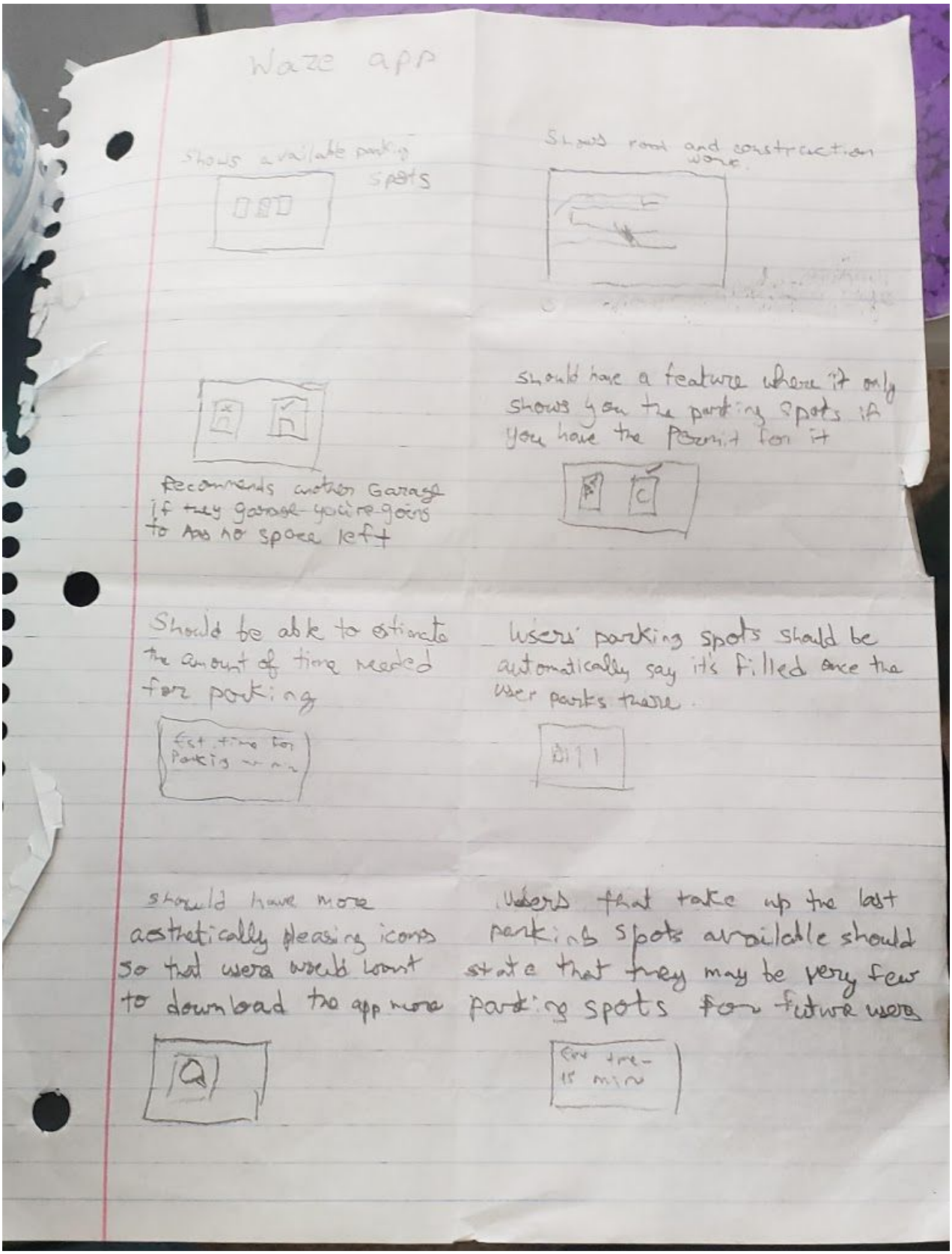
1. This screen is has a map overview of spot density in red, yellow, and green
2. This screen shows how the user can filter their searches by garages, street, or pass. It also shows the view of parking, radius from campus, time limits, etc.
3. This screen provides a detail page when clicked on a lot. It shows the following information: spot availability, pass requirements, cross streets, and estimation.

4. This screen provides a popup when someone gets to these locations and then prompts the user to let the system know how many spots are available within the range of “0-5, 5-10, or 10+)
5. This screen prompts information about direction and time estimation of arrival



1. Starts with setting the scenario how the user heads to the car at 10:00am
2. This screen provides details to why the user uses a navigation app. The app used is Waze and provides the ETA to campus
3. Provides more in detail why the user uses Waze and how 5 minutes are spent looking for a parking spot. Then user pings the car’s location

4. Once car parked user spends < 10 min walking to class
5. After class, the user uses Waze to help navigate where the car is parked. The screen has a triangle shape point to identify where the car is parked exactly
6. Once the ETA is provided on how long it takes to get to the car, the user starts walking to it
7. Once at the parking location, the user uses Waze to navigate through traffic. The screen provides best route
8. The navigates through traffic and parks at her apartment and waits for her next class


Waze app
shows available parking spots
shows road and construction work
recommends another Garage if they garage you're going to has no spaces left
should have a feature where it only shows you the parking spots if you have the permit for it
Should be able to estimate the amount of time needed for parking
users' parking spots should be automatically say it's filled once the user parks there.
should have more aesthetically pleasing icons so that users would want to download the app more
users that take up the last parking spots available should state that they may be very few parking spots for future users

1. User opens app the screen shows available parking spots
2. Once parking spot is selected the user is navigated to the destination showing road and construction work
3. If the space is filled the screen provides nearby locations and open slots
4. This screen shows if someone has a pass A, B, or C then those parking areas and slots should only be shown
5. The screen will provide estimate amount of time needed for parking
6. Once the user parks in the parking slot it should be automatically shown has filled
7. The app should incorporate more aesthetically pleasing icons so get more users to download the app
8. Users that take up a parking spot you provide insight on how many spots available around them

CGT 256 Parking for Waze

Team 8: Erin Cook, Nicole Dwenger, Akhila Komakula, Saswat Mishra, Kelly Tucker

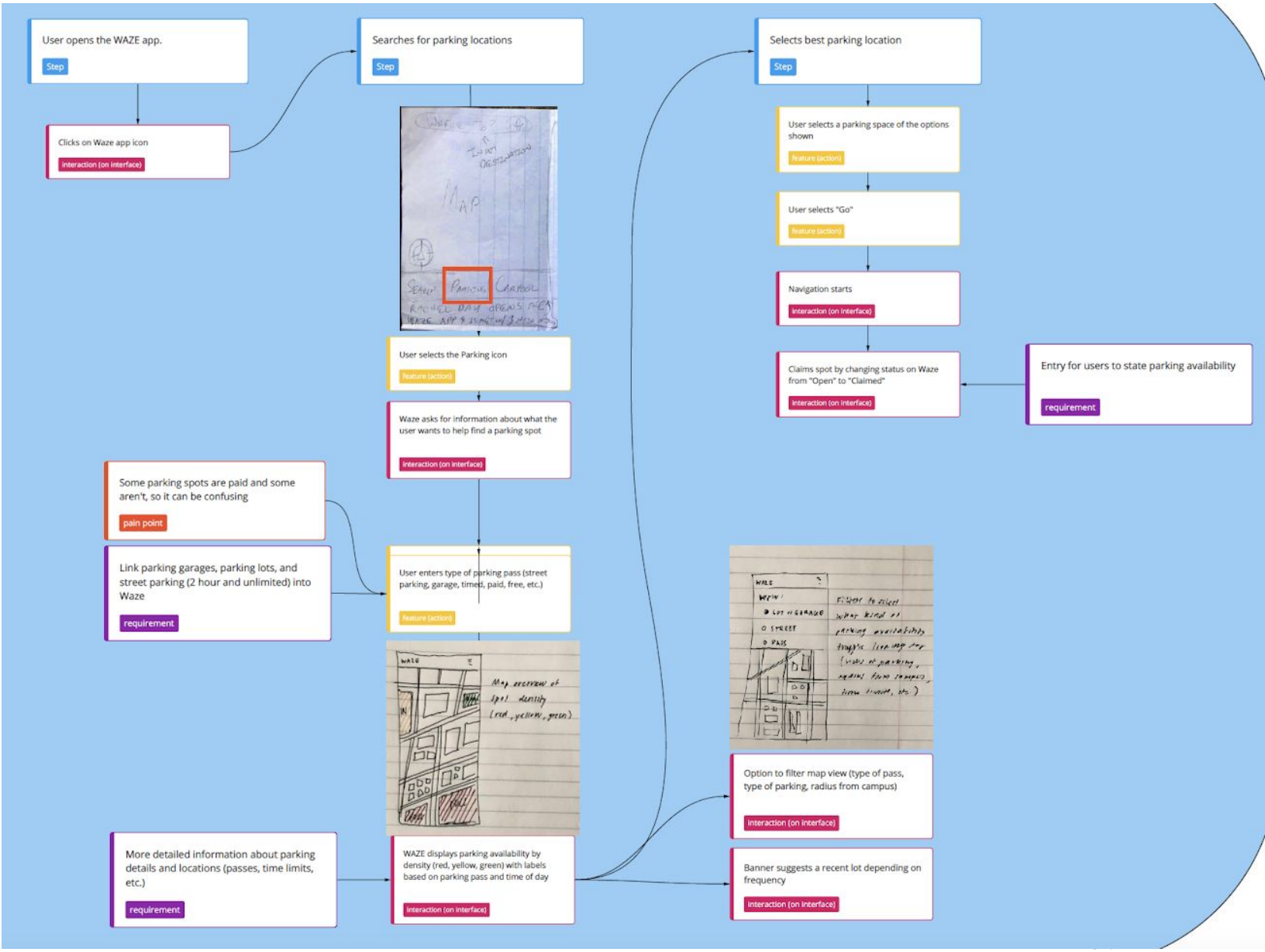
User Scenarios

After discovering design requirements to fulfill our user's needs and brainstorming interface elements, we needed to lay out a step-by-step interaction experience. In doing so, we will discover any other features and interactions the user may need to accomplish their tasks. At the end, the scenario will help with prototyping by accounting for a flow of screens.

Task 1

User wants to drive to campus the fastest route, and closest parking location

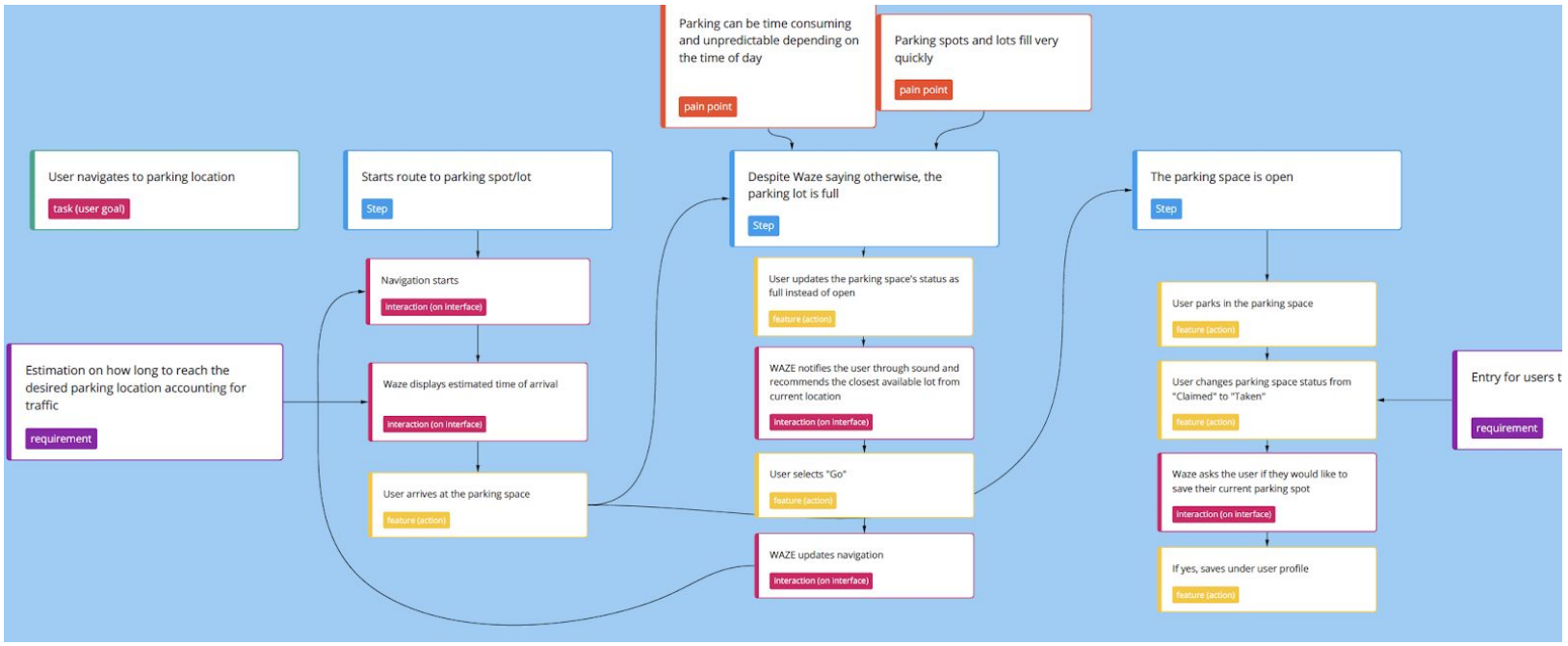
Pain point: Parking can be time consuming and unpredictable depending on the time of day.



1. User wants to drive to campus the fastest route, and the closest parking location and reserves a space
    a. User opens WAZE app (User clicks on the WAZE icon and then directed to WAZE home screen interface where)
    b. User selects parking icon (parking icon shown)
    c. Waze asks if user is looking for parking spot (a search bar appears)
    d. Waze uses location services (location shown with detailed parking information and filters shown for an accurate result)
    e. User selects best parking location (details of parking location shown like the map along with the “accept” button following with a message that says “confirmed location”)
    f. User changes status (status is updated to other users as “claimed” when a booked spot is clicked on)
    User starts navigation (directed to navigation page once space confirmed)

Task 2

User navigates to parking location

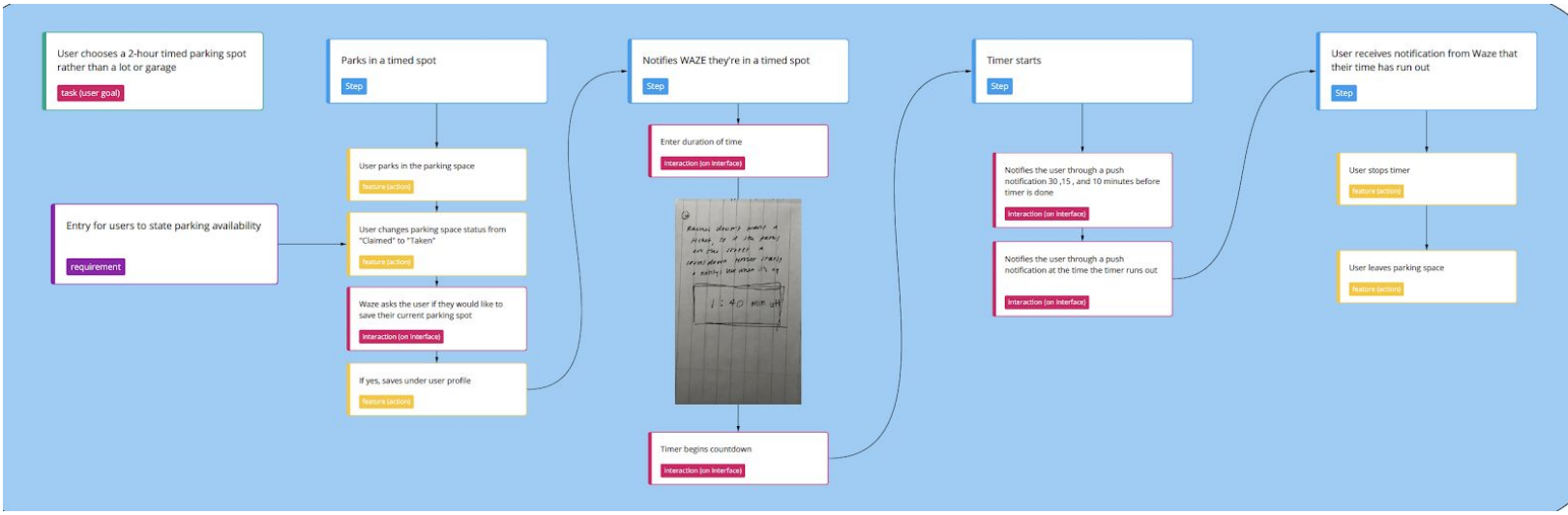


2. User navigates to parking location

a. User follows navigation (map is shown to parking space with ETA and traffic information)
b. User arrives at location (if wrong information provided user select on update information tab about parking space to change status as “full”)
c. Waze Notifies User (Waze pings a sound as status changed and provides alternative nearest parking)
d. User selects go (parking options are shown and “go” is clicked to accept new location)
e. User changes status (status is updated to other users as “claimed” when a booked spot is clicked on)
f. Waze Updates Navigation (user directed back to navigation page which shows the map with ETA and traffic information)
g. Waze shows prompt (prompt about whether to save the location is shown to user)
h. User answers prompt (the prompt page is shown with a yes or no and user selects “yes” and location is saved under user profile)
i. User completes rating (rating page is shown and 5 stars are visible to select and textbox is provided for any feedback)

Task 3

User chooses a 2-hour timed parking spot rather than a lot or garage

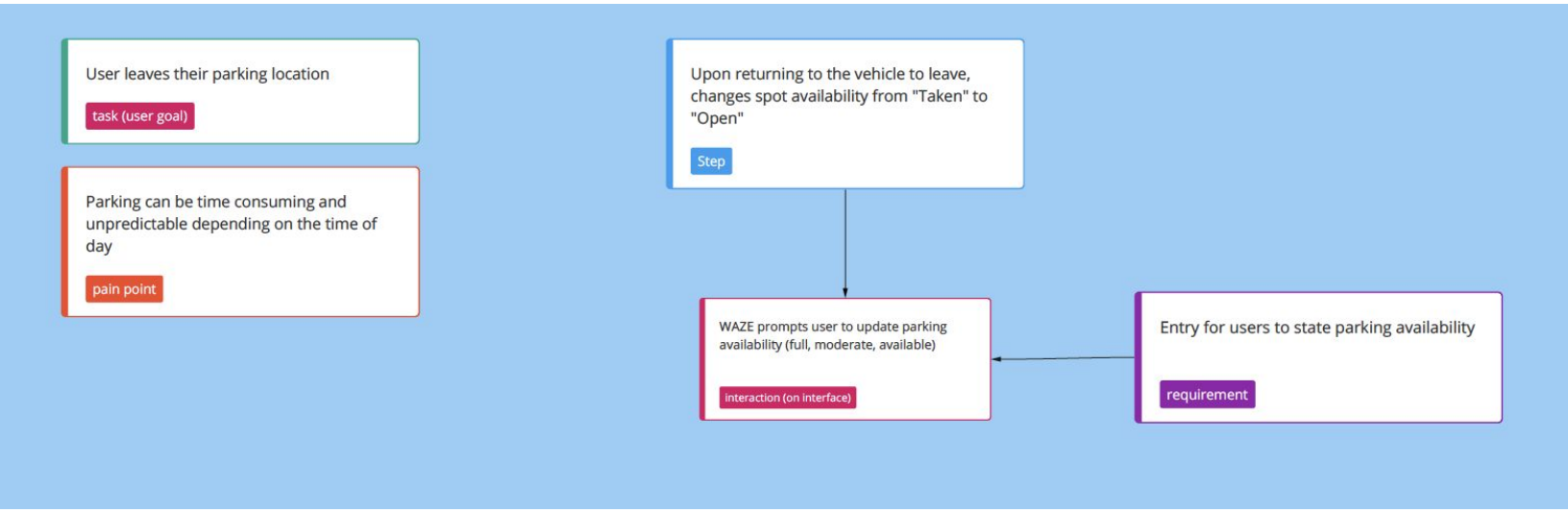


3. User chooses a 2-hour timed parking spot rather than a lot or garage

a. Parks in timed slot
b. User changes parking space from “Claimed” to “Taken” (After pressing the parking location, the availability button appears on one of the screen’s corners. Map screen greyed out and icons appear along the side of the screen: open, claimed, taken. Clicking the greyed area or the original availability button will return to the regular parking map view. Returns to parking map view once an option is picked)
c. WAZE asks if the user is in a timed slot (A dialogue box appears over the map screen with a yes or no button)
d. User selects yes (Button changes to darker color once pressed before disappearing)
e. WAZE asks for the user to input the duration of time in the parking spot (Text in the dialogue box transitions to a time input box with arrows over 3 numerical slots with a START button underneath. The three slots are separated with a colon in the middle. The arrows pulse faintly. Faintly written next to the number slots reads “Hours”, “Minutes”, and “Seconds”)
f. User inputs time duration (keyboard appears if the user presses the box itself, once filled a large START button appears)
g. User presses start, Timer in WAZE begins to count down (Exits out of dialogue box and back to map view automatically once button is pressed)
h. WAZE notifies user when they are within 30, 15, and 10 min from the timer running out (Push notification appears on screen)
i. User dismisses notifications (Swipe up or across to dismiss depending on the screen where the notification appears)
j. WAZE notifies the user when the time has run out (Entire screen greys out. The screen reads, “Your parking period has expired! Return to your vehicle” with a STOP button underneath. The device vibrates - if possible- until the STOP button is pressed)
k. User stops the timer (Button change to darker color once pressed before disappearing

Task 4

User leaves their parking location



4. User leaves their parking location
    a. Upon returning to their vehicle, user opens WAZE app (Home Screen)
    b. User presses Parking Tab(Parking Screen elements appear over current map layout, including current parking location, color coded availability of current and nearby lots/spots, and availability button once a parking location is selected)
    c. User changes spot availability from “taken” to “open” (Map screen greys out and icons appear along the side of the screen: open, claimed, taken. Clicking the greyed area or the original availability button will return to the regular parking map view)
    d. WAZE asks user if they would like to save the current parking location (A dialogue box appears over the map screen with a yes or no button)
    e. User responds (yes or no) (Button changes to darker color once pressed before disappearing)
    f. WAZE asks user to report general availability of the current parking location ((A dialogue box appears over the map screen with 4 buttons: full, moderately full, moderately empty ,empty
    g. User exits app

Summary of Solution

Our solution provides users with an option on Waze to choose a lot that is designated as having empty slots. The user has the option to choose which lot is *empty* and nearest to their destination. The user can easily decipher which lots are *available* by a color coding technique (full is to red as empty is to green). The lots are reported to be full or empty by the other users of the app through a self-reporting technique that utilizes simple radio buttons. When the user parks at their destination, they will be prompted to help other users by reporting the lot as being full, moderately full, moderately empty, and empty.

The rationale behind our solution stemmed from our user interviews. Our interviews led us to determine that we needed to find a way to *accurately* and *quickly* park in lots that are available. Waze uses self-reporting for their other capabilities such as traffic reports, so it made sense to have users report lot availability. Users will be able to rely on current and *accurate* updates as other users of the app will be frequently updating the information as they park or exit the lot. Waze will help them to *quickly* navigate to their selected lot.

Prototype and Test

User Feedback Session - Project 1

We presented our design solution to two previous interviewees and two representatives of our user group. Overall, the feedback was positive, but they had some concerns and suggestions. The feedback will be used to inform any changes in our design in the iteration phase.

Interviewee #1:

- Worried about how people will use the reservation correctly since they are concerned about people taking a spot and thinking it's open, but isn't when they arrive at the lot, then they may have to wait for towing or find a new spot
- Heat map and description of how many spots are left seems really effective—possibly provide an option for manual entry of spots if a user wants to be specific

Interviewee #2 :

- Wonders if users will be incentivised to actually keep the availability recordings up to date. Unlike the police tracking in Waze, parking does not have an immediate threat to incentivise the user to keep updating the app by self reporting. There is potential for the user reporting to be based only on a small numbers of users (which can decrease the accuracy of the app's recommendations)
- There could be small potential for a privacy risk for parked cars by the users who mark parking spaces as full, depending on how much detail the app gives on who is parked in a given spot

User Group Representatives:

- Concerned about if someone leaves the location they may forget to open the app and mark the spot as available; therefore, leaving the spot taken all day
- Possibly add a feature in which the app adjusts spot availability based on time of day—such as if someone doesn't have a pass, it shows them paid pass parking availabilities after 3:00 or 5:00
    - Could be in another release, not the initial

Sprint 1

The purpose of analyzing user feedback from Project 1 allows us to create a prototype that addresses user concerns and ensure we are creating a user-centered design. After interviewing previous interviews and user group representatives, results from Project 1 brought attention to possible user errors that could cause trouble within the app. These interviews showed that users have concerns regarding users forgetting to update their locations after leaving and incentivizing users to update parking availability.

For the first sprint, we needed to create a mid-fidelity prototype to test the user interface. Before creating the first prototype, we conducted a cognitive walkthrough of the user tasks to ensure we were creating the appropriate screens. The first sprint was conducted over the course of a week in which we were able to create a functioning prototype in Adobe XD, create a testing protocol, and receive feedback through testing.

Before creating the first prototype, we wanted to address the user concerns from Project 1. First, we had the idea to combat users forgetting to update their user status by displaying the user's status on the home screen of the app if one currently existed. Second, we wanted to create a simple radio button survey to try and keep the user input minimal when updating the lot availability. By creating a simple survey, a user may be more inclined to simply press a button rather than type the lot availability in an input box.

Cognitive Walkthrough

The purpose behind a cognitive walkthrough is to determine all interactions to do with a user's task. In order to complete the walkthrough, we analyzed our existing user stories and wrote affordances and the expected feedback on the interface. After conducting a cognitive walkthrough, we will be able to create a prototype that accounts for all user interactions.

Task 1: User located a parking location and reserves a spot

1. User opens Waze app (User clicks on the Waze icon and is directed to the home screen)
2. Selects parking icon (Density map of parking lots is shown)
3. Selects their desired parking location (location information is displayed depicting the number of spots, location, type of pass, distance, and hours)
4. Selects "Reserve" (pop up appears for user's status in that location)
5. Changes status ("claimed" radio button is filled)
6. Presses GO (navigation page appears and begins directions)

Task 2: User navigates to parking location

1. Begins navigation (map is shown to parking location with ETA and possible traffic information)
2. Arrives at location (pop up appears to change user status)
3. Changes status to “taken” (“taken” radio button is filled)
4. Presses “Next” (pop up screen advances)
5. Selects parking lot general availability (displays three options)
6. Selects availability (radio button is filled of option selected)
7. Presses “Submit” (pop up window disappears)

Task 3: User chooses a timed parking spot rather than a lot or garage

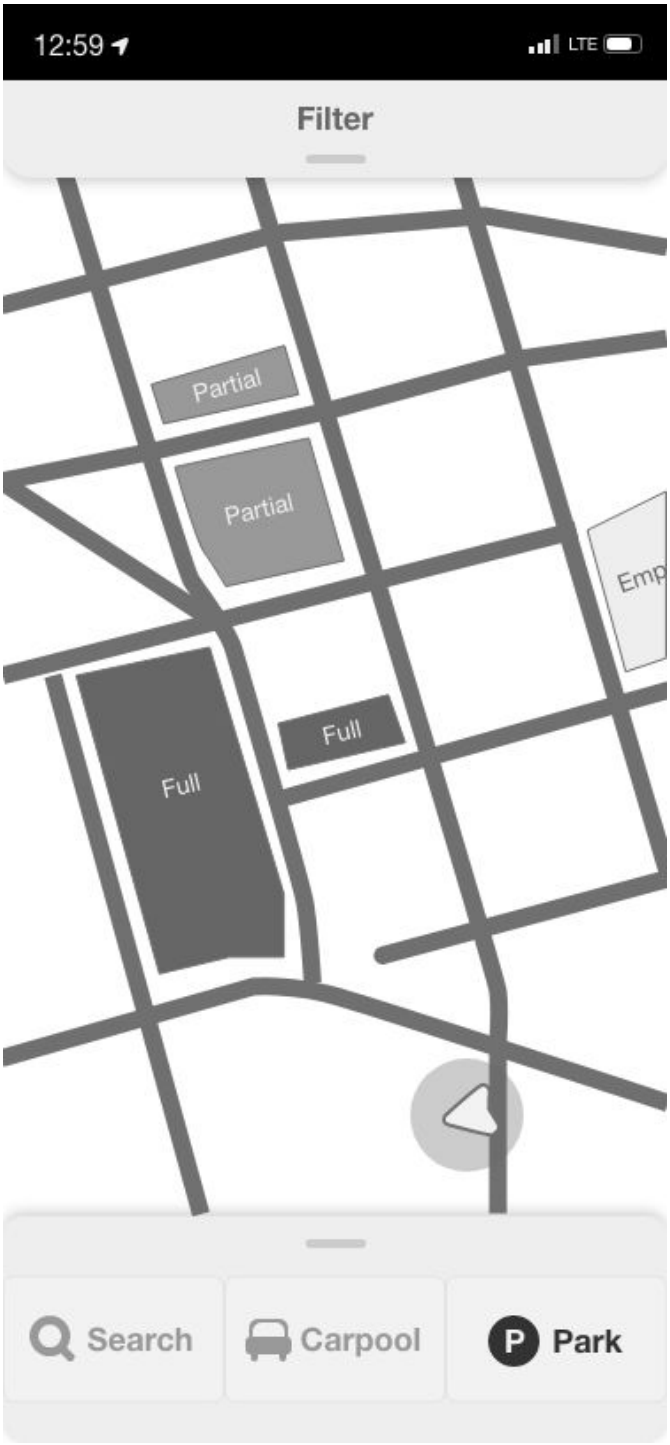
1. Changes parking space from “claimed” to “taken” (popup disappears)
2. Waze prompts the user if they’re in a timed spot (dialogue box appears with a yes or no button)
3. Selects yes (button goes darker before disappearing)
4. Inputs duration of time in parking spot (Text in pop up has a time input box with arrows and three numerical slots with a START button underneath)
5. Inputs time duration (presses arrows until desired time)
6. Presses start and timer begins to countdown (pop up box disappears and timer shows in corner)
7. Notifies user when they are 30, 15, and 10 min from timer running out (push notification on screen)
8. Notifies user when time runs out (device vibrates and displays a pop up box reading: “Your parking period has expired! Return to your vehicle.” and STOP button appears)
9. Stop the timer (button goes darker before disappearing)

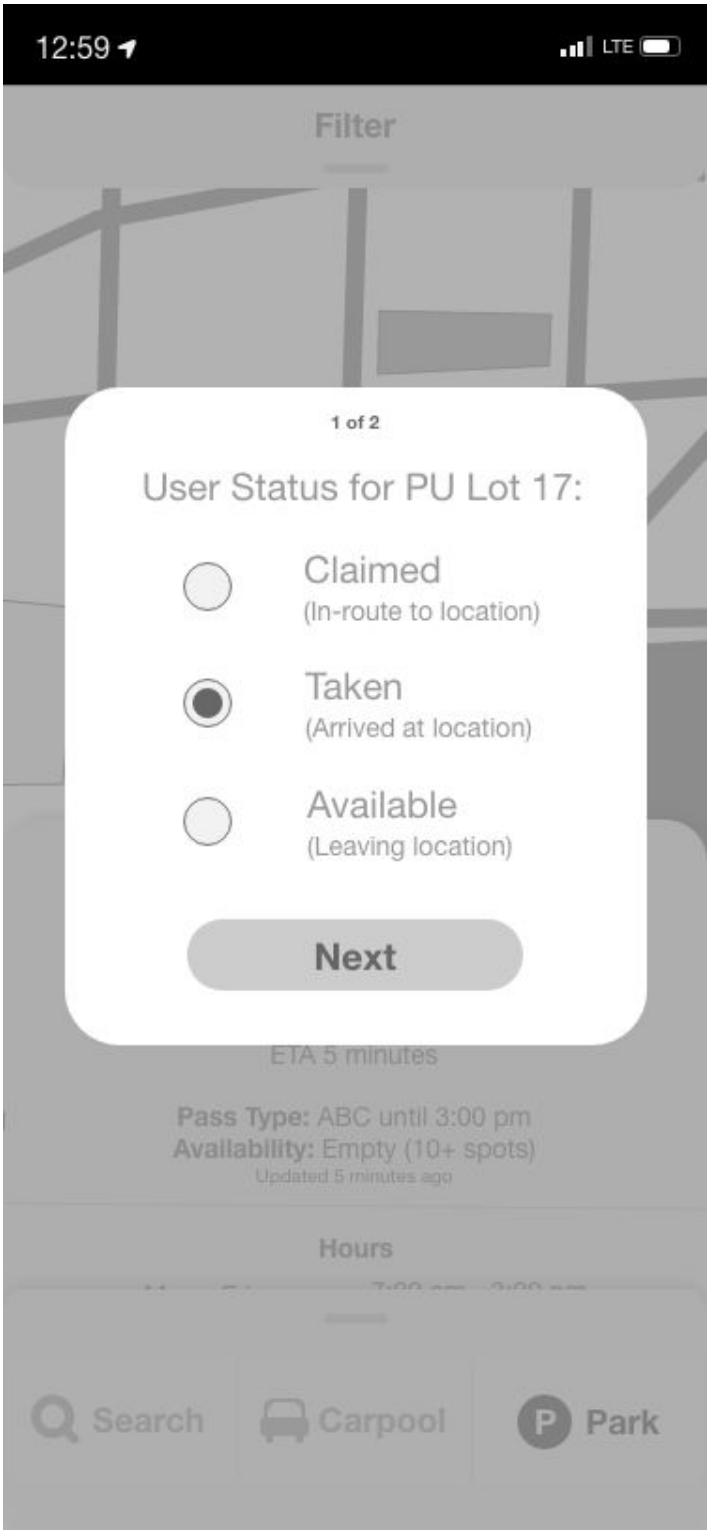
Task 4: User leaves their parking location

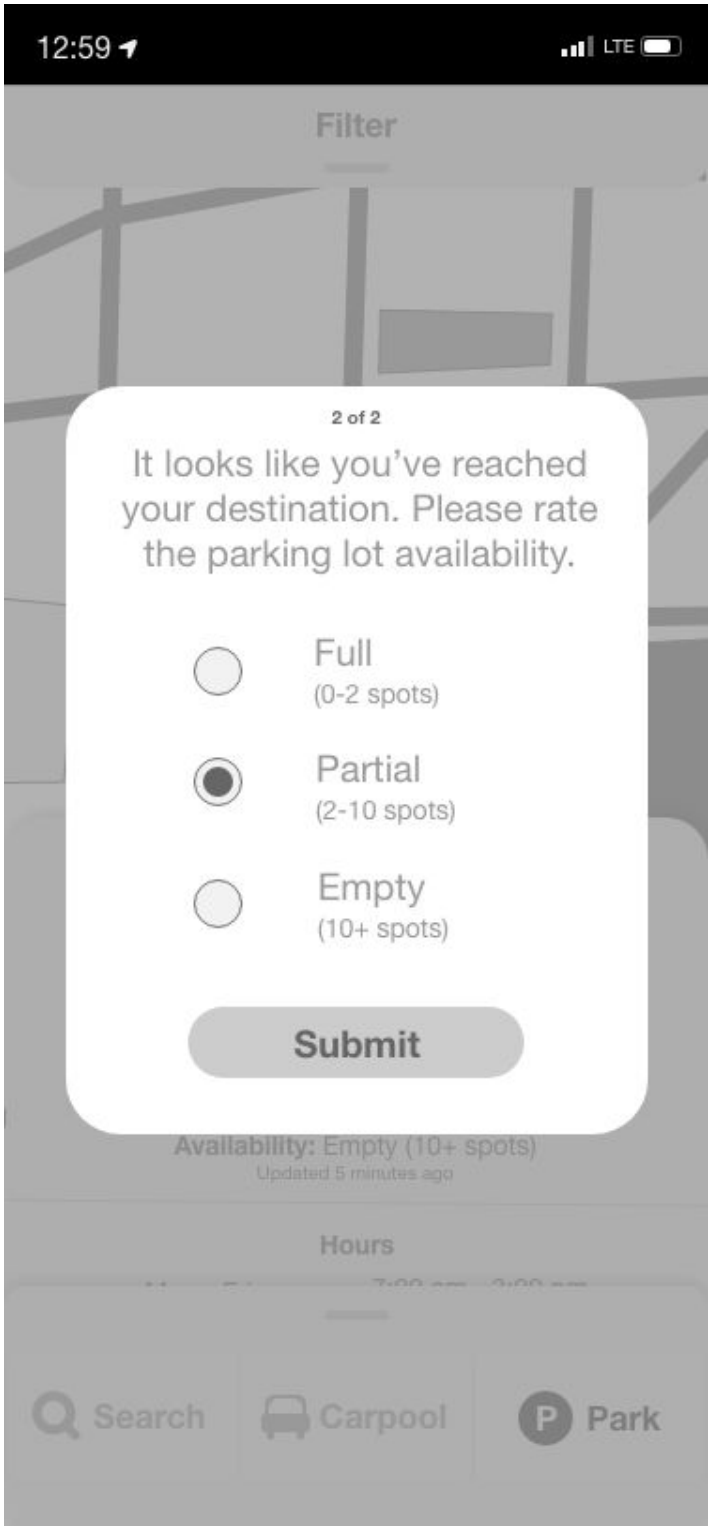
1. Opens Waze app (home screen appears)
2. Presses parking tab (shows parking density map, layout, and parking location)
3. Changes spot from “taken” to “available” (pop up box is shown and user selects the correct radio button)
4. Waze asks the user if they’d like to save the current parking location (pop up with “yes” or “no” button)
5. Responds with “yes” (information is saved in user’s profile and confirmation status is shown)

6. Asks user general lot availability of the parking location (pop up box appears and three options are presented)
7. Selects availability (radio button fills in with selected option and Waze updates the lot information)
8. Exits app

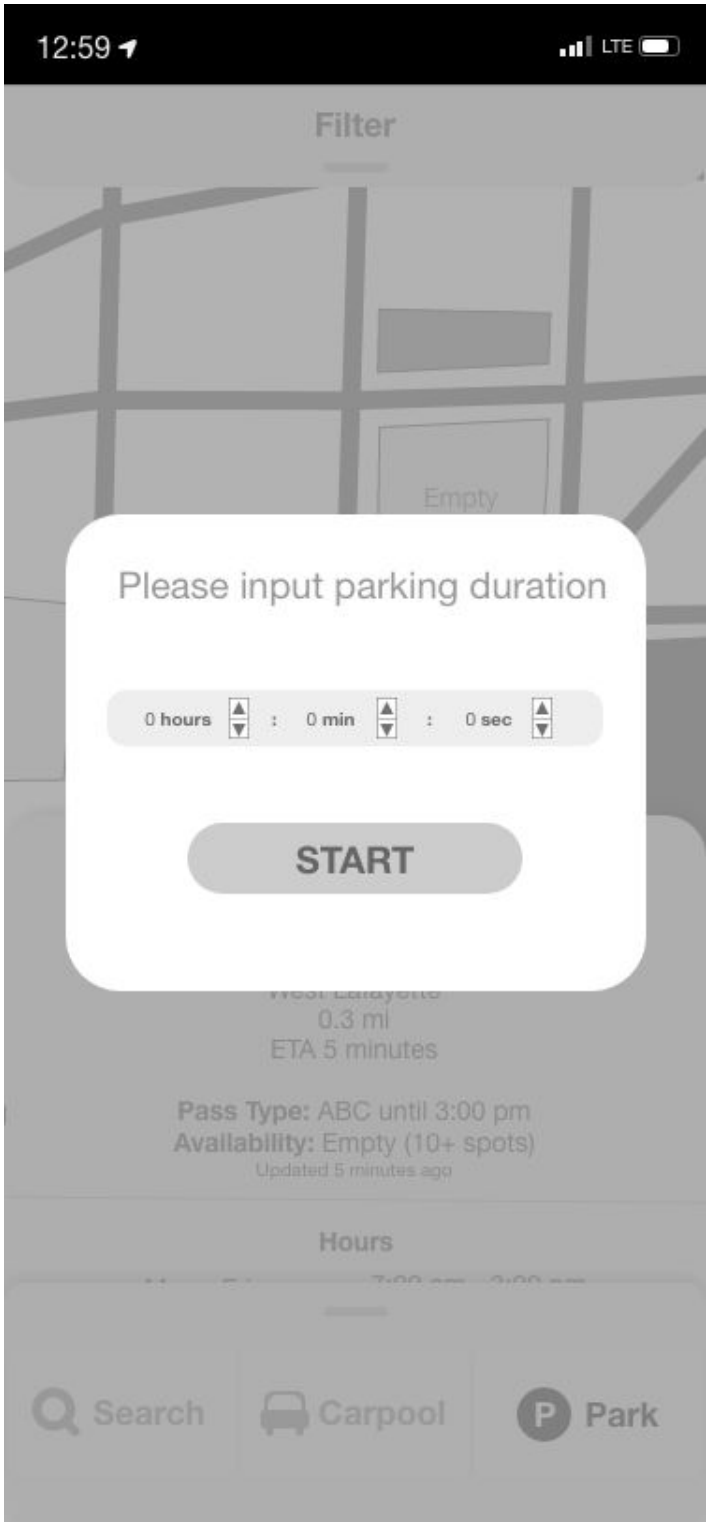
First Prototype




12:59
LTE
Filter
1 of 2
User Status for PU Lot 17:
Claimed
(In-route to location)
Taken
(Arrived at location)
Available
(Leaving location)
Next
ETA 5 minutes
Pass Type: ABC until 3:00 pm
Availability: Empty (10+ spots)
Updated 5 minutes ago
Hours
Search
Carpool
Park


12:59
LTE
Filter
2 of 2
It looks like you've reached your destination. Please rate the parking lot availability.
Full
(0-2 spots)
Partial
(2-10 spots)
Empty
(10+ spots)
Submit
Availability: Empty (10+ spots)
Updated 5 minutes ago
Hours
Search
Carpool
Park


12:59
LTE
Filter
Partial
Partial
Emp
ABC
PU Lot 17
West Lafayette
0.3 mi
ETA 5 minutes
Pass Type: ABC until 3:00 pm
Availability: Empty (10+ spots)
Updated 5 minutes ago
Hours
Go later
Reserve


12:59
LTE
Filter
Empty
Please input parking duration
0 hours : 0 min : 0 sec
START
0.3 mi
ETA 5 minutes
Pass Type: ABC until 3:00 pm
Availability: Empty (10+ spots)
Updated 5 minutes ago
Hours
Search
Carpool
Park

Testing Protocol

The purpose of testing protocol is to present a consistent script for users while not leading them to make certain decisions with the interface. Part of testing is to observe and understand if interface options are intuitive or do users need more information and guidance to accomplish a task. By creating a testing script, we consistently presented users with this script and follow-up questions after interacting with the click-through prototype. The outcome of testing protocol is consistent, holistic feedback of the user interface.

Greeting

Hi, I'm going to walk you through today's session. My team and I are currently working with Waze to implement a parking feature on college campuses. Today, we will be going over some tasks with this prototype. Your feedback is valuable and will help us determine if our app functions as intended.

During this session, I'll start by asking you a few questions about your background and vehicle usage on campus. Later on, I'll ask you to share your screen and accomplish a few tasks using the application. Are there any questions at the moment?

If you are anyway confused about how to accomplish anything, please let me know. I will be happy to help you.

Demographic info

- What's your age?
- Which year are you in?
- Where do you live on campus?

Screening Questions

- Do you drive a car?
- Do you have a parking pass? If yes, what kind?
- Do you park in a garage, on the street, or in a parking lot?
- How often do you drive your car on campus?
- Where are your preferred locations to park?
- What are your perceptions of parking on campus?

2-3 tasks with open-ended questions

- First task: choosing the fastest route to campus, finding a parking lot, and reserving a spot
    - What are your first impressions?
    - When you open the app, what is the first thing you'd think you'd do?
    - How would you search for a parking location?
    - What do you think about reserving a spot ahead of time?
- Second task: Navigating to a reserved parking spot
    - What do you think of popups? Are reminders helpful when arriving at your location?
    - How do you feel about voice navigation while you drive?
- Third task: Leaving your reserved parking spot
    - Do you think you'd remember to mark a spot available once you leave? Is there a way we can make this feature more prominent?
    - How would you feel about notifications from Waze once you left a location?
    - What do you think about how information and features are laid out?
    - Do you like the interface? Is it easy to use?

Feedback on First Round

Participant 1:

- Preferred type 1
- Thought the simple design made more sense rather than filtering options
- Felt that usually lots are going to be full so they will just choose by looking at which lot is empty on the map closest to their location

Participant 2:

- User was a bit confused by the second option
- After I explained it a bit they understood but maybe it could be altered to make it easier to follow
- User thought we had a great idea and appreciated the simplicity of the design
- User felt that entering the time for the spot was not necessary and an extra step they wouldn't want to do on a daily basis

Participant 3:

- User felt both were good options

- Felt that sometimes would prefer the second option during times where campus is less crowded i.e. when there are more spots open on campus, filtering results would be helpful for finding the best spot
- User liked that choosing the lot directly on the map was easy
- User liked the idea of inputting the time but didn't want to do it if they parked there every day

Results and Changes for Sprint 2

From Sprint 1, we learned that the users liked the simplicity and ease of the platform. Users felt that clicking on a lot based on availability was effective and a great idea; however, users felt that filtering could become complicated and that entering time for a timed street spot could become tedious everyday and unnecessary.

After receiving feedback on our prototype from three representative users, there were a few changes that needed to be made.

1. Update interface colors and branding to match Waze
2. Combine prototypes to account for filtering options in searching for street spots
3. Create a new input for a timed spot

Sprint 2

The purpose of Sprint 2 was to address user feedback and create a more user-friendly interface. From Sprint 1, we learned that the users liked the simplicity and ease of the platform. Users felt that clicking on a lot based on availability was effective and a great idea; however, users felt that filtering could become complicated and that entering time for a timed street spot could become tedious everyday and unnecessary. To account for this feedback, we adjusted the prototype and conducted another round of testing. In doing so, the outcome of Sprint 2 was a more user-friendly, effective design.

For Sprint 2, we needed to adjust the prototype by adding Waze branding/colors, combining previous prototype versions for filtering options, and creating a new input for a timed spot. After iterating on the prototype, we would then test it another time against the same users as Sprint 1. The testing protocol was the same as Sprint 1. By testing the second prototype against the same users as Sprint 1, it ensured we solved the issues they presented.

Feedback on Second Round

Participant 1:

- Appreciates the updates and including the feedback from first prototype
- Feels like there is less clicking to accomplish the goal

Participant 2:

- Likes that it doesn't feel like a real task to input information as you are leaving the lot because if it did feel that way they think no one would take the time to help others out

Participant 3:

- Likes that it tells you what parking pass you need for each lot
- Participant gets confused with pass types for lots at times without the app

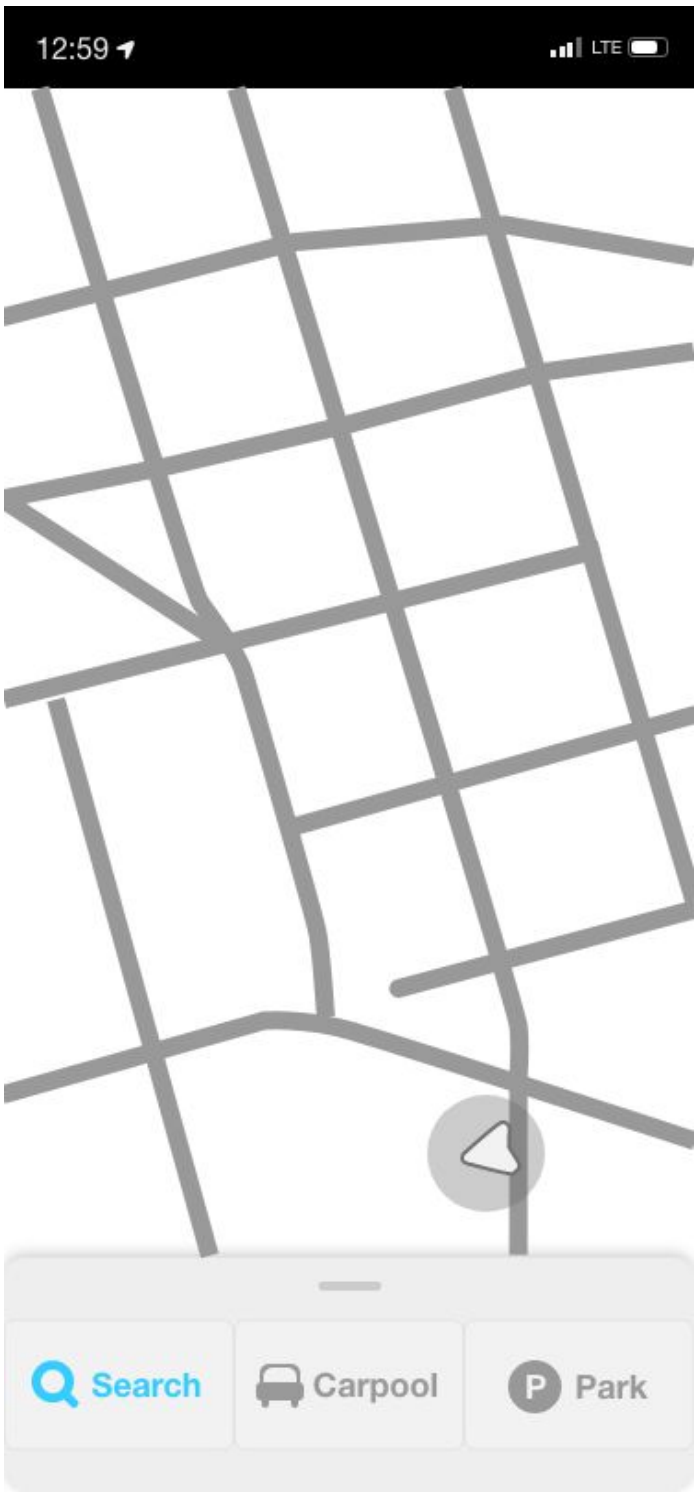
Results

The results from Sprint 2 were very positive. After completing the sprint, we now understood that by iterating on the first prototype, we helped solve the user's concerns. The goal of creating an effective user-centered design ensures that the user is at the forefront of the process to create a design that helps solve their problem. After testing the second prototype and receiving feedback that there are less user interactions and the interface makes tasks easier, we designed a platform that is user-centered.

Since the feedback we received was overwhelmingly positive, we didn't discover any major changes to our second prototype design. Therefore, our final prototype was the same as our second prototype. The outcome of Sprint 2 was a mid-fidelity prototype that helped accomplish our user group's problems in an intuitive and effective manner.

Final Prototype Solution

Prototype Link



When users first open up the app, they will see a screen similar to this. Our design will add an easily-accessible “Park” button. This way, a user won’t need to search for the parking feature.

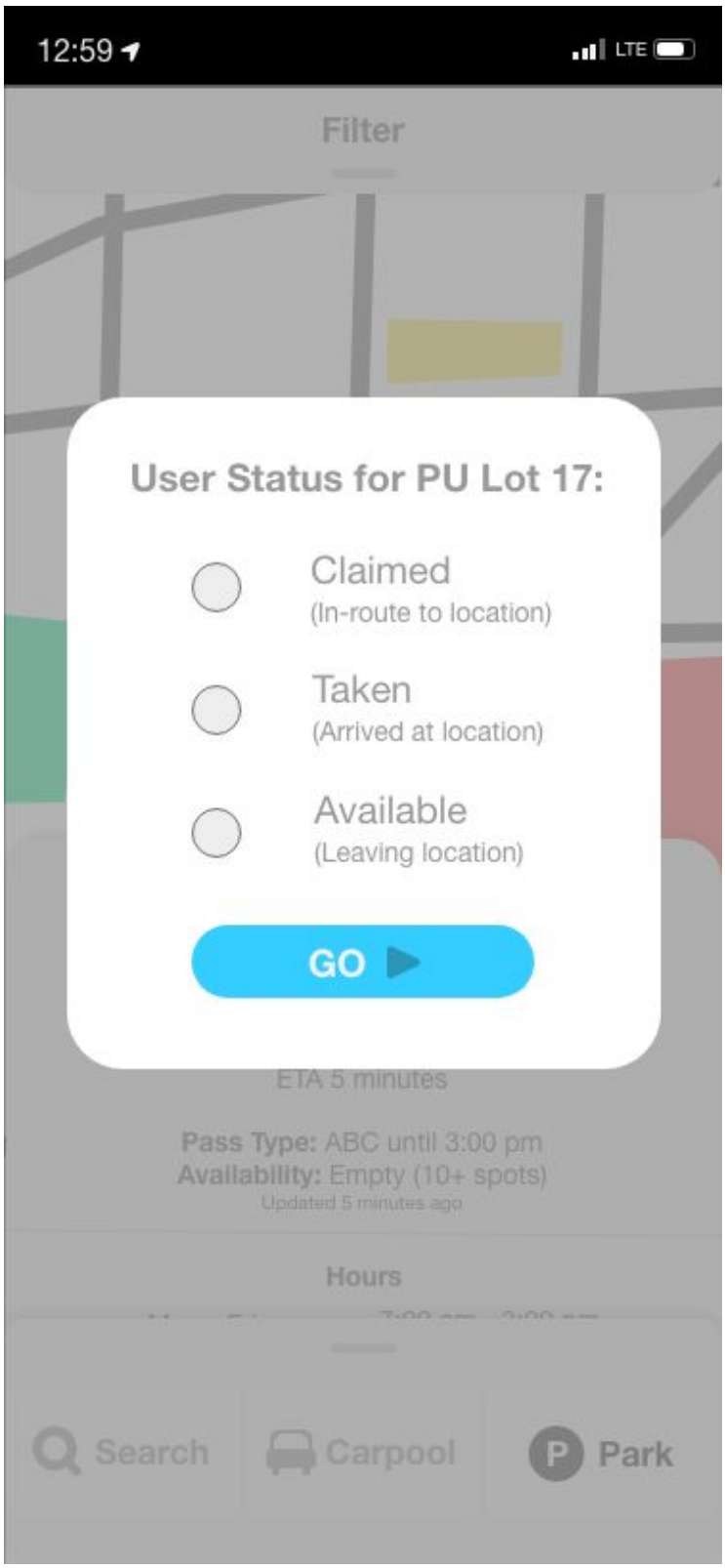
Once a user clicks on the “Park” feature, they will be shown a default, lot density map. The map is colored based on three possible availabilities: Full, Partial, and Empty. A density map is used to allow a user to visually see general availability of parking in their area.

The colors chosen to display density come straight from Waze’s branding.

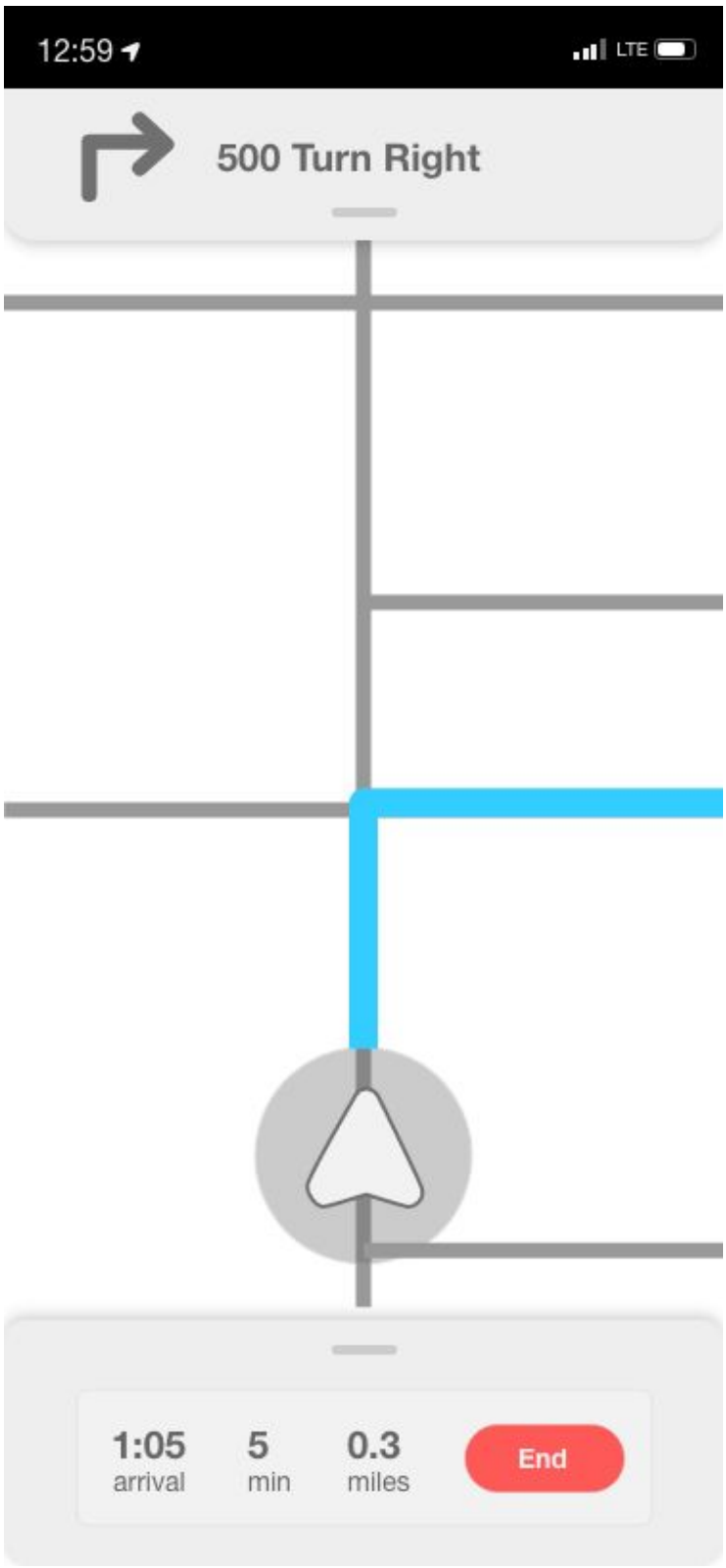
https://medium.com/waze/under-the-hood-behind-the-brand-refresh-95a4c23e42e

When a user clicks on a lot, they are presented with more information. In the lot information, various important information is displayed such as the pass type, lot name, distance from user, ETA, lot availability, and the last time the availability was updated.

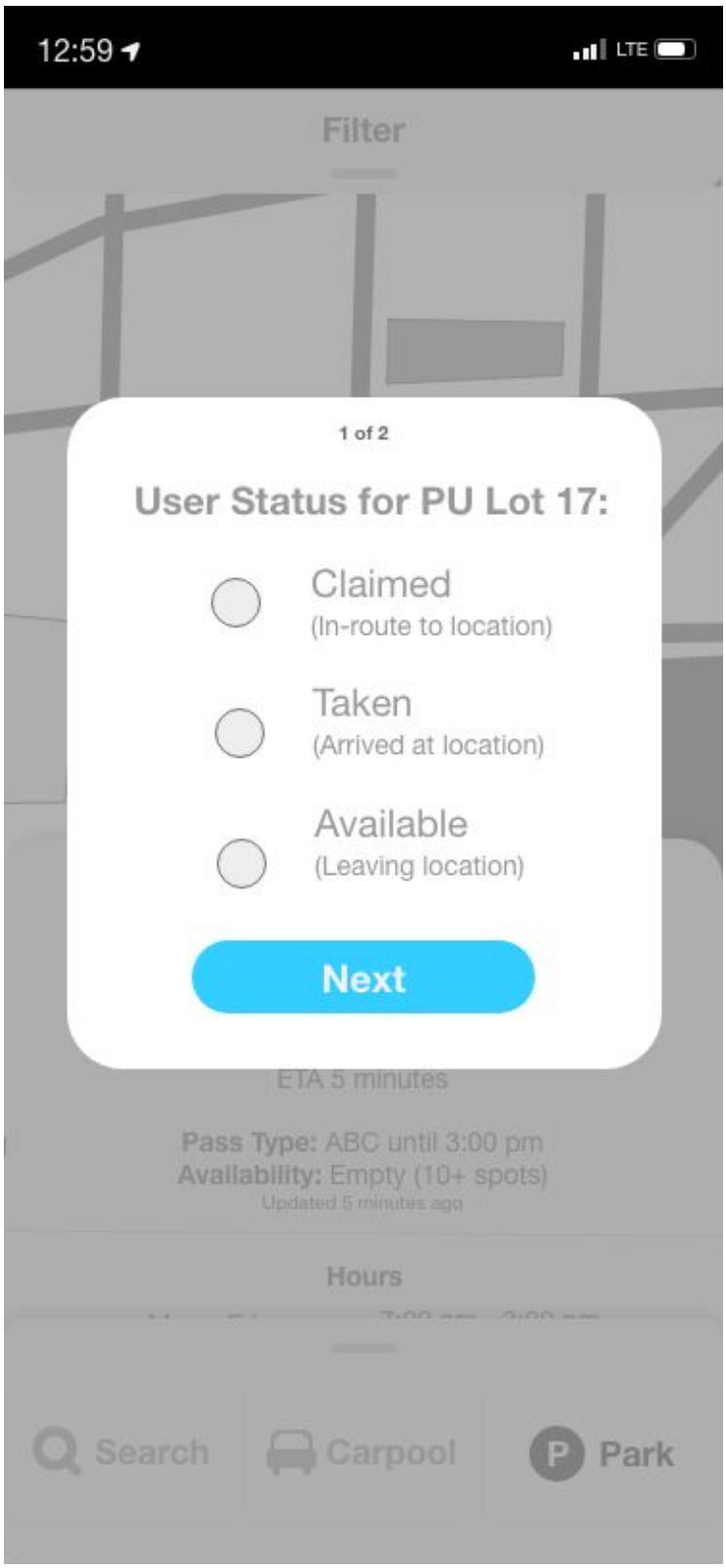
Once a user views the lot information, they are given two options: “Reserve” or “Go Later”. This interface design mimics Waze’s current design to keep interactions familiar to the user.



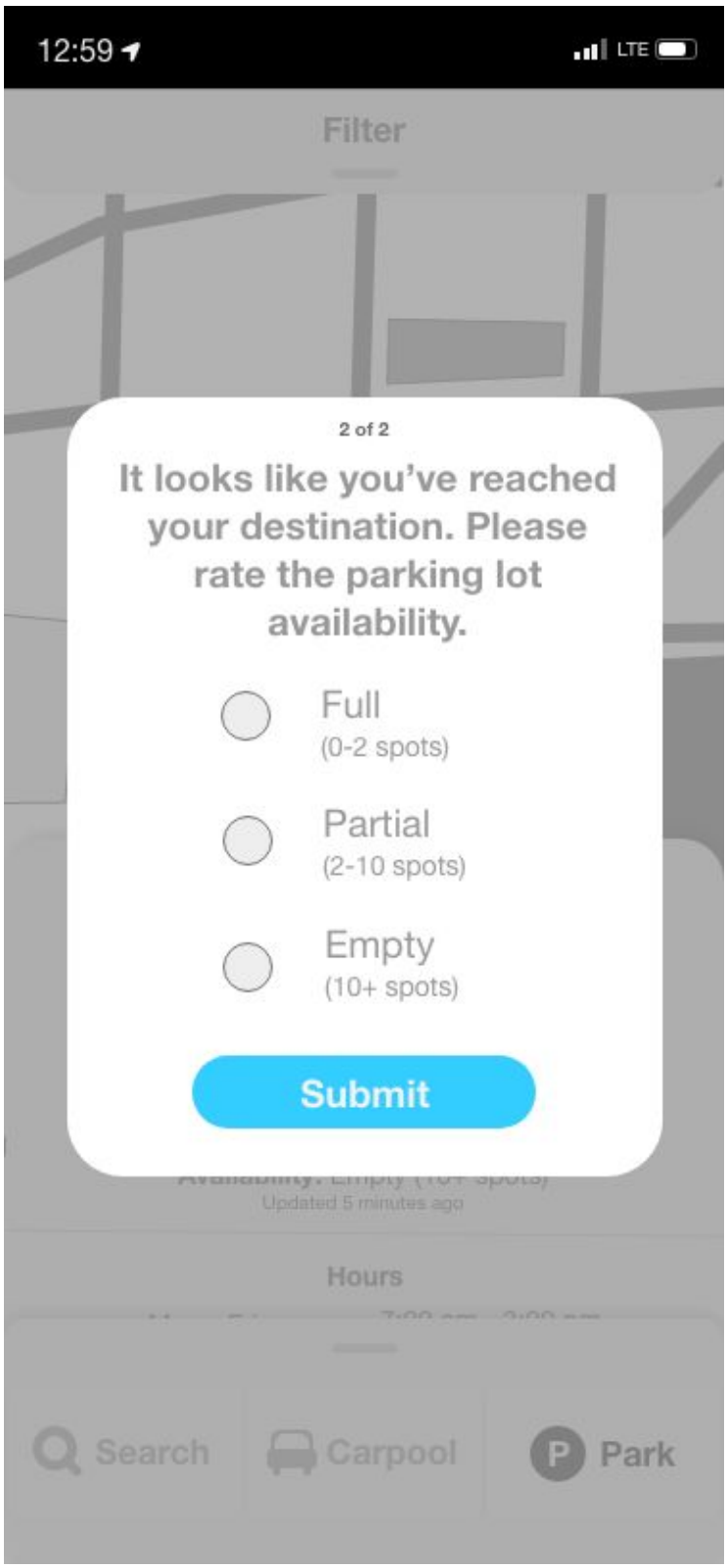
Once a user presses “Reserve”, they are prompted to change their status. They are presented with three radio buttons to make the selection quick and painless. A description of each status is also displayed below to reduce the amount of recognition on the user’s part.



After pressing “Go”, the navigation begins. In the navigation pane, it resembles Apple’s maps as in our initial user interviews, they stated they use Apple or Google due to their user interfaces. This way, a user may be more familiar with this navigation.

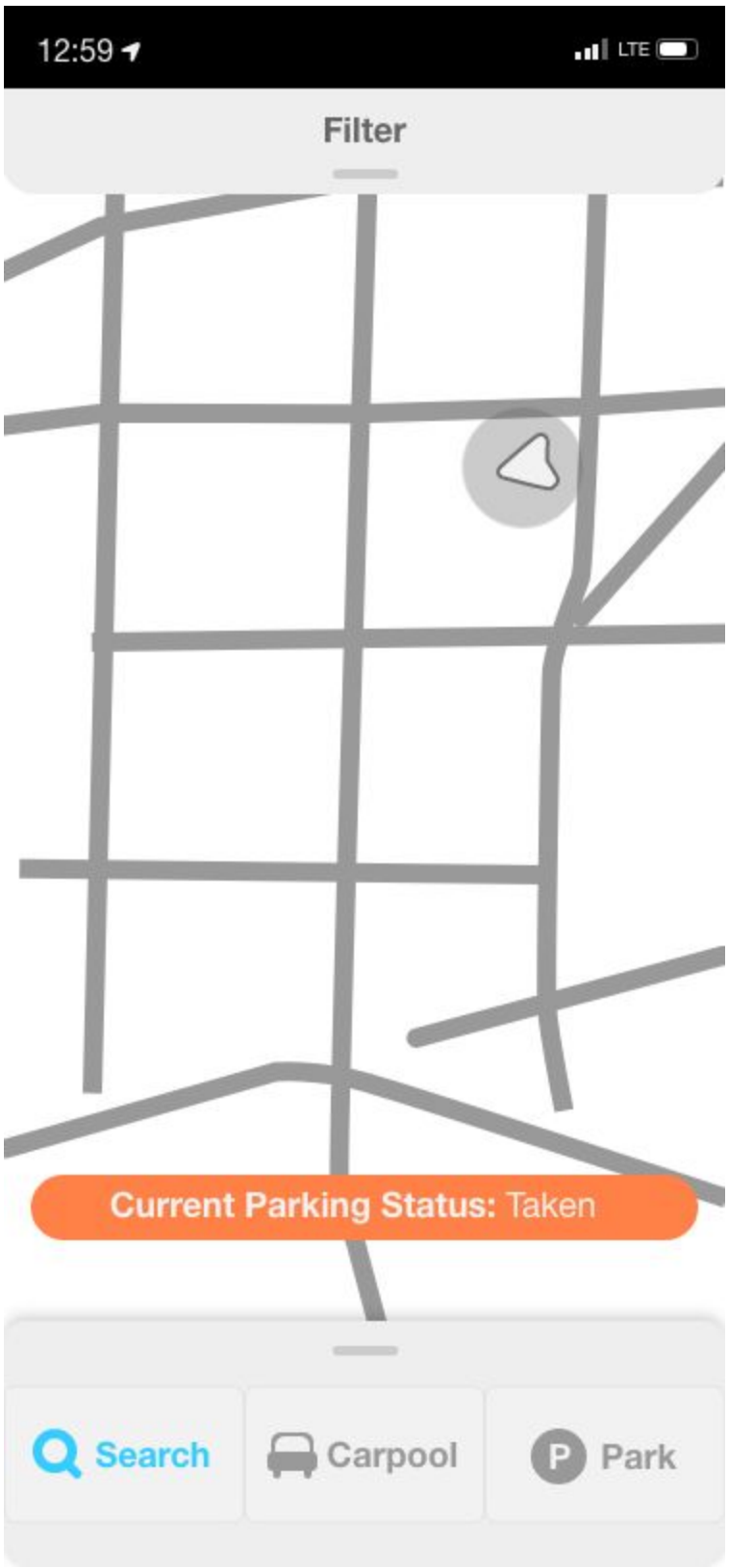


Once the navigation ends, the user is prompted with a popup to answer a few questions. The first question is to update their status so Waze keeps the database updated on the number of spots available.



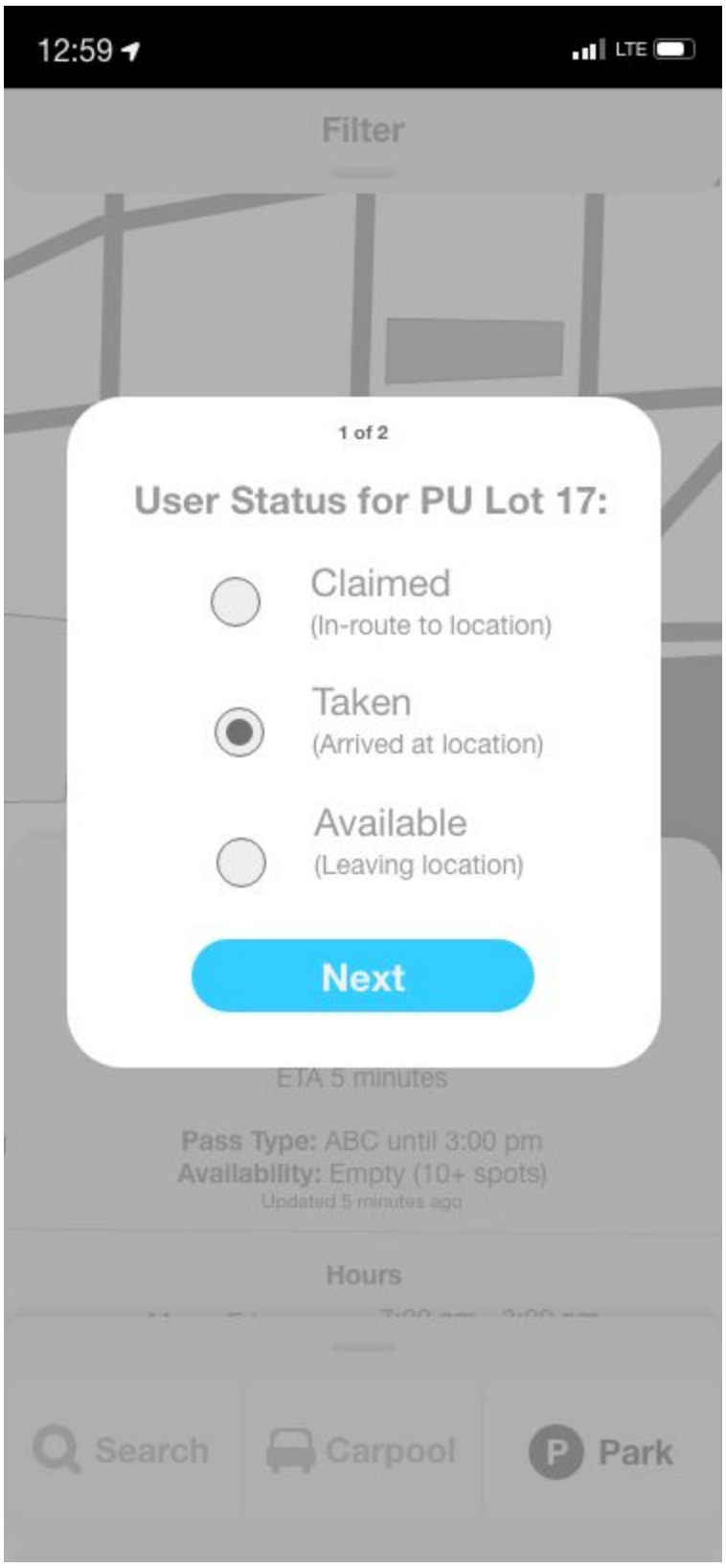
After changing their status, the user is then asked to quickly input the parking lot availability. Similarly to when a user changes their status, a description of each type of availability is offered to reduce recognition on the user's part.

By presenting three, quick options, the goal is to continually keep the interface up-to-date with fewer barriers from a user standpoint.

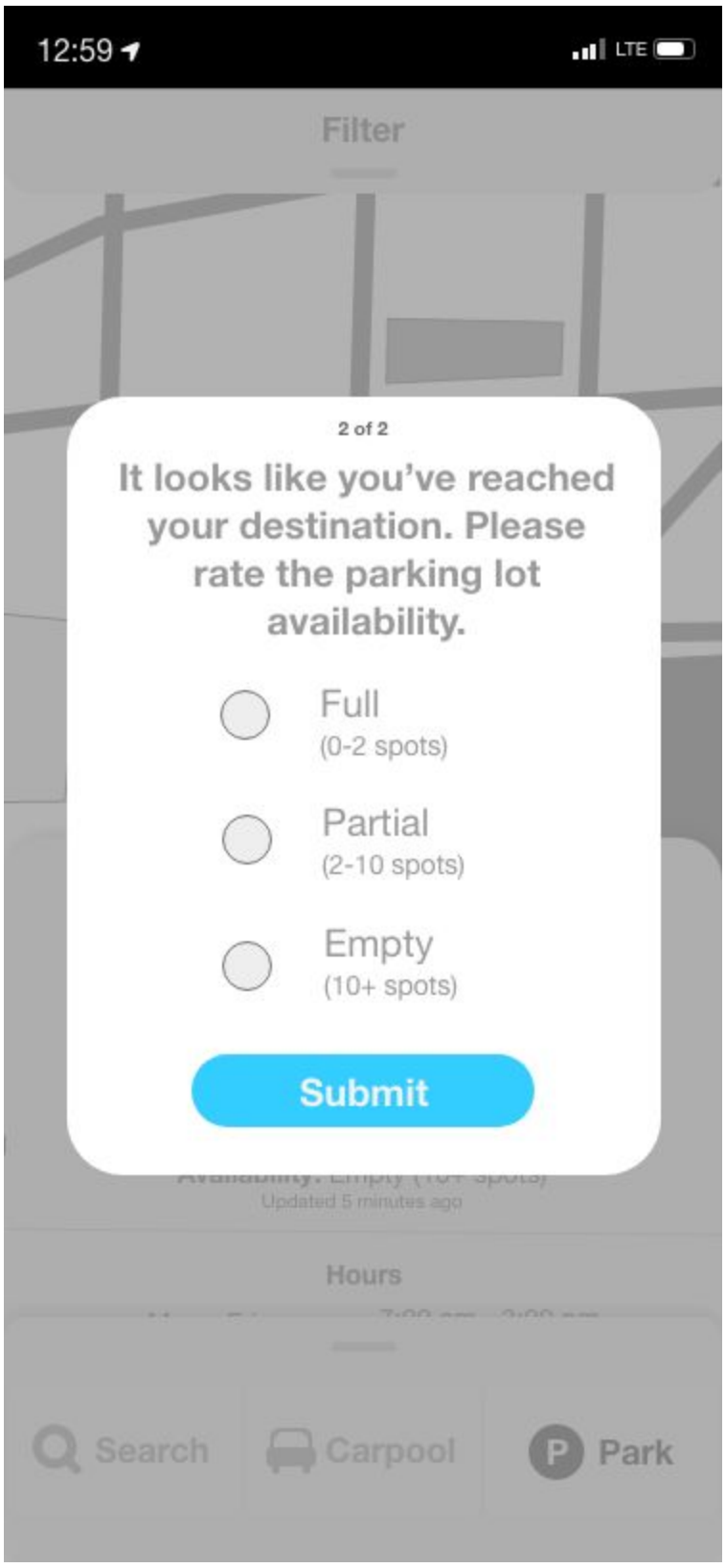


After filling out the two questions and pressing “Submit”, the user is taken back to the home screen of the application. The interface now displays their current parking status.

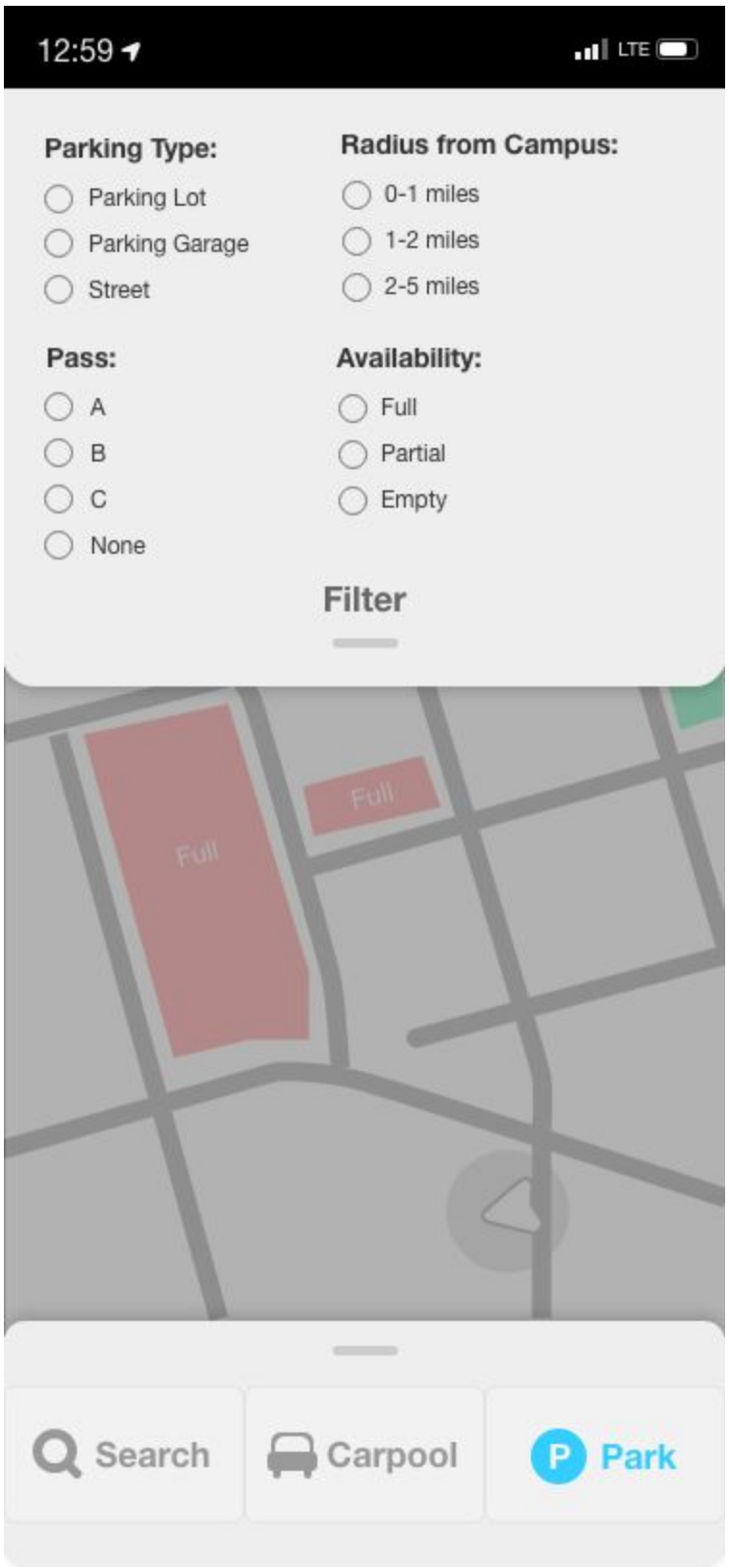
The rationale behind displaying the status is to hopefully reduce the amount of users that forget to update their status in the app.



As the user leaves their location, they are then prompted to update their user status in the Waze system.

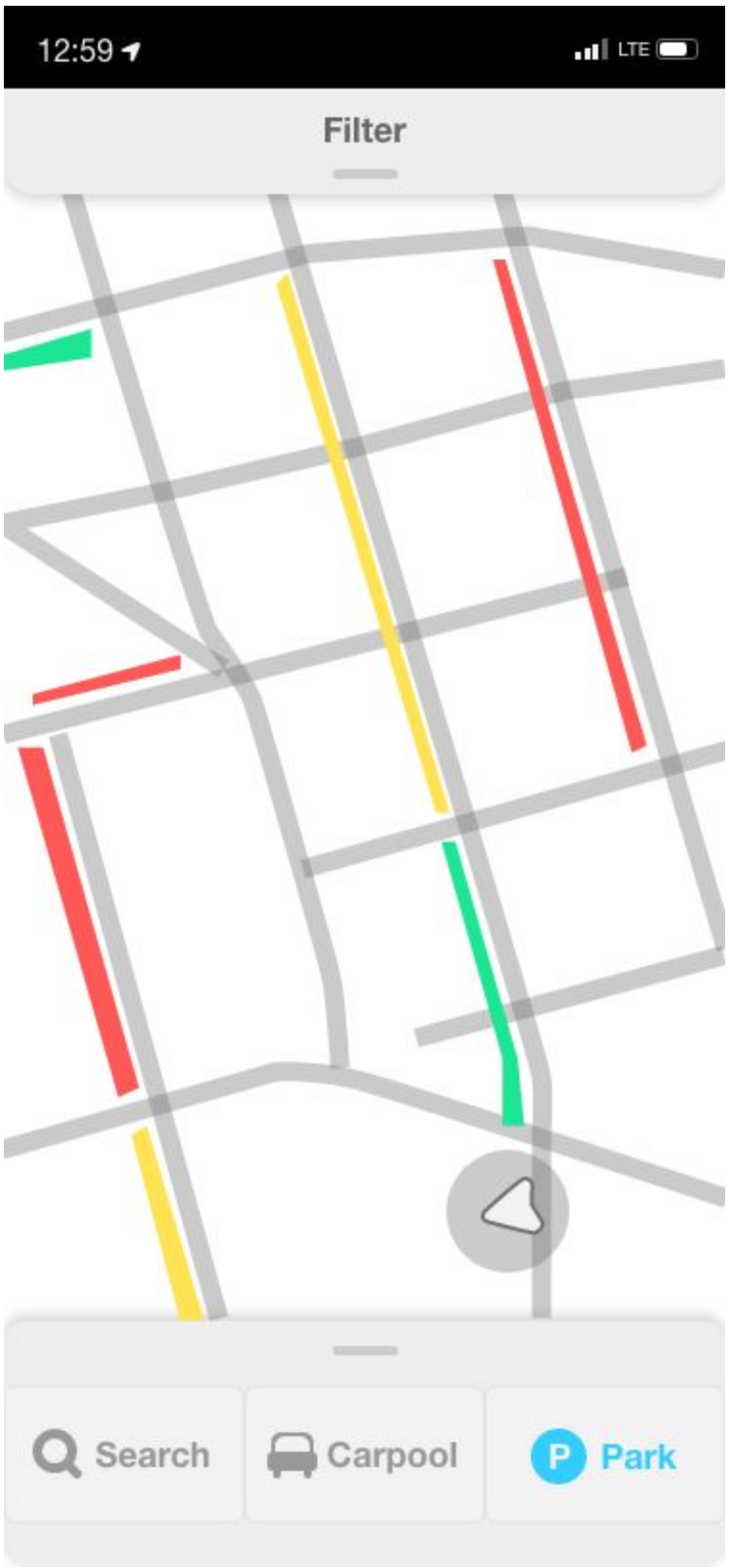


To keep the system updated, the user is then asked to rate the parking lot availability once they leave. Once again, simple radio buttons are used to help reduce the level of effort needed to update the lot information.

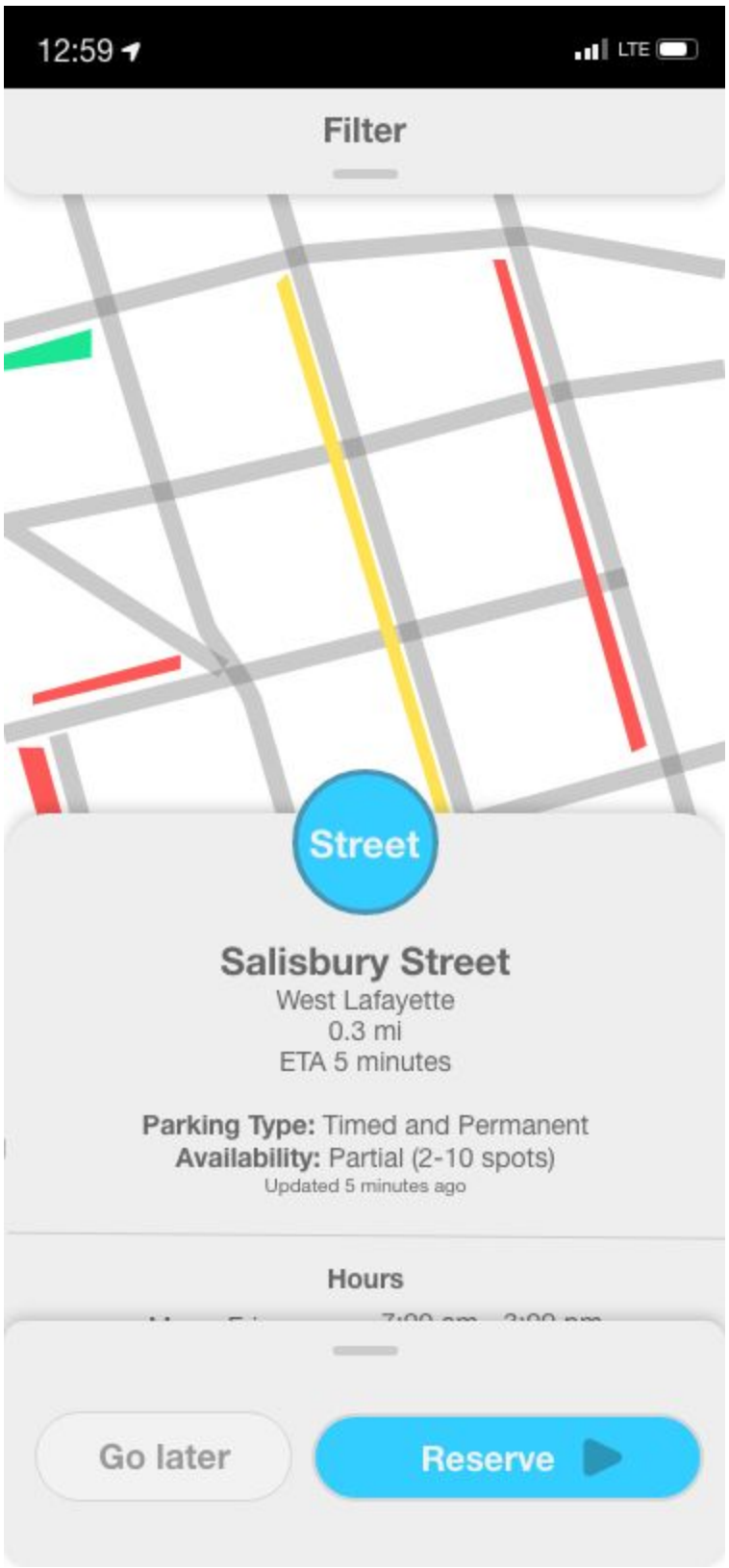


If a user doesn't want to view the default lot availability, they have the option to swipe down on the "Filters" menu. In this menu, the user is given options to view the map by parking type, pass type, radius from campus, and general availability.

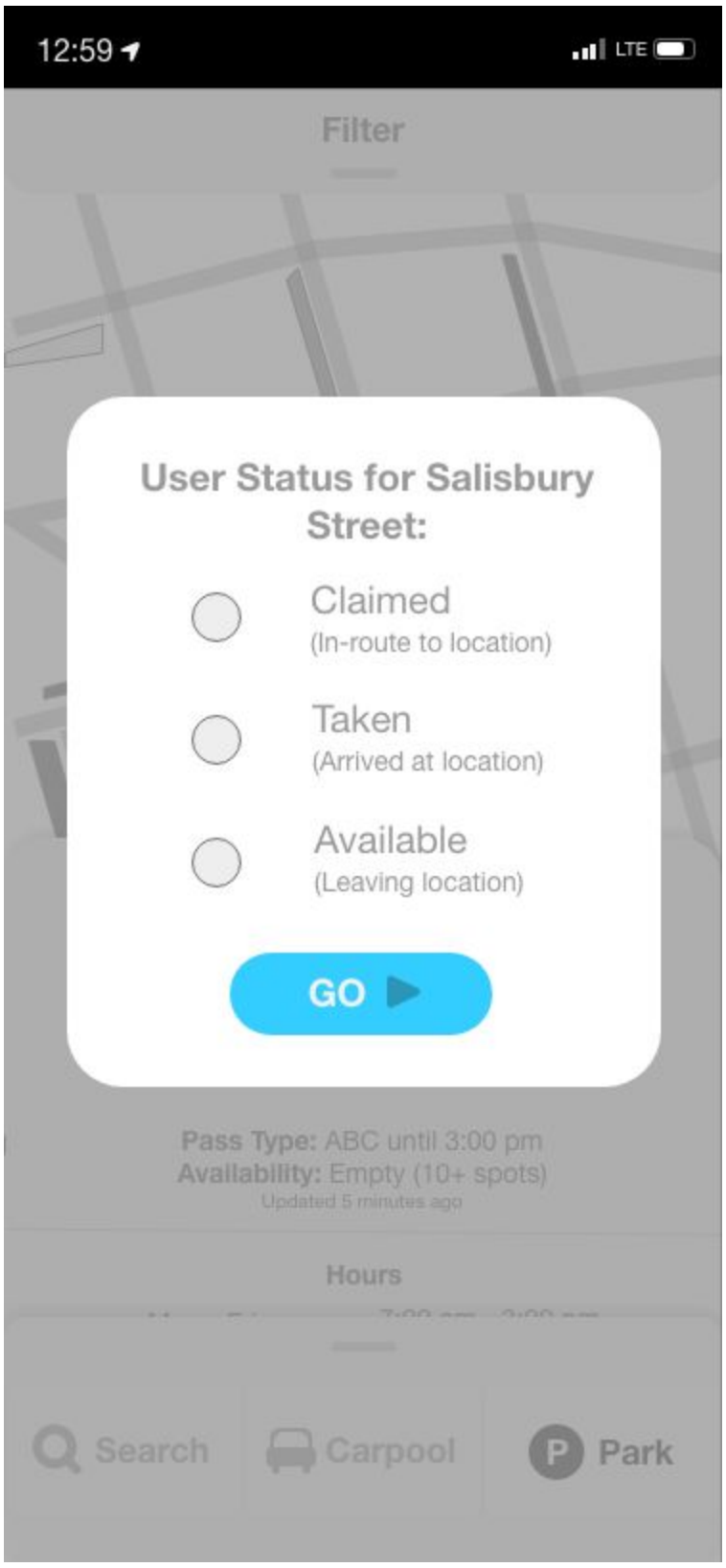
The rationale behind a "Filters" menu is to provide the user with more options to customize their experience rather than only allow them to park in a parking lot or parking garage.



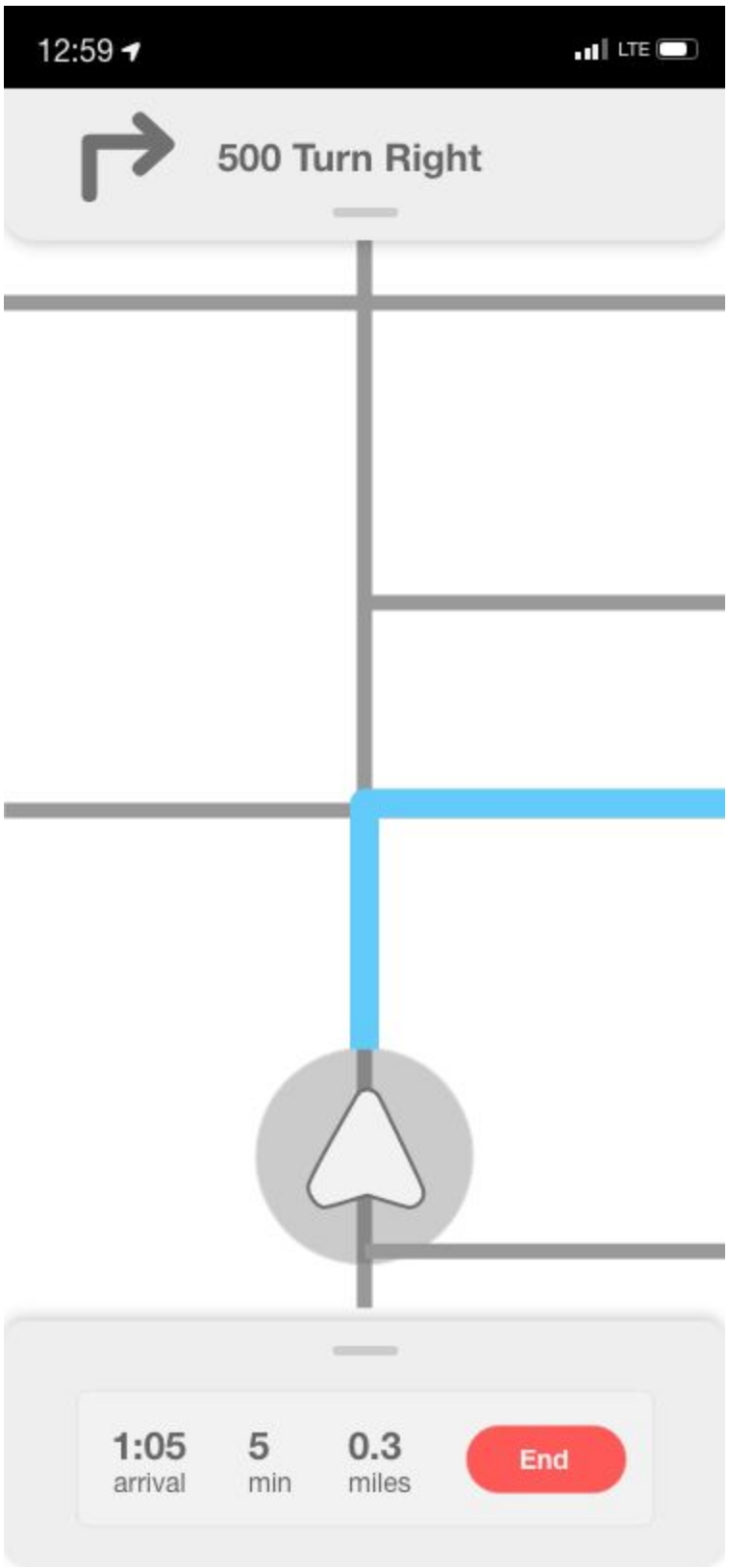
Similarly to the parking lot availability, if a user were to select the “Street” option in the “Filters” menu, they will be shown the availability of parking spots on a given street.



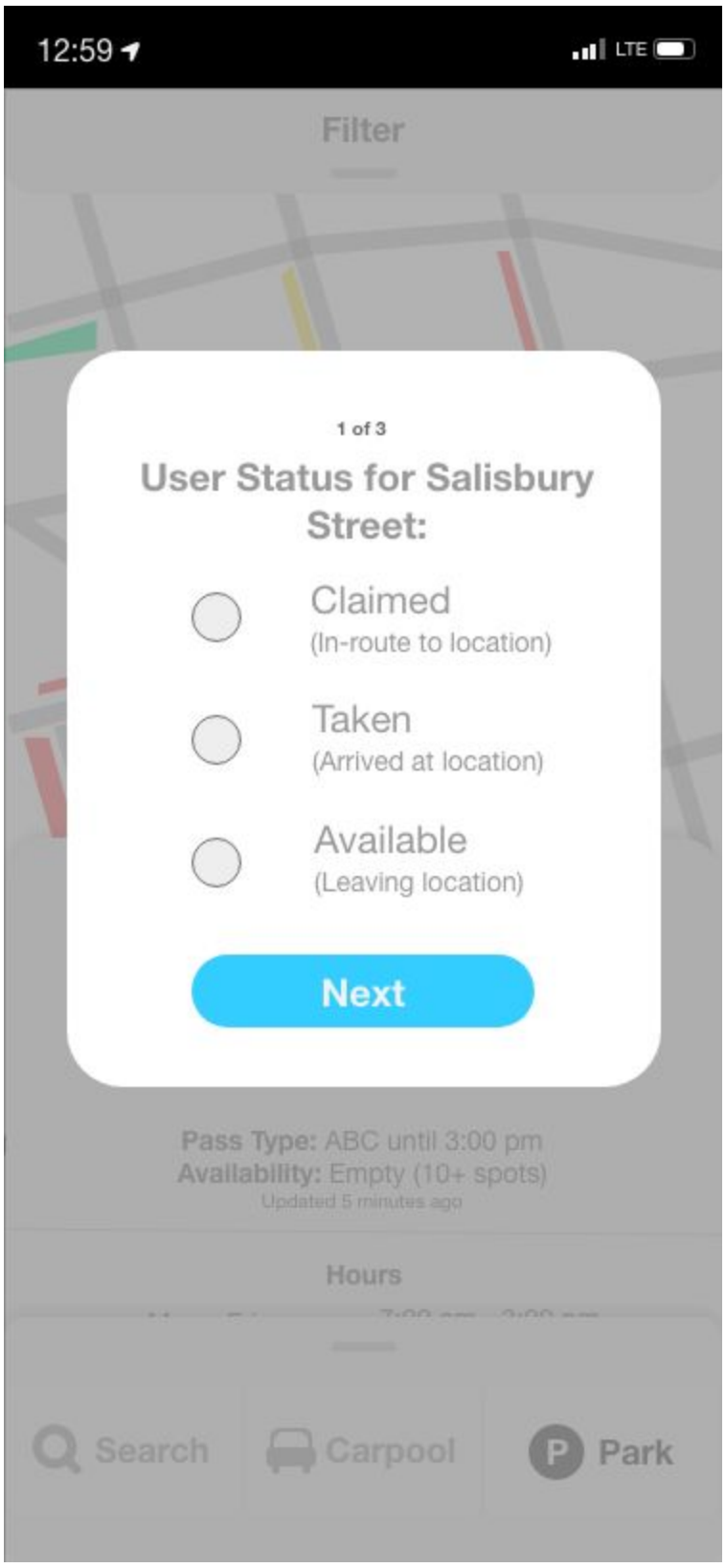
After clicking on a particular road for more information, the interface displays the street spot's relevant information. The street information interface resembles the lot information interface for consistency across the app.



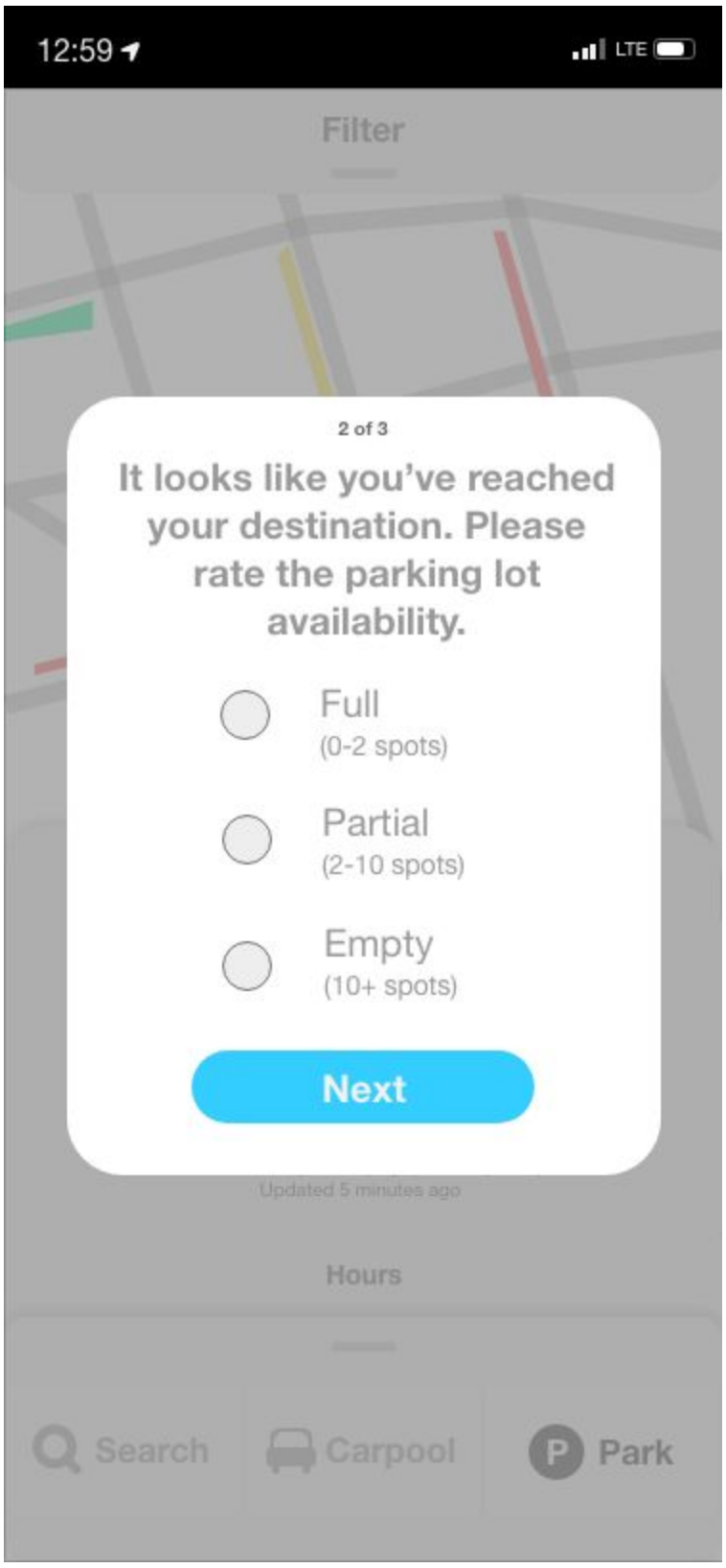
Once a user presses “Reserve”, they are prompted to change their status. They are presented with three radio buttons to make the selection quick and painless. A description of each status is also displayed below to reduce the amount of recognition on the user’s part.



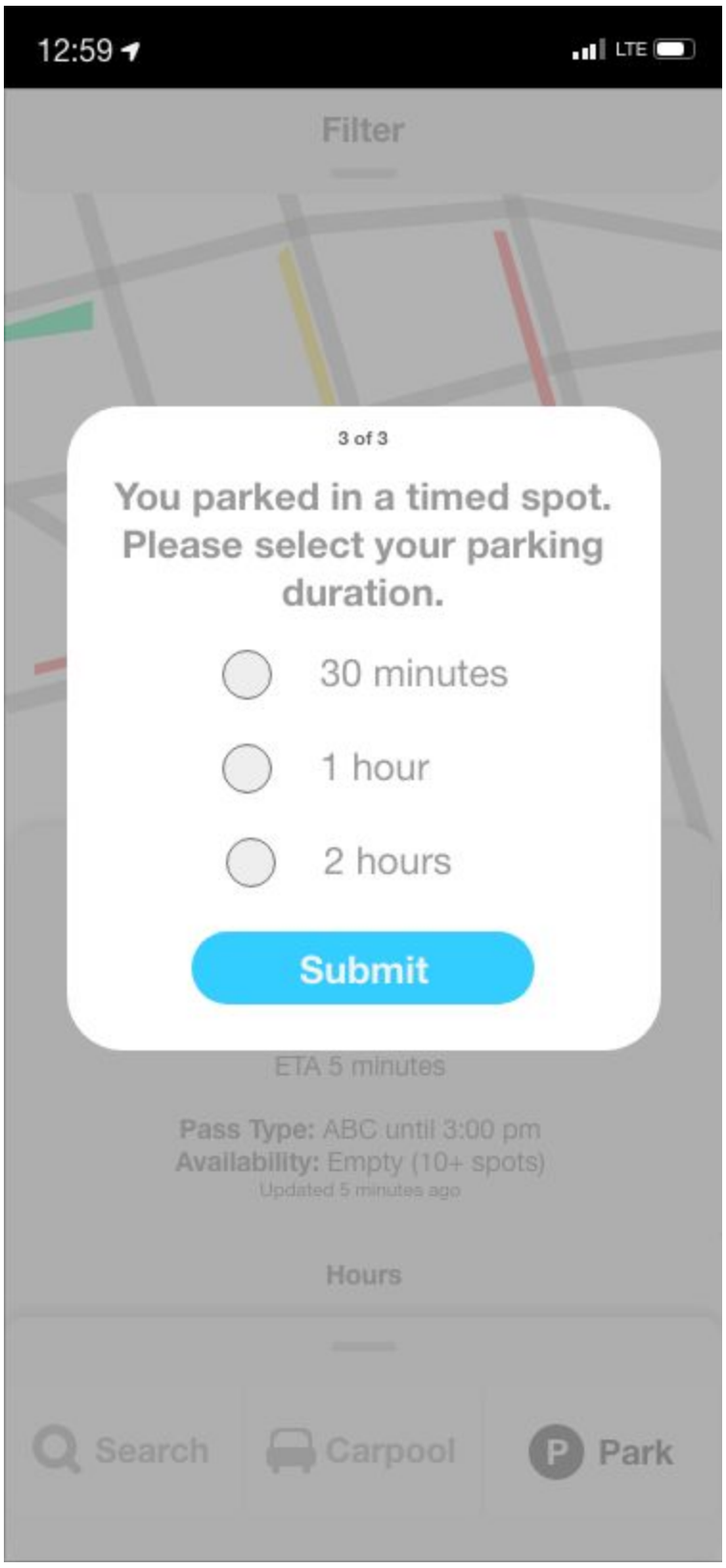
Similarly to the navigation pane earlier in the prototype, after pressing “Go”, the navigation begins.



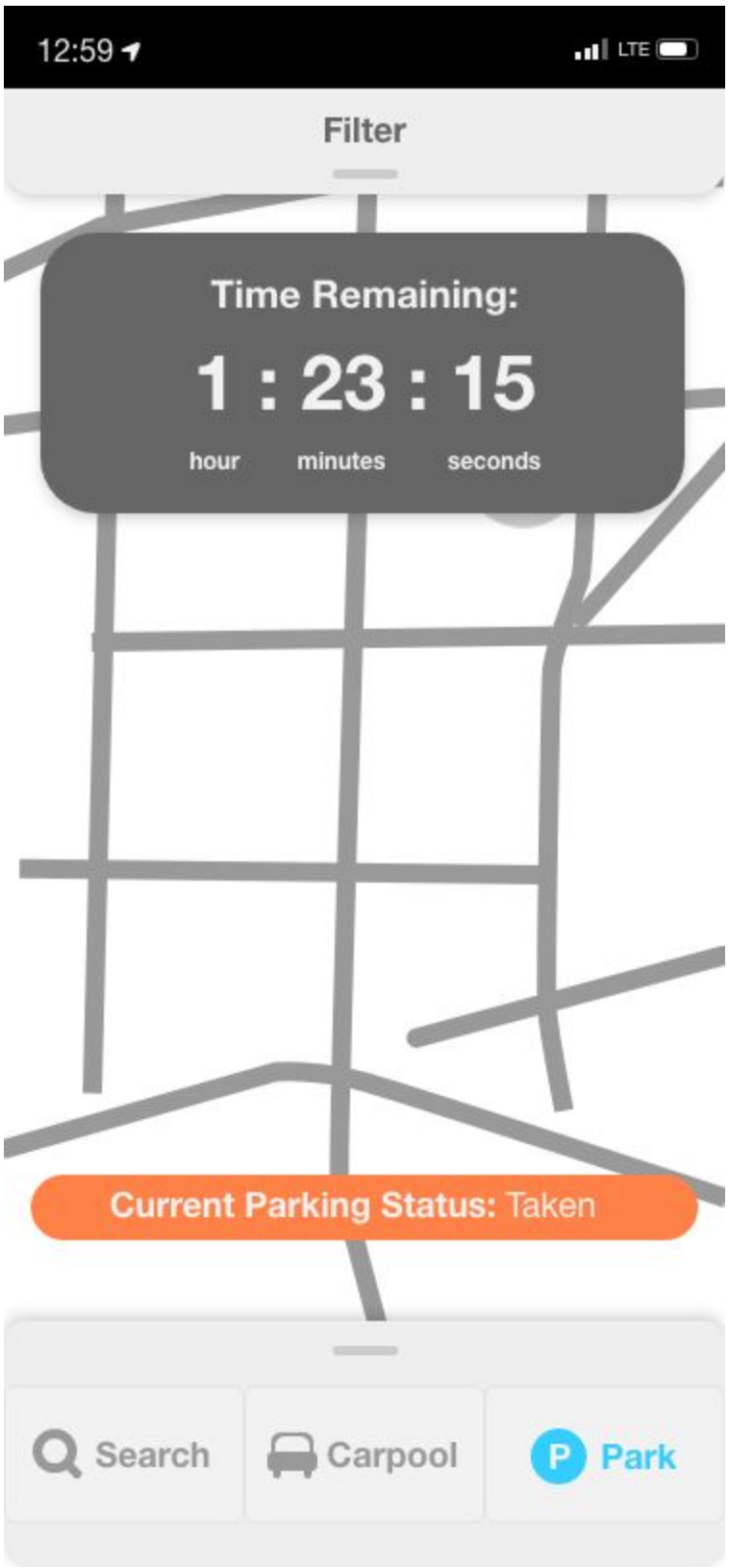
Once the navigation ends, the user is prompted with a popup to answer a few questions. The first question is to update their status so Waze keeps the database updated on the number of spots available.



After changing their status, the user is then asked to quickly input the parking lot availability. Similarly to when a user changes their status, a description of each type of availability is offered to reduce recognition on the user's part.



When a user chooses a street spot, they are asked an additional question when they arrive at their location. If a user is in a timed parking spot, they will be prompted to choose between timing options. In doing so, Waze will help remind the user that they are in a timed location.



After choosing the amount of time, the user is then taken back to the “Park” tab and displayed their current time remaining.

To remind the user and reduce their probability of getting a ticket, Waze will vibrate and notify the user on their time remaining at 30 minutes, 15 minutes, and when their time is up.

Feedback on Final Prototype

- Participant 1: appreciates the updates and including feedback on first prototype. Feels like there is less clicking to accomplish the goal.
- Participant 2: likes that it doesn't feel like a real task to input information as you are leaving the lot because if it did feel that way they feel that no one would take the time to help others out.
- Participant 3: likes that it tells you what parking pass you need for each lot. Participant gets confused with this at times without the app.

Future Steps

To ensure we are designing a solution that meets our users' needs, there are several steps left to accomplish. First, we will be refining the scenario and interface elements to account for user feedback and create a flow of screens.

We will take the feedback on our current design solution and brainstorm and sketch new ideas to account for some of these concerns. At the moment, we need to revise infrastructure issues with reserving specific parking locations, explore how to incentivize marking availability, and accuracy of reporting.

After another round of receiving feedback on the refined design, we will create a prototype to further test usability. Once a prototype has been made, we can gather more information and testing to continue iterating on the design until it satisfies the user group and our design requirements.

From Project 2, we solved and accomplished the tasks listed above in our future steps. If we were to continue with the project, we'd continue with prototyping and testing by making a more in-depth prototype with options and even some development testing.

Conclusion

The purpose of the Parking for Waze project is to design a product for drivers on Purdue's campus that accounts for their unique needs and perspectives. To achieve a user-friendly, user-centered design, we conducted user interviews to understand their issues and discover the root problem.

In the ideation stage, we analyzed the root problem, brainstormed, and designed a solution that is feasible for our users and design requirements. Based on the ideas, we created a user scenario to determine features and pain points for users to ensure we were alleviating their issues.

Lastly, we tested our solution by obtaining user feedback from previous interviewees and representative users and creating a final, mid-fidelity prototype of the user interface. For future steps, we would ideally create a more high-fidelity prototype before entering into development. In a high-fidelity prototype, we could present the user with multiple options and tasks to complete. By continual testing and iterations, we can ensure the user interface is effective from the beginning before starting development. However, for the purpose of our project, we will not be continuing into high-fidelity prototype iterations.

Appendix A: Team Contribution

Name	**Contribution**
Erin Cook	Team KWHL: Contributed ideas, synthesized the team's results, and turned in the document Interviews: Interviewed one person and shared insights to the team during class Persona: Helped refine and format persona slides, reviewed, formatted, and submitted interview synthesis slides Ideation: Contributed by providing sketches using the Crazy 8's method during class and insights what could possibly be the interface Scenario: Helped develop the different user scenarios, created the more detailed flow charts for the different scenarios on the Miro board Presentation: Presented on our proposed solution, design requirements, and how our solution would solve our root problem. Created a custom theme for our slide deck and adjusted the presentation based on feedback. Documentation: Collected feedback and incorporated it into the documentation Cognitive Walkthrough: Completed a cognitive walkthrough for user tasks three and four
Nicole Dwenger	Team KWHL: Contributed ideas, synthesized the team's results, and turned in the document Interviews: Interviewed one individual and synthesized information in class Persona: Developed persona outside of class Ideation: Contributed ideas for interface elements and led team discussions Scenario: Helped lay out three different user scenarios, added persona on Miro board, and turned in final scenarios Presentation: Presented on common problems of our users, the root problem, our persona, and turned the video in Documentation: Formatted and wrote documentation Prototype: Created and iterated on the first and second prototype based on user feedback
Akhila Komakula	Team KWHL: Contributed ideas and placed them on the KWHL Interviews: Interviewed one person and shared insights to the team during

	class **Ideation:** Contributed by providing sketches using the Crazy 8's method during class and insights what could possibly be the interface **Scenario:** Looked over the scenario and checked if everything was added onto it **Presentation:** Presented on feedback, next steps, and conclusion **Documentation:** Formatted and helped write/place information in the correct areas of the document **Cognitive Walkthrough:** Completed a cognitive walkthrough for user tasks one and two **Revision:** looked at the feedback that was given from project 1 and revised the document according to the comments provided. I also added a section about project 2's purpose and what we accomplished
Saswat Mishra	**Team KWHL**: Contributed ideas and placed them on the KWHL **Interviews:** Interviewed one person and shared insights to the team during class **Ideation:** Contributed by providing sketches using the Crazy 8's method during class and insights what could possibly be the interface **Scenario:** Looked over the scenario and checked if everything was added onto it **Presentation:** Stated the introduction, members, project overview, and edited/compiled the video **Protocol/Testing:** Wrote and researched information for prototype testing
Kelly Tucker	**Team KWHL**: Contributed ideas and placed them on the KWHL **Interviews:** Interviewed one person and shared insights to the team during class **Ideation:** Helped lay out three different user scenarios, and edited persona on Miro board **Scenario:** Looked over the scenario and checked if everything was added onto it **Presentation:** Presented evidence of our solution-- our sketches, scenarios and screens and reviewed our feedback received **Protocol/Testing:** Presented and received feedback on prototypes for Sprint 1 and 2