CS-570 INTRODUCTION TO HUMAN-COMPUTER INTERACTION
SPRING 2018 | PROFESSOR LEWIS-WILLIAMS

PROJECT 2: MOBILE INTERFACES

LEVIN, SCHUETTE, LE

UW Bus App

PROJECT 2: MOBILE INTERFACES

INTRODUCTION

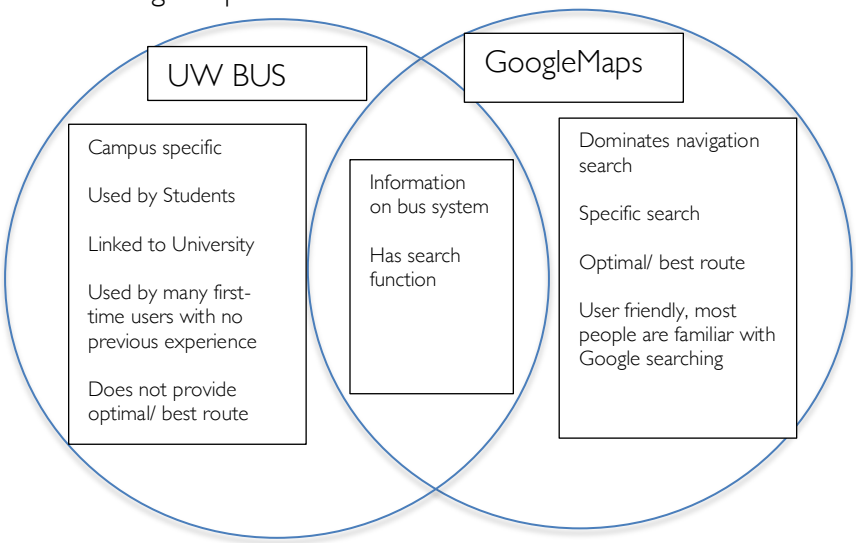
Many people in the Madison area use the public transportation system every day - relying on it to travel between home, school, work, and more. The student population is a large part of this demographic, made evident by ASM distributing free bus passes to all students. Many students don't have access to other forms of transportation, whether it be their own car or moped, or even a cab/Uber, so they spend their college years relying on the bus.

While students make up a large portion of bus-riders, the entire Madison community takes advantage of the extensive bus lines. People of all ages can be seen riding the bus at any given time, extending the need for a reliable bussing system. Currently, bus-riders have a few options for mobile resources with information about bus routes, schedules, and price. One is GoogleMaps' bus line feature, and the other is the UW-Madison app bus feature.

We presumed that the UW-Madison mobile app would offer features catered specifically to students, would be quick and easy to use, considering a large sector of their target audience are freshman navigating bus routes for the first time. We also assumed the app would provide information about delays, campus specific routes, and the ability to search a specific destination - but it offers none of these features. Currently, the app allows you to see bus stops near you, search specific bus stops by number, and view the entire bus line grid to select a route. There is also a "real time" feature that provides timely updates about arrivals.

Currently, the UW bus app competes with GoogleMaps, but lacks the specificity and customization that GoogleMaps offers. GoogleMaps dominates navigation search for many modes of transportation, including walking, driving, buses, trains, and cabs. GoogleMaps is equally as popular in each of those categories because of its easy-to-use interface and reliable results.

In order to identify the major issues and opportunities for improvement within the UW bus app, we analyzed strengths and weaknesses of the app in comparison to GoogleMaps.



After the comparison, we identified several problem areas and opportunities for improvement to focus on. We decided the app lacks personalization, user-friendliness, and real world application.

According to Nielson's 10 heuristics for design, we believe that the current search feature violates the heuristic in which users depend on applications to have real world context. In order to test this, as well as gather information from users about the improvements they wish to see implemented, we conducted a Cultural probe, user-performance modeling on CogTools, and several phases of prototyping to establish a new and improved bus app for students.

PROJECT 2: MOBILE INTERFACES

UNDERSTANDING

Before we started our study, we conducted a survey asking the participants why, where, and how often they take the bus, as well as where they get information about the bus and how they pay for it. Then, we sent an informational email telling them what to expect over the next 7 days, providing them with details about the surveys and our contact information for any questions or concerns.

Process

We sent one survey every morning by building an automated survey with Python and Twilio to send text messages and collect responses from participants asking how many times they expected to use the bus that day.

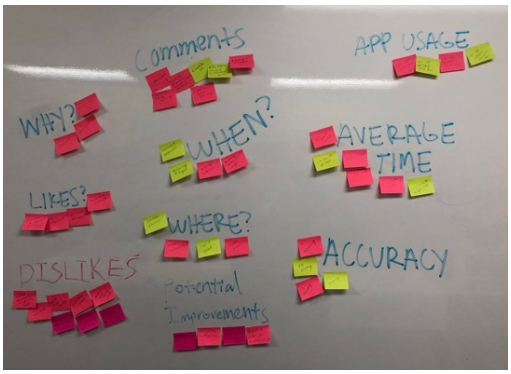
Every night we sent a more comprehensive survey through email to understand how they used the app. We asked how often they took the bus, how efficient the app was, and where and when they used the app. We also provided an open-ended response section for additional comments. We intended to use this personal data to determine how the app could be improved on an individual level.

We also sent a mid-week evaluation to keep the study on track and ask questions that arose after the first few days of data collection.

Finally, we used the final interview to ask the participants specific questions about their experience using the app. We received unique contributions from each person, but their overall feelings about the app were similar: it has helpful information, but it is confusing, inaccurate, and has a lot of room for improvement.

Analysis

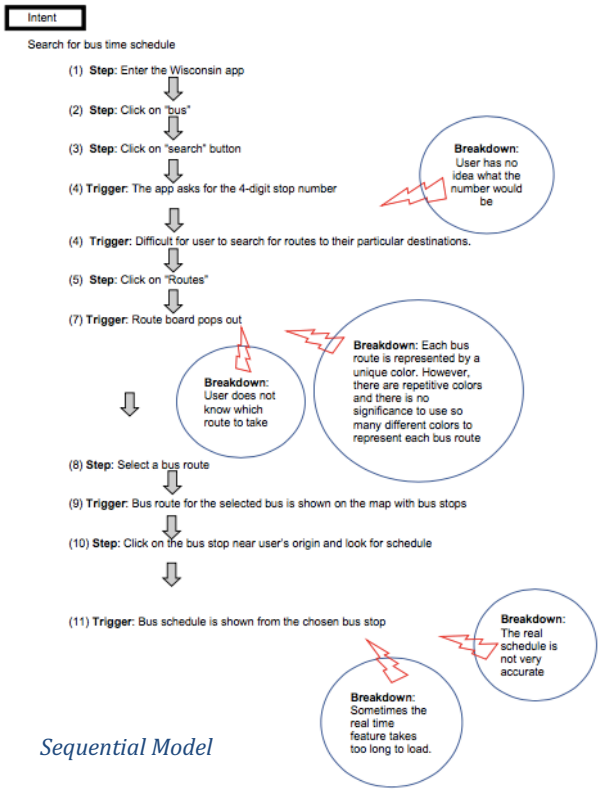
In order to analyze the data, we separated it individually and then compressed their data points into meaningful conclusions about the entire group.



We used an affinity diagram to analyze themes such as where, when, and why they use the bus, as well as how many times they use the bus each day, their overall accuracy rating of the bus schedule, and the potential improvements they recommended.

We concluded the app is difficult to navigate, not reliable, inaccurate, and frustrating because searching for a specific location is not supported in the app.

To address these findings, we built a sequential model to reveal the breakdown that occurred most often with our participants (search), and an artifact model to start analyze the most confusing visual features of the app. Based on our data and our models, we concluded that the app needs to be more university oriented: optimize the display to feature campus routes and bus stops, and allow the user to search a specific destination.



Sequential Model

PROJECT 2: MOBILE INTERFACES

IDEATION

Based on our cultural probe, we concluded that the current search function needs to be improved. Typically, a search function, especially when it comes to navigation, should allow users to type whatever their desired location may be. However, the current search function provides a text box that only accepts a 4-digit code of the desired bus stop. In the real world, users know their geographic location based on relative proximity to physical landmarks and readable street names. Thus, it is naive for the app to demand a bus stop code because users would only know these numbers if 1) they had previously looked it up or 2) if they were physically next to a bus sign. Overall, the current search feature is confusing, frustrating, and does not provide the expected results.

In order to make the search function more efficient and understandable, we redesigned it in two different ways. Design I maintains the current functionality, but instead of calling and labeling it as "search" we replaced it with a destination toggle (pin icon) often seen on apps like Yelp which represents precise locations. For Design 2, we kept the function as an arbitrary search, but completely overhauled the functionality to make the search process more similar to other navigation search functions.

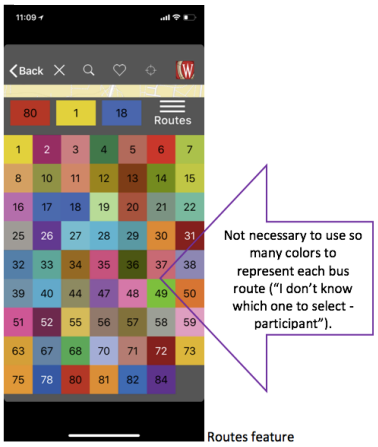
CogTools

In order to test both designs, we used CogTools to evaluate the overall efficiency and time required to find a bus route to the desired location. The completion time difference between the two designs:

Design 1	16.4 seconds	Not verified, unreliable, best case scenario
Design 2	12.7 seconds	Optimal route, shortest

CogTools not only helped us understand the efficiency of both designs, but helped us to eliminate processing time, minimize the number of total steps, and understand how different operators affect the user. In the end, we decided to pursue design 2 because it returns the closest and shortest route for user while design I requires further analysis from the user.

Artifact Model



Routes feature

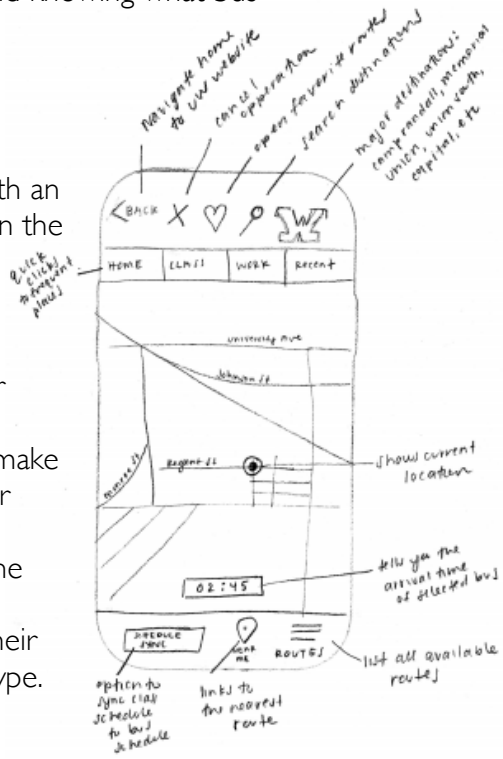
Design

Our design maintains a similar aesthetic to the original app, but eliminates several screens and navigations steps currently required by the search function.

This screen is from our artifact model, and shows the bus route selection page from the current app. Our participants complained that they have no idea how to navigate this page, and knowing what bus route to select is an essential part of the search function.

Our solution is to provide the users with an open-ended search in the form of a text box instead of the 4-digit code.

We provide the user with a text box, give them the option to make certain locations their "favorites," and then provide them with the most efficient search results by guessing their destination as they type.

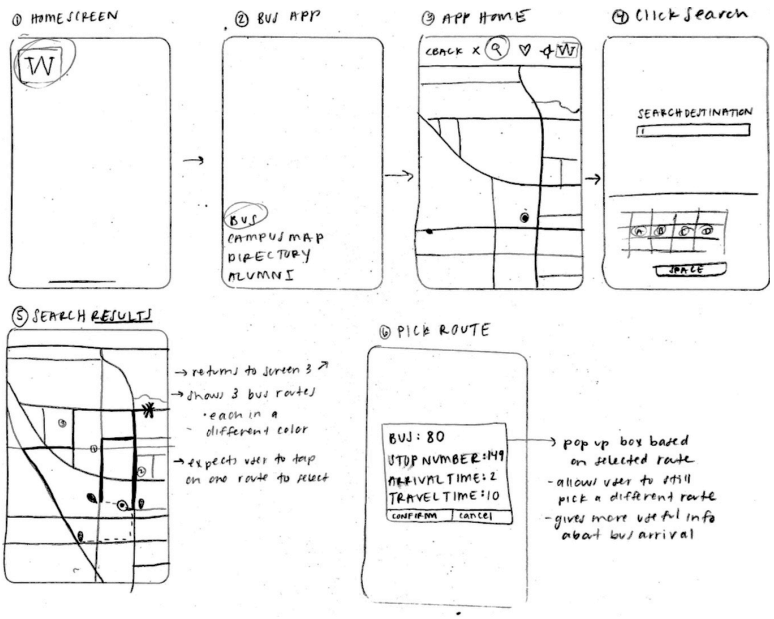


PROJECT 2: MOBILE INTERFACES

PROTOTYPING

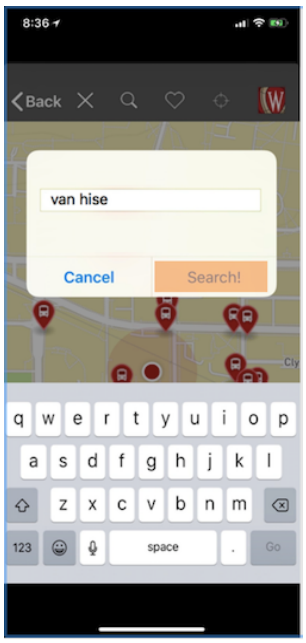
Our original prototype wireframe walks through the entire process, step by step, beginning at the home screen and resulting in a successful search.

This lo-fi prototype includes a search bar with open ended type box, and produces 3 different bus routes for the user to pick from connecting their current location to their desired destination. The final step of this prototype is when the user selects one of the 3 routes, and the app will tell you the address of the bus stop you need to get to and the approximate arrival time of the next bus.



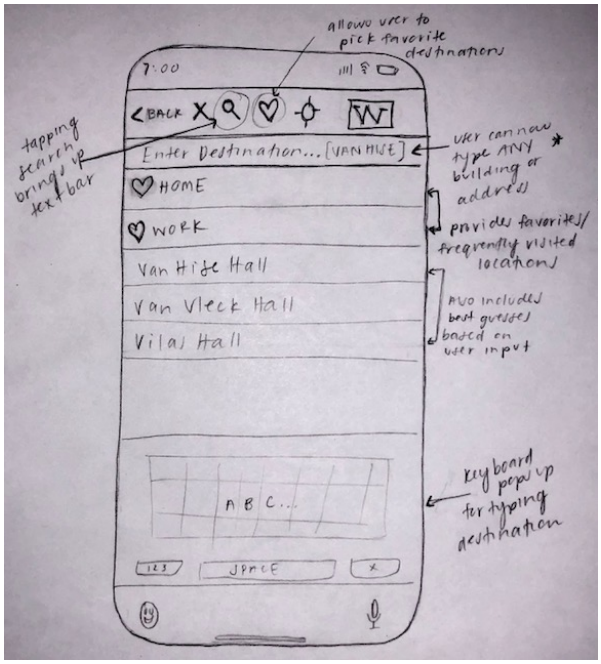
Before we moved forward in our design, we decided to focus on providing the best route rather than 3 routes to make the app more efficient, less time consuming, and require less effort from the user overall.

Our first attempt at a hi-fi prototype was simple to ensure it was functional, usable, and aesthetic. We provide an open-ended search and a single route to choose. This prototype supports simple search only.



After testing this prototype on CogTools, we decided to improve it even further by adding a "guessing" element. This is a feature that the participants of our cultural probe mentioned as an element of GoogleMaps that they appreciate – as they type, the search bar guesses their desired location based on the letters they've entered and other proximal and relevant options.

After going back to the drawing board for our new prototype, we were ready to implement it on Invision.



PROJECT 2: MOBILE INTERFACES

EVALUATION

Cultural Probe Evaluation

Overall, our experience using a cultural probe was great. Using automated text messages for surveys made the process easy, straightforward, and as non-invasive as possible. Sending the longer survey at night worked well because it allowed us to get more detailed answers as the interviewees reflected on their experiences with the app and the bus throughout the entire day. We were very satisfied with the overall participation as none of our participants dropped out; we sent them gentle reminders when we noticed their answers were more delayed than usual to keep them on track. Overall, the answers they provided were what we expected to hear, and helped us brainstorm ideas for improvement. We are satisfied with the conclusions we drew from the data, and excited about our plans for redesign.

CogTools Evaluation

User performance modeling gave us a new perspective on building and testing interfaces. It forced us to think quantitatively about the designs we produced, whether it was the number of taps needed to complete a task or the total time to complete a task.

We learned that quantifiable results can provide more indisputable, objective evidence to aid the decision-making process when choosing between multiple design proposals. Yet this process doesn't guarantee one design to be better than another, as user-preferences is equally important. Since keystroke-level modeling doesn't account for user preferences, we see this methodology to be beneficial only under particular circumstances. For tasks that involve substantial navigation, searching for specific information, or anything that requires pre-determined knowledge, keystroke-level modeling can be applied to compare designs in a numeric, objective manner. But for open-ended tasks, like scrolling through Instagram or hopping around news articles, keystroke-level modeling fails to provide meaningful information.

Additionally, we learned that it may have been beneficial to consider the best-case, average-case, and worst-case scenarios when running our scripts. For example, in our second design the user has complete freedom to search whatever they want. In the worst case, their search may be longer than 15 characters. But in the best case, they may only need to type 2 or 3 characters. In our first design, we present the user with the 3 nearest bus stops, and leave it to them to investigate which one will suit their needs. In this instance, the best-case scenario would be if the user selected the correct choice on their first try, but the worst case may need 3 (or possibly even more) attempts. Beyond this, at no point in the script-writing process did we account for differences in users (i.e. it can be hard to tell if we are setting the correct think-time, and there may also be unaccounted correlations like elderly users who take longer to think could also be using legacy machines with substantially longer system response times). The lesson here is that thinking quantitatively can be advantageous for a plethora of reasons, but the results should be interpreted with caution.

Ultimately, we found this experience to be worthwhile. For designers and engineers alike, we can add another perspective to our arsenal of decision-making tools. Using this software made us think critically about every step, and allowed us to eliminate unnecessary steps before we finalized the design. As we created each new screen for navigation, we changed the design several times to make the process follow Nielson's heuristics more closely.

Prototyping

Prototyping was important to the development of our final product because each prototype we made helped us identify additional features that could be improved. Several times we started our hi-fi prototype, realized it was lacking specific elements that we desired, so we stopped, went back to the drawing board and began again with lo-fi prototype. This process was not linear, but helped us to ensure that we ended up with the ideal solution.

PROJECT 2: MOBILE INTERFACES

FINAL SOLUTION

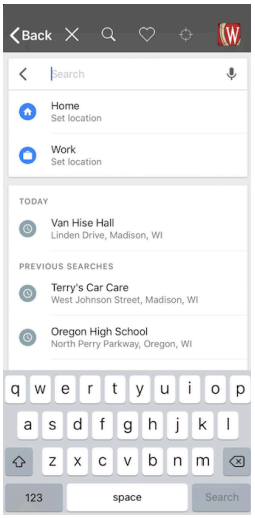
We used Invision to implement our final solution. To begin working on our final prototype we focused on the search feature, implementing the "guess" location, and making search resemble other navigation searches.

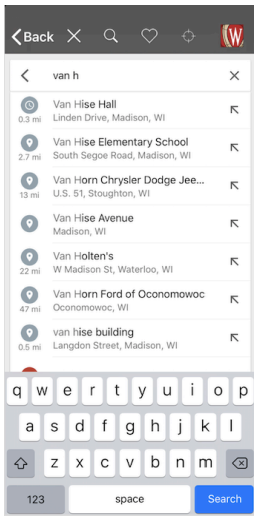
Based on the competition of GoogleMaps and the frustration expressed from our participants, unlimited and optimized search became our design priority.

The scenario we focused on was a freshman navigating the bus routes, schedule, and app for the first time. The student is nervous about taking the right bus, minimizing the wait time, and always being aware of where he is and where he is going so that nobody thinks he is a clueless freshman!

The way we created our designs suits his needs exactly. A panicked freshman (or even an expert bus riding senior) can open the app and find the shortest bus route at the nearest bus stop by simply typing the destination into the search bar.

Our final design incorporates features from every stage of prototyping – revealing how the process influenced the solution. Our initial goal of making the app specific to the University (suggesting specific academic buildings and popular student locations as a result of search) ultimately violates what the user expects, which is listing the most relevant results by proximity.



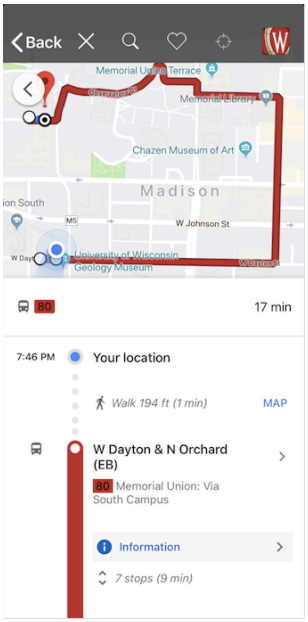


Having unlimited search with results similar to other navigation searches such as GoogleMaps, Apple Maps, and Waze allows the UW bus app to have real world application, breaking down initial barriers of confusion for first time users.

Another feature we implemented was "suggested places" based on recency and frequency. When the user starts typing into the search bar, a list of recently and frequently visited places will appear to save time for users who often use to bus between the same locations.

The app will also give the user the option to set "favorite" locations such as home or work, which would appear at the top of their search results for quick and easy navigation.

Finally, the app produces an aesthetically pleasing and easy to understand screen: the best bus route to your desired destination and the location of the nearest bus stop.



We believe this solution not only satisfies the needs of the target audience, but surpasses GoogleMaps as the best navigation app for students.