The Peerspun Project
System prototype and evaluation plan

1. Design Choice Criteria

SpinPointAR was the design choice we found to provide the best opportunity to develop a system of sufficient scope and complexity, compared to the other options we had developed. Of our 3 design alternatives from part 2, this option encompasses the navigation component of GoGlow, as well as the interactive decision making interface from StepStop. The actual interface is much more complex than GoGlow, allowing greater potential for creativity in design as well as utility for users. Because it is a mobile application, and can be used on practically any mobile device, users will not be hindered by the constraints of a static, non-customizable bus stop-based interface. Ideally, the three options could be used together within the same transit decision system. Since SpinPointAR encompassed the most features, flexibility, and potential for design challenges, we found this to be the best, most interesting choice to base the expanded and refined system upon. The evolved system has taken on the name PeerSpot.

2. PeerSpot: Features & Functionality

2.1. Feature List

Borrowing ideas from feedback and suggestions from the poster session and strong points of all three concepts, it was decided that the following features would be added to the system at the end of the fourth design meeting.

1. Transit option Suggestion
2. Navigation sytem, walkable routes
3. Trolley Occupancy
4. ViaCycle location and availability
5. Accessibility- voice search
6. Weather Data   In Prototype version 2
7. Show/Hide Layers
8. Add new paths   In Prototype version 2
9. Distance / Time to destination
10. Switch 2D & 3D modes
11. Slow movement Alert   In Prototype version 2
12. Last searched destination
13. Favorite destinations
14. Unlock viaCycle from within the app
15. Track this bus

2.2. User Interface

The interface of the PeerSpot transit decision system consists of a viewport through which a user sees the landscape overlaid with markers detailing the various transit options available. 80/20 rule was followed while designing for the on-screen controls in this augmented reality smartphone application. The most used functionalities were kept most accessible (highest in the keystroke level model), whereas less frequent functions were kept a level down.

On screen controls include:

- Interactive search button (voice and type)

- Favorites

- 2D/3D Toggle switch

- Slider Menu with layers (Trolley, Stinger, Walk & Cycle) and Application settings
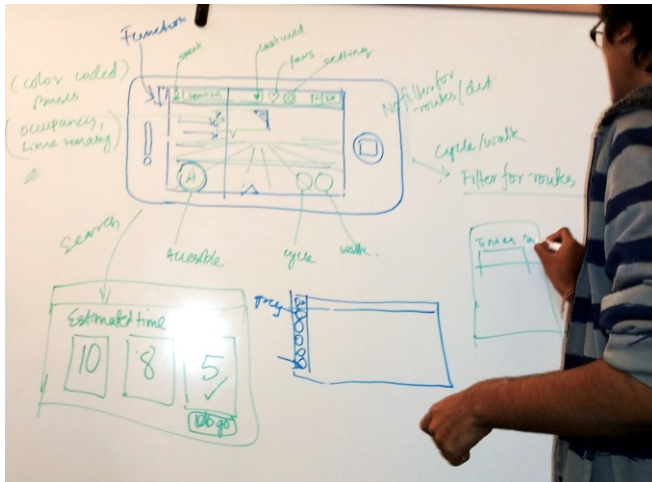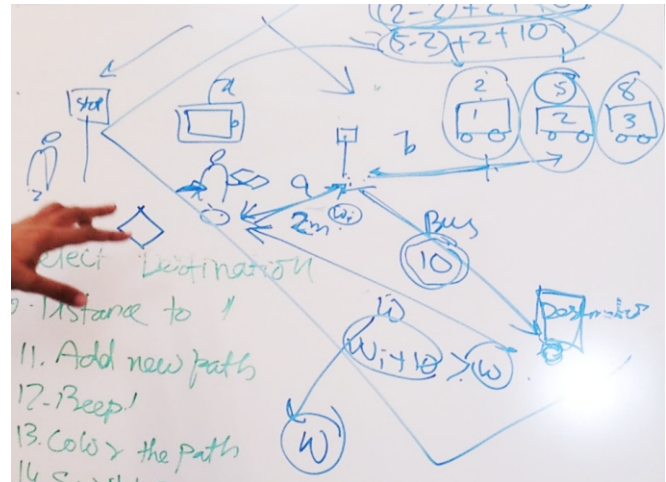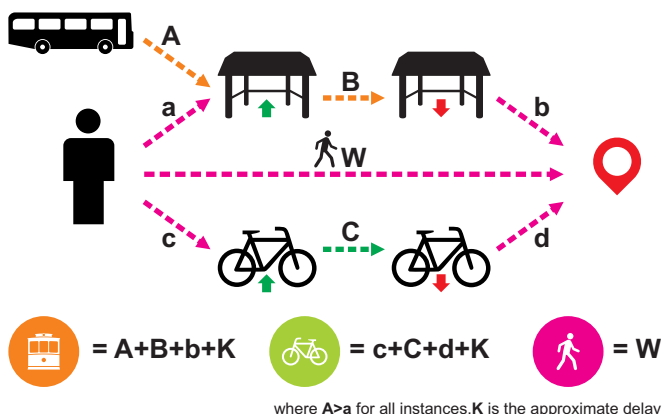
2.3. System Functionality

The system is designed to remove clutter from implementation models and appear closer to user mental model. Few functionalities that ensure this are:

1. The system recognizes voice input and maps it first to the names in the favorites list and then to the most common places on the campus map, followed by the rest.
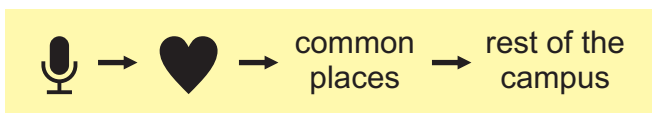
2. The app dynamically asks if the favorited destination needs to have a short voice preset attached to it.

3. For a destination searched, the system calculates the transit time based on the current location of the user. The final time displayed for each option is inclusive of delays, walking time to the bus stop, or pick-up/drop-off of viaCycle. This is explained in the figure below.

$= A+B+b+K$ $= c+C+d+K$ $= W$

where **A>a** for all instances, **K** is the approximate delay

4. Autosuggest functionality was added to so that the system can hint at the most probable destination from a list of most used and prominent destinations.

5. Turning layers on/off in the slide panel dynamically changes overlays on the viewport. However, users could track buses by pinning them onto the viewport. This functionality is independent of the layer activity.

6. The app could access and send messages to unlock ViaCycle for users looking forward to taking the transit option. This saves time and effort.

2.4. Usability Criteria

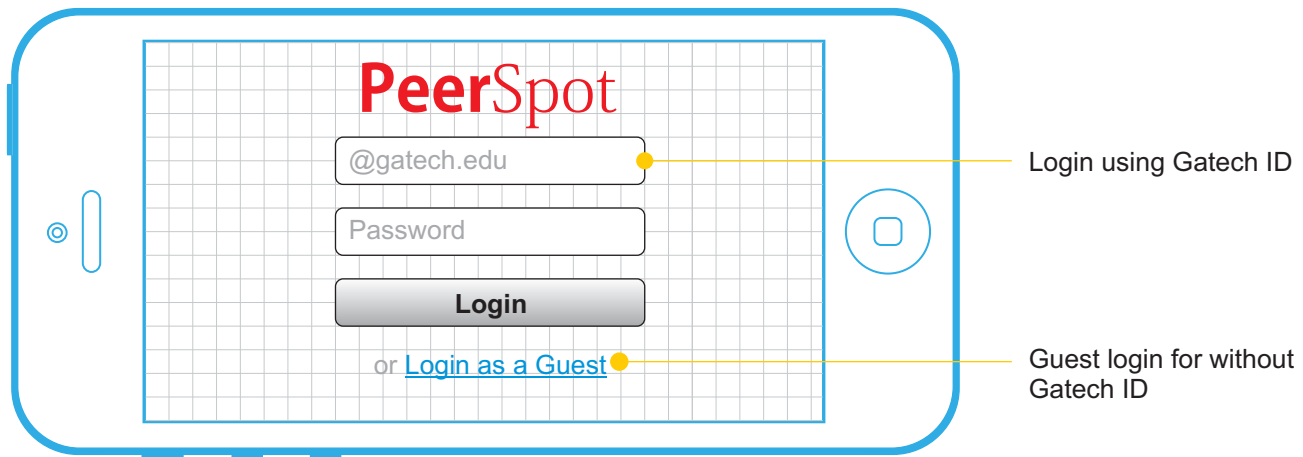The following criteria were taken into consideration while making the wireframes for the app:

1. Time: Number of keystrokes were calculated for all functions and reduced to a minimum.

2. Visibility: Icons and fonts were made prominent and visible.

3. Feedback: Ample feedback was ensured with dialog boxes, alerts, prompts and audio response.

4. Other criteria includes efficiency, effectiveness, learnability, memorabiltiy and error correction.

2.5. Development

Development was made considering the iPhone 5 in mind. Initial low fidelity wireframes were sketched on paper and then transferred to CorelDRAW as high fidelity wireframes. Number of prototyping iterations were made in proto.io, JustInMind Prototyper and Jquery mobile before the final prototype was made with Wikitude API and HTML5/CSS3.
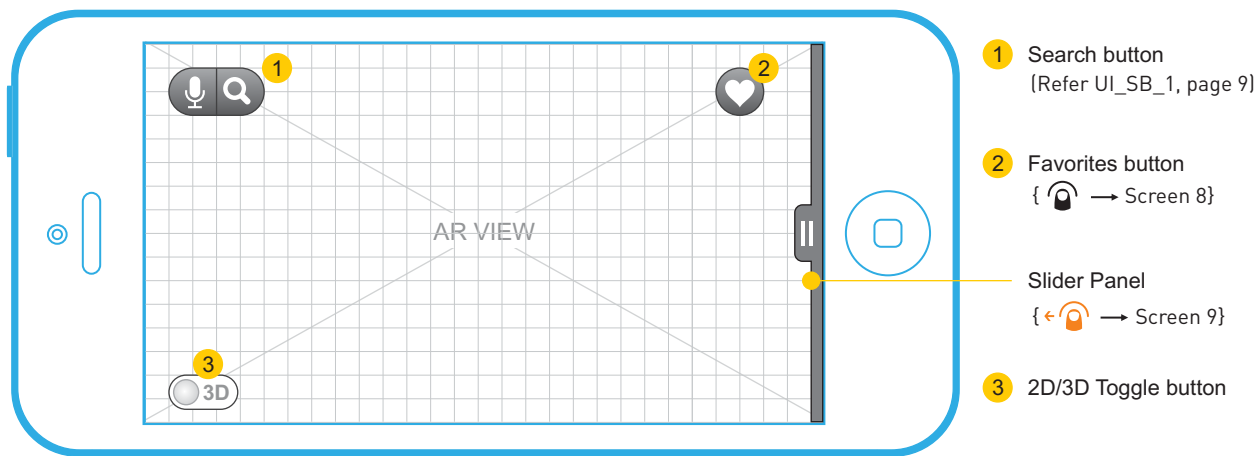
3. PeerSpot Wireframes

Screen 1: **Login Screen**

PeerSpot

@gatech.edu ——————— Login using Gatech ID

Password

Login

or Login as a Guest ——————— Guest login for without Gatech ID

- When search terms are input by text or voice entry, the resulting drop-down listing of location presets provides the option to set as favorite and record a voice preset to select the destination at a future time. These preset functions are only available to be saved for a later date if the user is logged in, using the dialog shown in Screen 1.

Screen 2: **Home Screen / Landing Page**

AR VIEW

3D

1 Search button
(Refer UI_SB_1, page 9)

2 Favorites button
{ 🔒 → Screen 8}
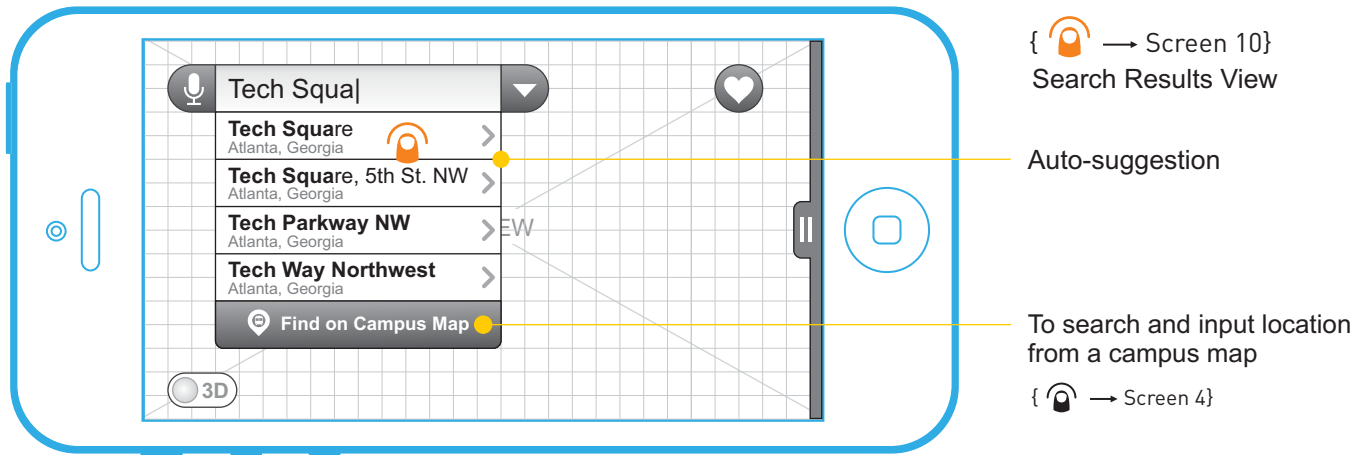
Slider Panel
{← 🔒 → Screen 9}

3 2D/3D Toggle button

- **AR VIEW:** The three closest buses and the closest Viacycle stations are shown as tooltips, along with the default UI, overlaying the camera view.

- No information is presented regarding a 'walk' option until a destination is entered.

- In the top-left corner of the device screen, the voice & text search functions may be accessed. When the mic icon is pressed, the voice search dialog box pops up. When the magnifying glass icon is pressed, the text search bar slides to the right and the icon changes to a drop-down arrow.

- Slider panel hides the layers option and the application settings button. It slides out to the left on left swipe.

Screen 3: **Type to Search**

{ 🔒 → Screen 10}
Search Results View

Auto-suggestion

To search and input location
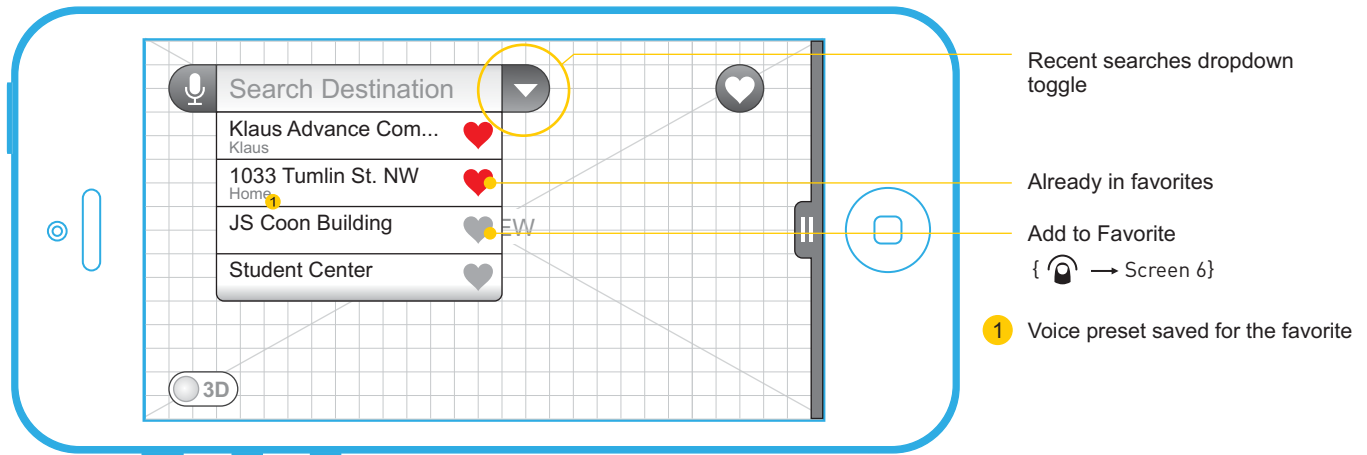from a campus map

{ 🔓 → Screen 4}

- Selection of a drop-down menu box results in appearance of cursor indicating that text may be entered.

- On typing, **Auto-suggest** lists possible destinations in order of relevance.

- In the case where the user may not know the exact name, or drop-down results do not contain the destination, the user can select the option, "Find on Campus Map." (refer Screen 4)
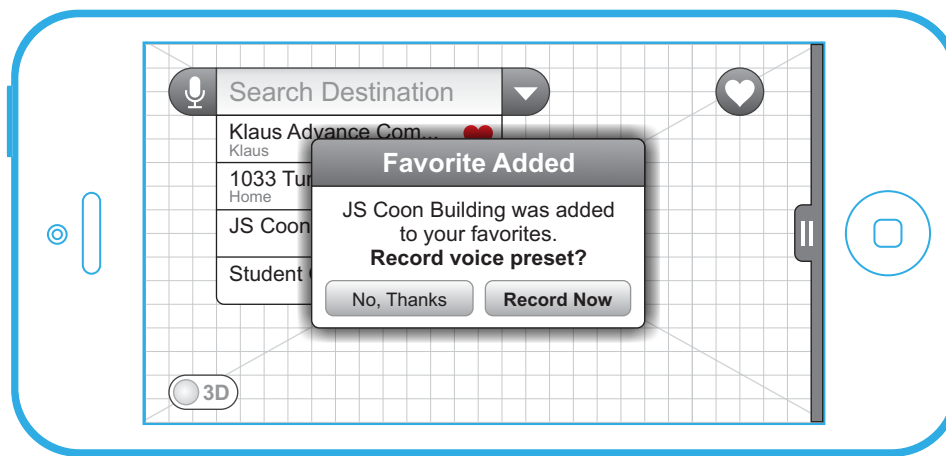
Screen 4: **Destination Selection by map**
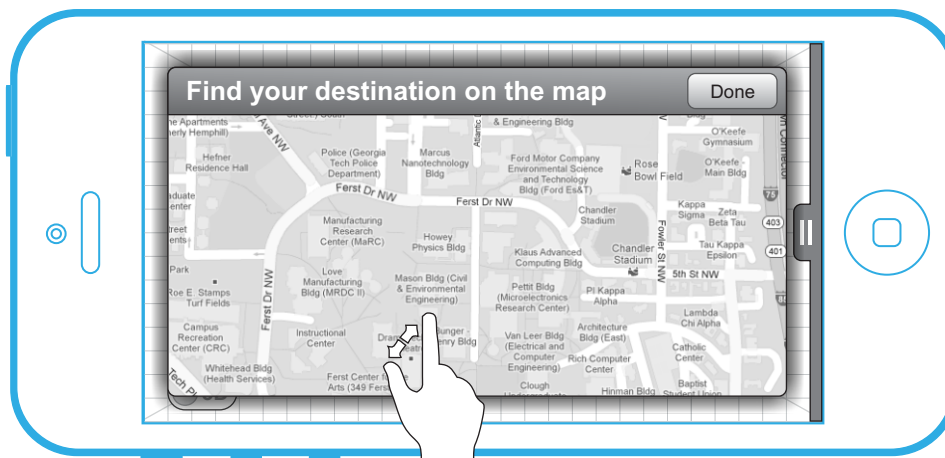
- The map follows default touch screen interactions such as pinch&spread to zoom in&out, and tap-and-hold to drop pin (select location).

Screen 5: **Recently searched places**

Recent searches dropdown toggle

Already in favorites

Add to Favorite
{ 🎧 → Screen 6}

1 Voice preset saved for the favorite

- On tapping the dropdown button, a list of recently searched places is displayed.

- Places favorited have an 'active' heart icon in front.

- Favorited places with voice presets have transcribed text written below them.

- Destinations not favorites yet, have an 'inactive' heart icon in front.

- Long tapping the inactive heart icon adds the corresponding destination to favorites. (refer to Screen 6)

Screen 6: **Confirmation / Save preset dialog**

Favorite Added

JS Coon Building was added to your favorites.
Record voice preset?

No, Thanks   Record Now

- A dialog box pops up confirming that favorite has been added. It also asks if the user wants to record a voice preset for the favorite destination.

- 'No, Thanks': To exit without saving a voice preset for the favorite.

- 'Record Now' allows users to record preset.

Screen 7: **Voice Search**
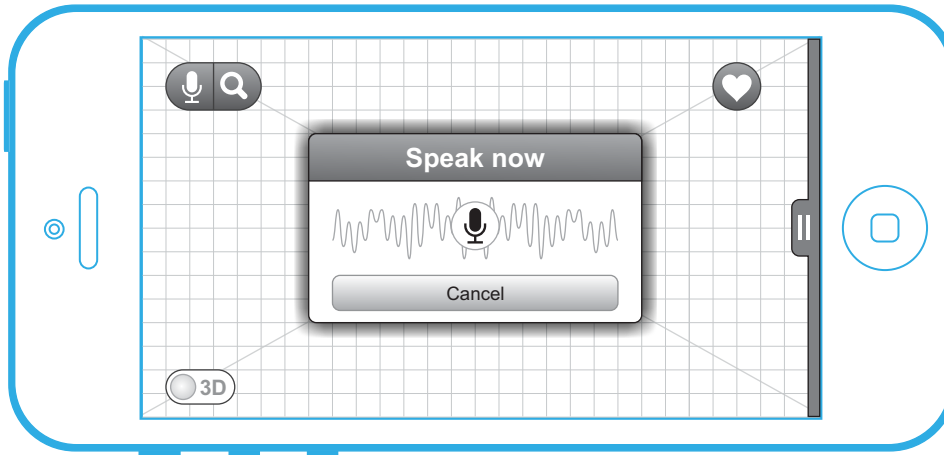
- On tapping the mic button, a dialog box pops out accompanied by a voice saying 'Speak your Destination'.

- The function can be cancelled anytime to go back to the last screen.

Screen 8: **Favorites**
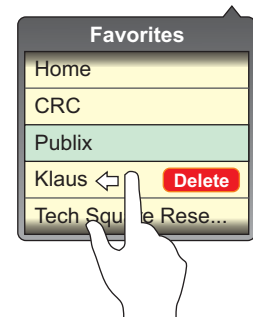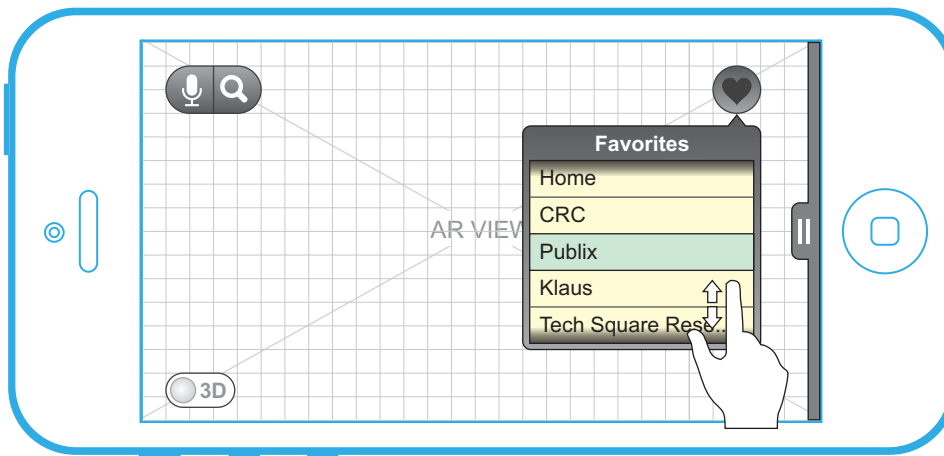
- Scrollable drop-down menu appears when favorite (heart) icon is pressed.

- Favorites with or without voice presets are shown in the list.

- Touch and hold to add or edit voice presets to an existing favorite.

- Left swipe reveals the delete button.

Screen 9: **Slider Panel**
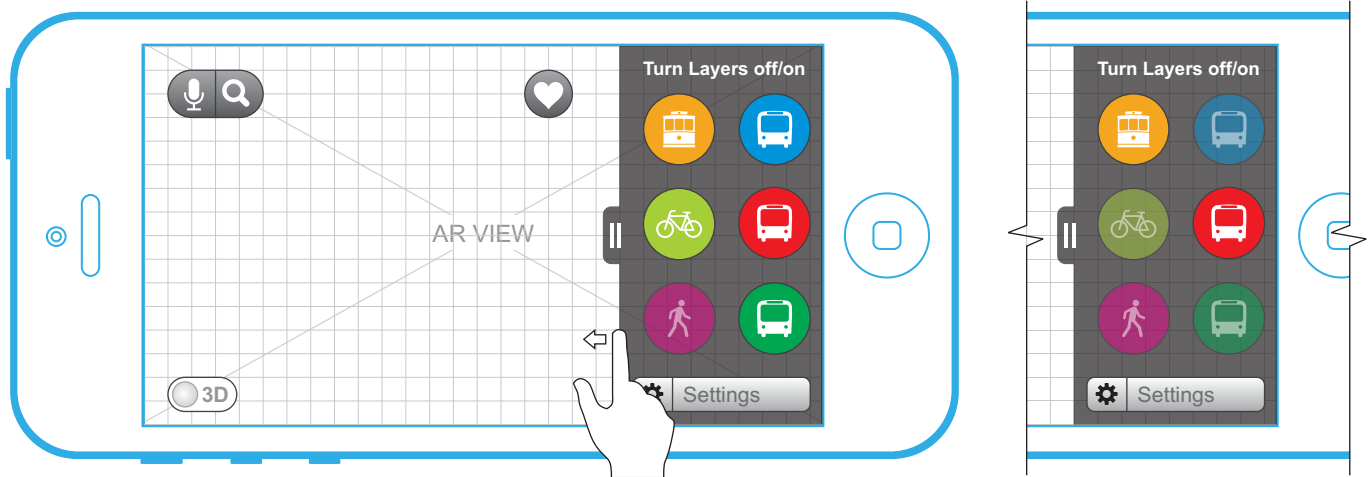
- Slider panel provides all transit options as toggle buttons, used to display or hide (when greyed-out) individual transit option layers in the AR View.
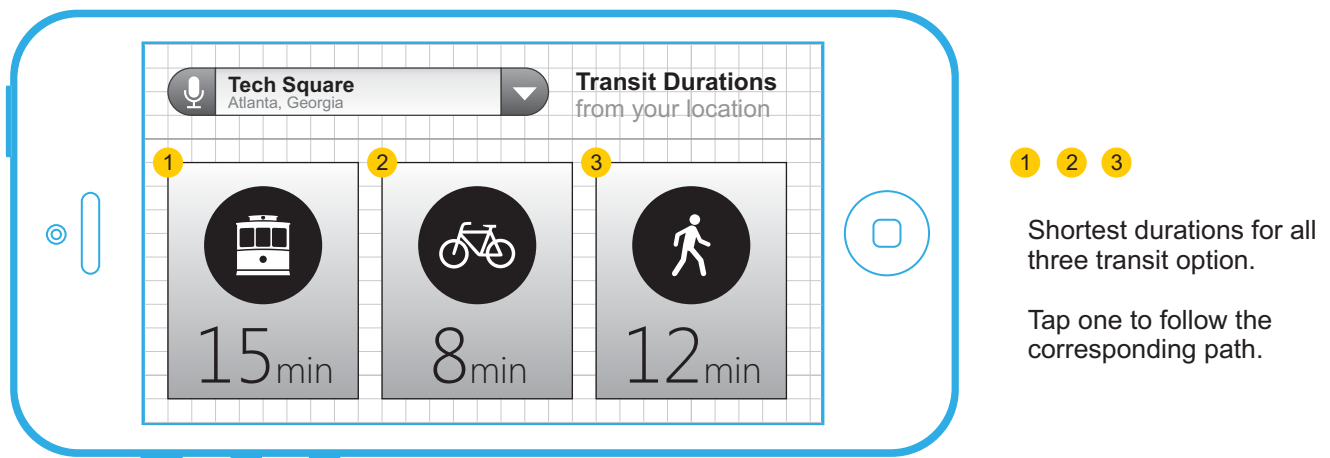
ON   OFF

- The 'walk' option at lower left becomes accessible once a destination is entered.
- App settings are accessible through settings button.

Trolley   viaCycle   Walking   Red Bus   Green Bus   Blue Bus

Screen 10: **Search Results View**

Tech Square Atlanta, Georgia

Transit Durations from your location

1 15min   2 8min   3 12min

1 2 3

Shortest durations for all three transit option.

Tap one to follow the corresponding path.

- Upon selection of a destination, the transit durations for each active transit type that has been selected are displayed.

- From the possible bus/trolley option types, the bus route that best coincides with the fastest route to the user destination is automatically selected.

- The closest three buses (heading in the correct direction) are displayed by default, with the rest hidden.

- The user may then press one option to select, which will display the route overlaid on the 3D view (Screen 11) or 2D map (Screen 12).

Screen 11: **Augmented Reality View**

Destination Marker

ViaCycle Locator Tooltip
(Refer TT_VC_1, Page 10)

Direction and Distance Pointer
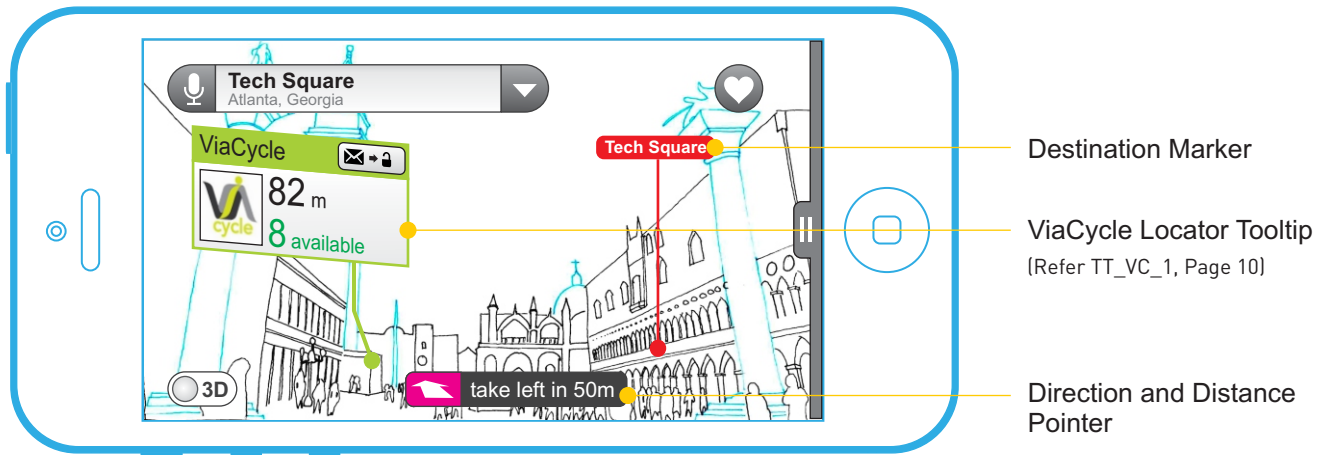
- The screen showing the view from the current location is overlaid with AR VIEW Components indicating locations and transit option details.

- The next immediate step on the users route is indicated at bottom.

The only major roadblock encountered in the prototype development process was creation of tool tip overlays that accurately correspond to view screen information. We have accessed numerous prototyping tools, but are still working to refine this aspect of the system.

Screen 12: **2D Map View**

ViaCycle Drop off

Time in the current leg of transit

Direction and Distance Pointer
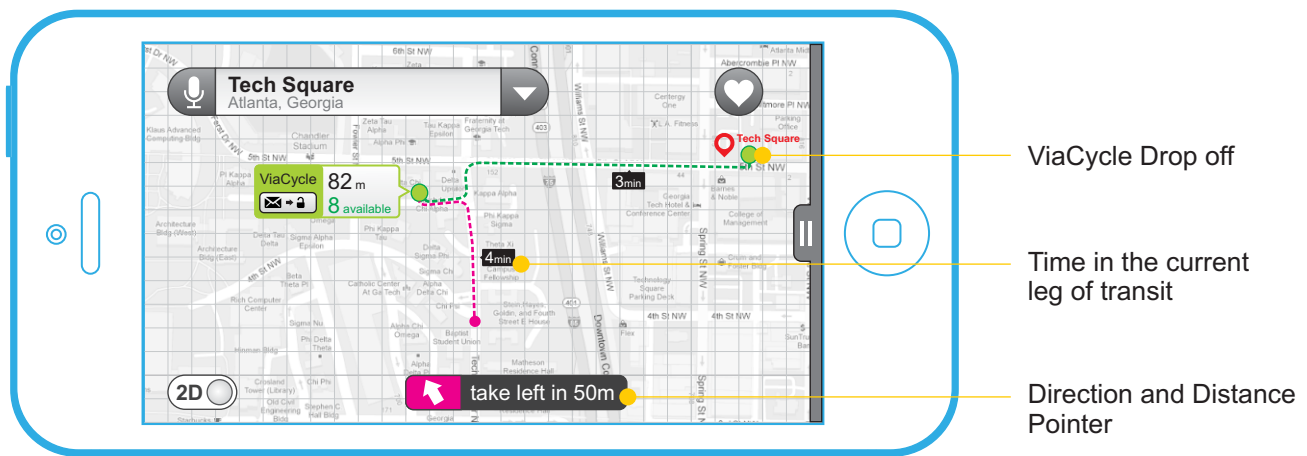
- The paths the user must take between each transit option are displayed on screen, with each path indicated by a dotted line of a color associated with that transit option type.

- This overview includes the AR VIEW Components indicating locations and transit option details .

- The next immediate step on the user's route is indicated at bottom.

4. UI Components

4.1. Search Button (UI_SB_1)

start

Speak now

Cancel

exit
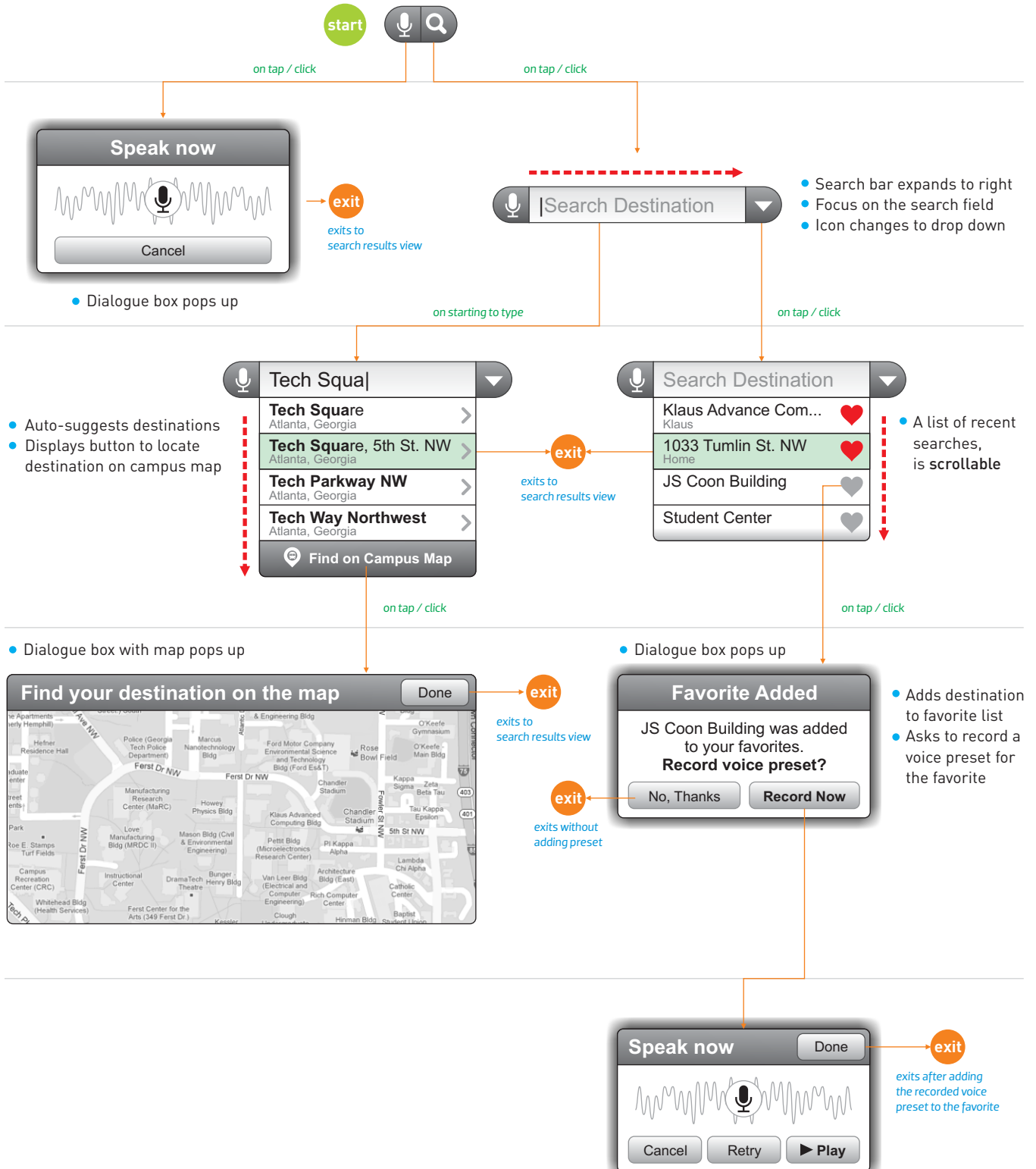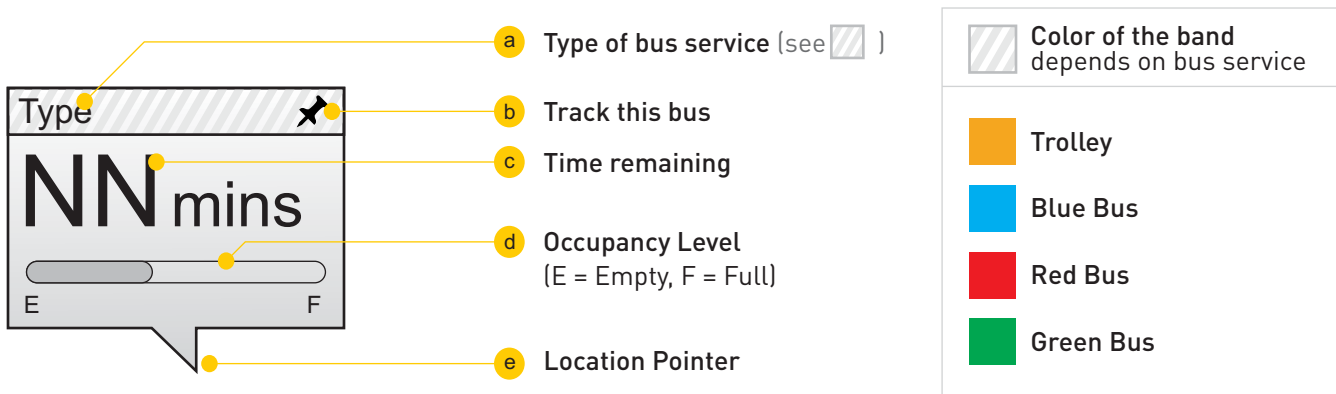*exits to search results view*

- Dialogue box pops up

|Search Destination

- Search bar expands to right
- Focus on the search field
- Icon changes to drop down

on tap / click

on tap / click

on starting to type

on tap / click

Tech Squa|

Tech Square
Atlanta, Georgia

Tech Square, 5th St. NW
Atlanta, Georgia

Tech Parkway NW
Atlanta, Georgia

Tech Way Northwest
Atlanta, Georgia

📍 **Find on Campus Map**

- Auto-suggests destinations
- Displays button to locate destination on campus map

exit
exits to search results view

Search Destination

Klaus Advance Com...
Klaus

1033 Tumlin St. NW
Home

JS Coon Building

Student Center

- A list of recent searches, is **scrollable**

on tap / click

on tap / click

- Dialogue box with map pops up

Find your destination on the map Done

exit
exits to search results view

- Dialogue box pops up

Favorite Added

JS Coon Building was added to your favorites.
Record voice preset?

No, Thanks   Record Now

exit
exits without adding preset

- Adds destination to favorite list
- Asks to record a voice preset for the favorite

Speak now   Done

Cancel   Retry   ▶ Play

exit
exits after adding the recorded voice preset to the favorite

4. UI Components

4.2. Bus locator tooltip (TT_BL_1)

a   **Type of bus service** (see [////])

b   **Track this bus**

c   **Time remaining**

d   **Occupancy Level**
(E = Empty, F = Full)

e   **Location Pointer**

[////]	**Color of the band** depends on bus service
🟧	**Trolley**
🟦	**Blue Bus**
🟥	**Red Bus**
🟩	**Green Bus**

- Bus tooltips provide information about each individual bus. Type of bus service is indicated by color bar at top, time in minutes until arrival is displayed at the middle, and the occupancy of the bus is indicated by a bar at bottom.

- Selection of the pushpin icon at top right provides an opportunity to attach the individual bus to the transit view while interacting with other functions.

4.3. ViaCycle locator tooltip (TT_VC_1)

a   **Send message to unlock cycle**

b   **Distance to ViaCycle stop**

c   **Cycle Availability**

d   **Location Pointer**
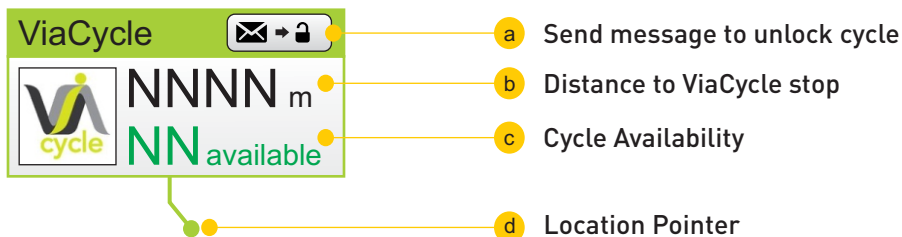
- The ViaCycle tooltip provides information about each ViaCycle station.

- Selection of the 'message unlock' icon at top right provides an opportunity to claim and gain access to the bicycle prior to arrival at the ViaCycle stand.

- Distance to the desired ViaCycle station is displayed at the middle (in meters or feet, potentially adjustable in settings), and the availability of bicycles is provided at bottom.

5. Scenarios

5.1. Trek by Trolley

Brendan has just finished a workout at the CRC and has no interest in further exertion. He's decided he's taking a trolley or bus to his apartment (at North Ave) tonight, so he would just like to know which is closest and likely to get him there fastest, in order to give his girlfriend a head's-up as to when he'll be home.

Brandon removes his phone and kicks in the app. He logs in with his buzzport credentials.

He is already happy with the nice AR view.

He directly goes to his presets and selects home which saves him the hassle of typing or entering the destination.

Brendan selects home from his favorites list. In the suggestion page, he chooses buses. He waits for the next trolley arriving in 3 minutes & in the mean time texts his girlfriend that he would be home in 13 minutes.
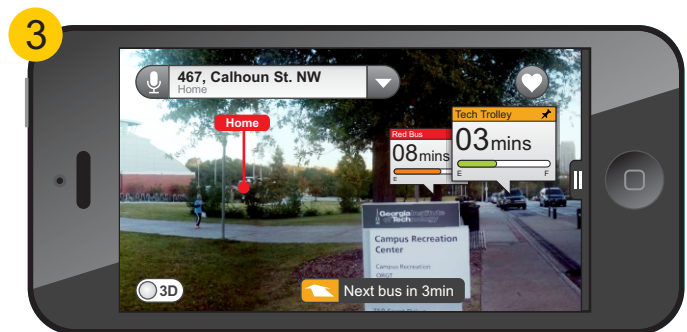
His past experiences suggest he can trust the system to calculate the time accurately so he can inform his girlfriend exactly when he is going to come home.

The cool AR view appeals to the tech side of Brandon and he finds the app damn cool and easy.

5.2. Way to Walk

Jana, a first-year grad student, wants to make her way to meet a friend for lunch at the student center. Its a lovely day and she would like to walk, but isn't yet familiar with the campus, so she'd prefer to have an idea of the quickest path there from the TSRB.
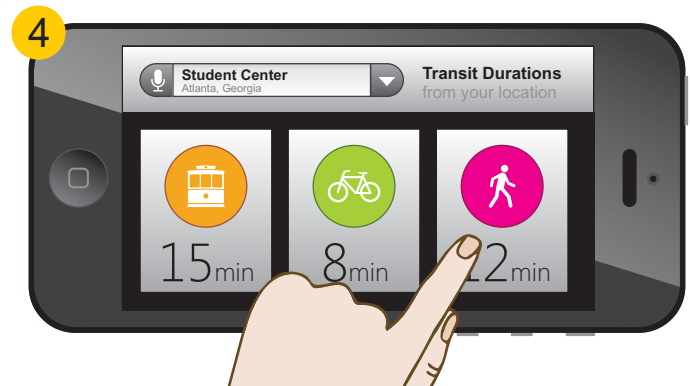

Find your destination on the map

The app intuitively calculates all the best possible routes for the various transit options and displays them for Jana.
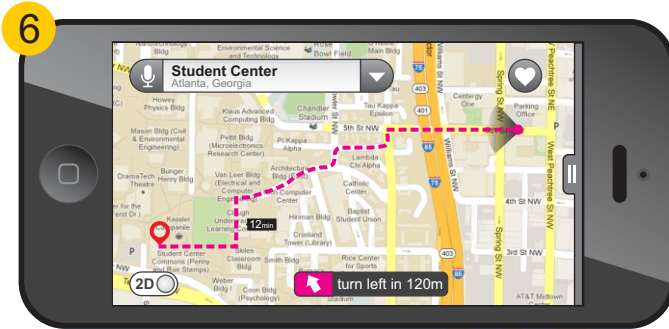

Student Center
Atlanta, Georgia

Transit Durations
from your location

15min   8min   12min

Since Jana would like to walk, she immediately selects that option to get the walking directions.

Jana whips out her phone and switches on the app. She sees the available buses but would rather walk.

She selects the 'Find on Campus Map ' option to and selects Student Center as her destination.

Student Center
Atlanta Georgia

Student Center

turn left in 120m

The app then provides AR navigation by suggesting walking routes based in arrows overlaid on the camera.

The toggle switch at the bottom enables Jenna to switch to 2D view to get a better perspective of the entire route if required.

Student Cente|

Student Center Parking
Atlanta, Georgia
Presbyterian Student C...
Atlanta, Georgia
Student Center Comm...
Atlanta, Georgia
Student Commons Par...
Atlanta, Georgia

Find on Campus

3D

Red Route
3mins

This is also useful if she doesn't want to pan her phone during the entire journey.

Jana reaches her destination and gets to enjoy the lovely walk. She doesn't have to spend the entire journey asking people for directions and reaches her destination on time for lunch, thanks to PeerSpot.

5.3. Fast Favorites

Lee is a PhD student who has very little time and likes to make use of every minute. He has a routine down, and is used to being able to rely on the PeerSpot system to get where he needs to be, using as fast a transit method possible. Today, his schedule is packed, so he would like to see whether he can rely on his Favorite locations to navigate to the Barnes & Noble at Tech Square, then to the Molecular Sci & Engr Building to pick up exams to grade, then back to Coon building (where his office is located) during his lunch hour.

He's familiar with all the transit options and is a regular user of ViaCycle, so he already has an account set-up for access.
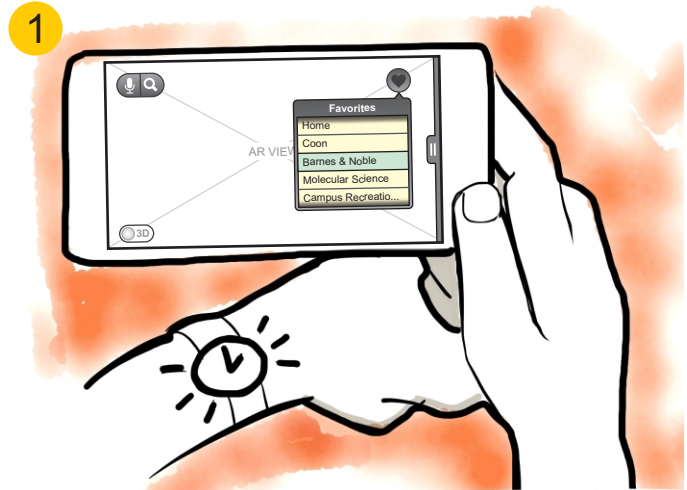
Lee switches on the app and directly accesses his favorites. The system applies the algorithm at the backend and returns his best options, ViaCycle being the quickest one. Lee has come to trust the system and takes the suggestion.
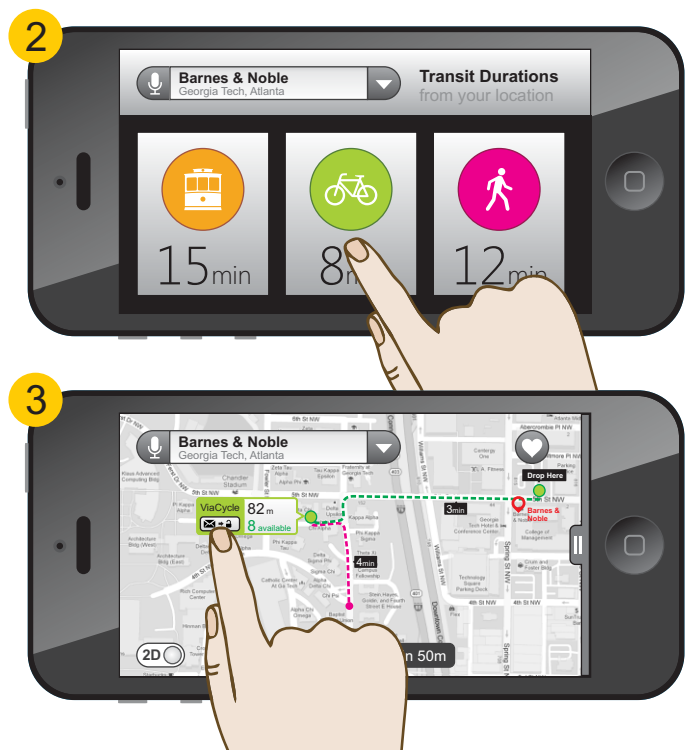
Lee runs to the nearest viaCycle station. He sends a message from the app itself to unlock a bike. He takes the bike to complete all his chores in one go!

Lee finishes all his work in half an hour. He can now spend that extra time doing meaningful research rather than worrying about transit, thanks to PeerSpot

6. Usability Criteria for Evaluation

- The user must be able to accomplish their ultimate goal without substantial roadblocks or challenges

- The user must be able to successfully complete a series of navigation tasks and subtasks culminating in the determination of the quickest available route using desired transit method

- They must be able to quickly recognize the means to attain that goal, which should be visible on the initial screen.

- The user must be able to quickly determine the process necessary to achieve goals by either of two main methods:
  a. When looking for the closest available trolley/viacycle
  b. When looking for the fastest means to get to their destination

- The time it takes to find and figure out functionality that is not on first screen, should be minimal

- The time it takes to switch between functionality, should be minimal (e.g: switching from trolley mode to fastest route available)

- The time it takes to enter a search, and select destination should be no more than 20 seconds (8-10 secs x 2)

- The time it takes to create or modify a favorite location should be no more than 10 seconds

- Standards for functions should maintain that no operation should require more than 8-10 seconds to perform, once the user has had sufficient training in the task procedure. For most functions, the interaction with the device's system should be based on widely used standards for touch screen interfaces. So, few (no more than 3) errors should be expected to occur for most tasks.

7. Initial Evaluation Plan

7.1. Objective

Through use of the PeerSpot system participants will be able to successfully gain information regarding the quickest routes and transit options to make the best decision as to which to depend upon.

7.2. Process

Prototype evaluation participants will be run through a series of tasks that represent the most commonly used functions of the system. The potential participant pool is composed of Georgia Tech students recruited by word of mouth. The time frame of each evaluation will consist of two parts. First, a cognitive walkthrough of the system will be the first means of participant evaluation of the prototype interface. Once complete, a post-walkthrough interview should provide qualitative details regarding user perception of prototype functionality. Evaluation with each participant should take no longer than 2 hours, with breaks taken as necessary.

One group member will act as moderator during the evaluation, directing participants to commence with tasks, and asking questions when necessary. This member will speak with the participants about the consent process and be sure to present the consent form, asking the participant to sign, and informing them of their right to quit the study at any time. The remaining group members will take notes as to the system state, the actions and feedback from the participant, and any other extraneous information about the system, environment or circumstances. Both roles can be performed by all group members throughout the study.

7.3. Benchmark Evaluations

Action/Function Use Tasks:

1. Find the correct destination location using text search field

2. Add the last searched place to favorites

3. Find the correct destination location using

the voice search function

4. Add a voice preset to a favorite

5. Find the correct destination location using the campus map

6. Select desired transit options (change layers in sliding toggle button menu)

   6b. Find the layer slider in the right side

7. Compare all options to determine quickest transit time

8. Successfully use the ViaCycle option

9. View route in 3D view and full path in 2D map (change between 3D and 2D views)

10. Customize settings

Perception Tasks

11. Differentiate between walking, cycling and trolley when each option makes up a portion of the route

Throughout each of these tasks, the ability of the users to successfully reach the specified goal will be observed, with any challenges or helpful insights recorded. Recorders will take note of any procedures that aided in successful completion of tasks. In addition to knowledge gained through observation of participants during task evaluation, post-walkthrough interviews should provide further insight into the experience from each user's perspective.

We would try to answer the following questions:

- How long did each participant require to: find a function control, determine how to interact with it successfully to initiate action, complete or cancel out of an action?

- How many errors occurred throughout each attempt? were these errors in perception, understanding of the task required, or based on motor skills?

- How did the participant react as they went through this process of discovery? Were they

pleasantly surprised at any successes? Were they unduly frustrated when met with roadblocks? Is there any additional functionality that the users may desire?

Analysis of subsequent data collected will take into account variability of success with regard to program features, as well as any differences among participants and their experiences with the system.

7.4. Evaluation Timeframe

Evaluations are scheduled to begin as soon as possible. The earliest probable date that evaluations are likely to be possible is Nov 14th. Depending on how many participants are successfully recruited (estimating ten out of the maximum possible of 30), evaluations should be completed within a week. This assumes two participants per day, over five days.

Timeframe selection is primarily influenced by the IRB process, the need for adequate time to review collected data, and submission deadlines. Evaluation cannot begin before IRB approval had been granted. The earliest probable date that IRB certification is likely to be granted is approximately two weeks after submission, in the absence of any issues the review board may have. With approximately one week to complete evaluations, two weeks would remain to compile and analyze data.

8. Prototype status

Features implemented

- Augmented Reality API
- Search Functionality
- Voice function

- Slider Panel
- Layers on/off
- 2D/3D Toggle
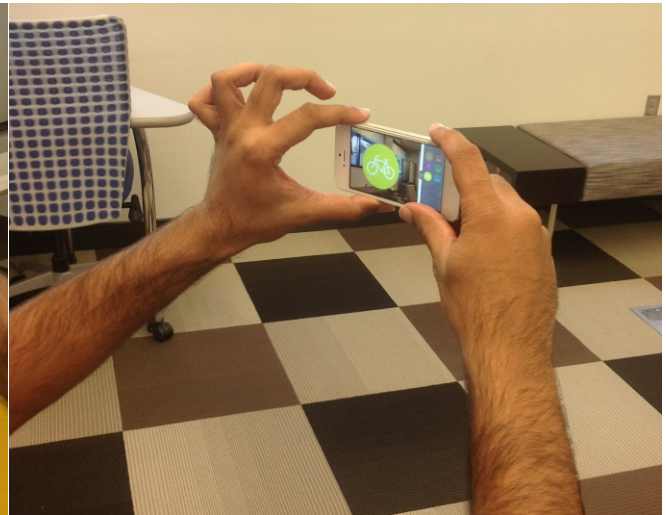
Screen views of system displaying slide out transit option menu (top-left), bus o(bottom-left), Viacycle option selection (top-right), and arrival at Viacycle station (bottom-right).ption tooltip information