Campus Access: Requirements Document

Date: November 20, 2022
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Introduction

This document contains the system requirements for **Campus Access**. These requirements have been derived from several sources, including the National Institutes of Health, Pants Up Easy, and Pitt DRS.

Types of Readers

Project Manager
The project manager should read the entire document in order to gain a full understanding of the product, its components, and goals. Thorough understanding of all aspects of the project covered in this document will be vital in leading the project to success.

Back-end Stack Developer
Back-end stack developers should read the whole document to understand both the general and technical goals and requirements of the product. Familiarizing themselves with the general aspects outlined in the general description will be extremely useful when it comes to coding and designing the features outlined in the specific requirements section. Ensuring the requirements are properly engineered to match the general description goals is the main priority for developers.

UI/UX Designers (Front-end Web Developer)
Frontend developers should familiarize themselves with the User Interface Requirements to create a product that is easy and enjoyable to use, along with the appendix where a desktop mockup of the website is shown.

Mobile Developers (iOS/Android)
Mobile developers need to be familiar with the Functional Requirements and User Interface Requirements sections, which are the parts of the document related to the Backend and UI.

Database Manager
Database managers should read through the Functional Requirements to know what types of data are being hosted and how to structure the databases. The database manager will be working with the back-end developer on server-side issues.

Stakeholder - Pitt DRS
Pitt DRS should read the whole document to understand the scope of the project and what the project entails. They have the most invested into this project so they should know the product fully before the project takes course.

Beta Testers
The end users are people in wheelchairs and people who are blind and also the guests. The guests are family, friends, or anyone else who would be able to assist the people with disabilities. The end user only really needs to read the general description. Campus Access will have a group

initially as a beta group before we roll it out to a bigger group. The purpose of the beta tests is to get feedback on a smaller scale because we want to help out as many people as possible, so getting small scale feedback can help us make edits before rolling the finalized product to a bigger group. If there are any words that are unclear, testers can refer to the glossary.

Disability Resource and Services Employees
These people only need to read the general description. They do not need to know the app on a technical level. We will have meetings with the employees so they can get a better understanding on how to help people and how to get the most out of this app, so they only need to know this app on a surface level from this document.

Technical Background Required

Project Manager
There is no real need for the project manager to have a technical background, but they must have prior experience managing a technical project in the past.

Back-end Developer
The back-end developers need experience in C# or Javascript, as both are really good back-end softwares. They should know how to use each.

UI/UX Designers (Front-end Web Developer)
The front-end developers should have experience in HTML, CSS, and web frameworks, such as Angular, and they should have experience in making a fully-functioning website using those.

iOS Developer/Android Developer
The mobile developers should have experience in Java as it pertains to constructing a mobile app from scratch.

Database Manager
Database managers should know MySQL and how to use it to create and maintain a database.

Stakeholder - Pitt DRS
No technical background is needed.

Beta Testers
No technical background is needed other than rudimentary knowledge of how to use an Android, iPhone, or desktop web browser.

Disability Resource and Services Employees
No technical background needed.

General Description

This section will give the reader an overview of the project, including why it was conceived, what it will do when complete, and the types of people we expect will use it. We also list constraints that were faced during development and assumptions we made about how we would proceed.

3.6 million Americans are wheelchair-bound, and 14 million Americans suffer from being visually impaired [1, 9]. Having college campuses that are optimized to accommodate these people is

essential. However, there are places throughout our campus that are not very accessible, such as the Information Sciences (IS) Building on Bellefield Street in Oakland, PA. For instance, the restrooms in the IS building are in the very narrow staircases, which means it can be easy to fall down the stairs for someone who is blind and a wheelchair might not be able to fit there. Places, like the music building on Pitt's campus, do not have adequate signage, and Holland Hall, one of the Pitt residence halls, does not have wheelchair access on its top floors. We have also seen statistics on how people with disabilities are more likely to drop out of college or not be as happy due to there not being a community of people they can relate to. This is where our solution comes in. We want to create an app that helps people who are wheelchair-bound and without sight to be able to use our app to find out various things and to not feel so alone. We want to be able to have people use our app to find things like where the most accessible entrances are, where there are accessible bathrooms, etc. Having this resource would be a step up from current resources such as the Pitt DRS website, which is hard to access and is not designed for use on-the-go.

Upon completion, Campus Access will be usable by people who are in a wheelchair or are blind, where they can go to the app to find nearest accessible entrances and give reviews based on that location. That way, people will not have to struggle to find a sign or have to look around for the proper entrance. Each location will have a spot for reviews so that others can know where to go and what to avoid at a certain place. A division of locations into different categories will help the user not be overwhelmed with a bunch of locations at once and be able to find the place they exactly want.

Product Functions

Campus Access allows people with wheelchair and visual ailments to:

1. View information related to how buildings accommodate their disability
2. Request help for assistance in their daily commute
3. Contribute to discussion about what can be done to help
4. More easily devise paths around campus

User Characteristics

We expect any Pitt student who is visually impaired or wheelchair-bound to find a use for the app. They are 18-25 years old, take classes on campus, and they make use of Pitt's buildings on a regular basis. By integrating with existing device text-to-speech functionality, the app will mitigate any challenges blind users may have when navigating its pages.

Constraints

iOS and Android compatibility is important for Campus Access as we want everyone, regardless of what phone they have, to have access to our app. Campus Access will also be compatible with all the phone settings, such as text-to-speech, that the user already has configured into his or her phone. Campus Access will also be available as a website for users looking to use it on a laptop or computer.

Assumptions and Dependencies

Campus Access's target audience is college students, and based on that, Campus Access has come up with the following assumptions. One assumption is that the user has access to a smartphone (iOS/Android) or a laptop/computer, as today devices are readily available to use at Computer labs or the library. Another assumption is that the user has their iOS/Android device updated to the latest version at the time of download. Because Campus Access will be pulling information from servers, Campus Access assumes that users will have access to the Internet. Campus Access will

also be pulling some settings from the device settings, so an assumption is made that accessibility settings, like text-to-speech, are enabled on the user's phone or able to be toggled on.

Campus Access will also rely on other servers or apps to function as well. Campus Access would require access to Pitt servers that contain all the Pitt students to help authenticate users when they are trying to login. Those servers would also be used to help set up all Pitt students with accounts to Campus Access. Campus Access will also be using Google Maps for directions, so it would be dependent on the Google Maps servers to be up and running. Finally, Campus Access will be dependent on a partnership with Pitt Police and SafeRider, as Campus Access will be giving out their phone number to users and using them as a resource for our users if they ever need help.

Specific Requirements

This section of the document lists specific requirements for Campus Access. Requirements are divided into the following sections:

1. **User Requirements —** These are requirements written from the point of view of end users, usually expressed in narrative form.
2. **Availability and Performance Requirements**
3. **System and Integration Requirements** — These are detailed specifications describing the functions the system must be capable of doing.
4. **Sustainability Requirements**
5. **User Interface Requirements** — These are requirements about the user interface, which may be expressed as a list, as a narrative, or as images of screen mock-ups.

Functional (User) Requirements

Building Pages

The building page will display relevant accessibility information about a specific building. In terms of wheelchair accessibility, it will say whether the building can be accessed at all (yes/no), what floors of the building can be accessed, how many ramps, accessible restrooms, and elevators there are, and a picture of the building entrance. The page will also include information about blind accessibility, including whether braille signs exist.

There will be at least one picture for each building, which will have encoded text-to-speech descriptions to aid the blind that will play when tapped. The page will also have a "favorite" button to add the building to the user's favorites list.

All textual and image data will be stored in the MySQL database, which the database manager would maintain. The images can be stored as BLOB types, and everything else will be VARCHAR.

Use Case:
Emily is wheelchair-bound. She wants to make sure she is living in a dorm that is accessible and one that she can do everything she needs to do. When researching Holland Hall, she realizes that the elevators do not go to the 10th floor, which means she cannot do her laundry on her own, meaning that she will not want to live in Holland Hall and more in a place like towers, where she can take an elevator downstairs and do her laundry.

Comment Fields on Building Pages

There will be comment fields on each building page where registered users can submit their thoughts on a certain location. For any comment, other users will have the option to upvote or downvote it depending on how helpful they perceive it to be. Every time a comment is made, it will be automatically checked against a blacklist of words, which will act as a layer of defense for vulgar activity. Every comment will be inserted into the MySQL database as a VARCHAR, and the amount of upvotes would be stored as an INT.

Use Case:
Karl is blind and relies on a cane to get around. He prefers using ramps because that means he has a lower chance of falling down a certain set of stairs. He wants to go eat, but wants to avoid a restaurant with stairs. He wants to give Pie Express a chance, but when listening to the comments, he keeps hearing that there are no ramps from other users and that the restaurant is completely inaccessible. Therefore, he chooses to go to Pizza Romano as that restaurant is more accessible.

Map Page

The map page will be the primary way for users to view possible locations to look up. Each location will show up as a "pin" on a scrollable map, and users will be able to filter the pins based on their category. A singular pin could be shown by searching for a specific location in a search bar at the top of the page. The actual map will be displayed using the Google Maps API. The coordinates of all of the locations (latitude and longitude) will be stored in the MySQL database as INTs.

Use Case:
John is a person who is wheelchair-bound and needs ramps to be able to access buildings. He is planning to go to the music building and has never been there before. He wants to plan ahead and know that he can get there on time and be able to access the building. With Campus Access, John can go onto the app, find how to access the building via a ramp, use a navigation system through our Google UI to get right to the ramp, and then go up the ramp and access the building.

Get Help Button

The "Get Help" button will act as a directory for contact information of people that could help the users in different situations of need. These people include Pitt Police, links to shuttle services, and Pitt Angels (student assistance volunteers).

Use Case:
George lives in Sutherland Hall and is wheelchair-bound. He had a late night studying in the Cathedral of Learning and he's been waiting for the 10A shuttle for 20 minutes without any sign of it showing up. Then he finally turns to other help. He clicks on the "Buddy System" button and that alerts a student assistance volunteer who is on-call at the time named Bob. He meets George at the bus stop and helps him up to Sutherland Hall using the sidewalks on Sutherland Dr and Allequippa St. By George being able to utilize Bob through the buddy system, he was able to make it home without having to wait in the cold for a shuttle that may have not shown up.

Availability and Performance Requirements

Availability

Campus Access must maintain a high-level of availability. As such, Campus Access plans to deliver 99.7% uptime, such that Campus Access may be inaccessible for no more than 24 hours per year. This is within the industry-accepted range of 99% to 99.999%. Campus Access plans to achieve this metric utilizing the cloud-based hosting company Firebase to host the mobile app. Firebase is owned by Google and a well-respected mobile app hosting provider that promises a monthly uptime of at least 99.95% in their Service Level Agreement [8]. While Firebase is able to provide at least 99.95% uptime, Campus Access is only promising 99.7% uptime to allow for unexpected app maintenance or other unforeseen circumstances. Of course, Campus Access will strive to provide 100% uptime, but it is recognized that this is not practical in practice.

Servers

Campus Access requires back-end servers to process the requests made by the users. Campus Access will utilize Firebase as a cloud-based hosting provider. Firebase offers server redundancy and a content delivery network (CDN) that hosts servers around the world. Firebase has the capacity to handle over 10 million monthly active users, which leaves Campus Access plenty of room to scale up as required by business demands [7]. By using Firebase from the initial app launch, Campus Access is investing in infrastructure. Because Firebase is cloud-based and virtualized, performance metrics can be scaled up or down to meet the needs of the customers. Firebase also supports app versioning and user analytics integrations to allow Campus Access to provide frequent and meaningful updates. As detailed later in the Sustainability Requirements, we plan to have about 600 users in our beta group and then about 3,500 users in our bigger rollout.

System Maintenance

Campus Access will require regular system maintenance. Campus Access will perform maintenance during off peak times for the app, such as from 2 AM to 5 AM every Sunday. This helps to ensure that our system maintenance impacts as few users as possible. Additionally, Firebase is able to handle any server failures by automatically moving our app's files to a different virtualized environment. This is one of the main benefits of cloud-based hosting, as Campus Access does not need to manage any issues related to server hardware. Firebase's content delivery network also allows Campus Access to provide location-based maintenance, meaning that maintenance can be performed in different locations at the time that works best in that time zone.

Updates

Campus Access plan to release updates biweekly. These updates will be used as patches to fix bugs in the software or improve the performance of the app. In addition to these minor updates, Campus Access plans to release one major update every month that includes at least one new feature. New features will be added based on in-app feedback and industry best practices. This update cycle will allow Campus Access to run smoothly, as it emphasizes stability without disregarding functionality. Server-side code can be updated at any time through Firebase, but client-side code, such as the Campus Access app itself, must be updated through the Google Play store or Apple App Store.

System and Integration Requirements

Campus Access will be designed to be viewable on desktop and mobile devices. Foremost, we will have a mobile app that can be downloaded from Google Play and the Apple App Store, which will run on Android 10+ and iOS 15+. Along with the mobile app, we will design a website using HTML and CSS, which will access the same database but be optimized to be viewable on Google Chrome, Firefox, Microsoft Edge, and Safari. By giving access to Android and Apple, which make up over 99 percent of mobile operating systems, along with making the site optimized for the set

of four browsers, which make up over 90 percent of market share, we make the viewing experience optimized for the most people possible [2, 6].

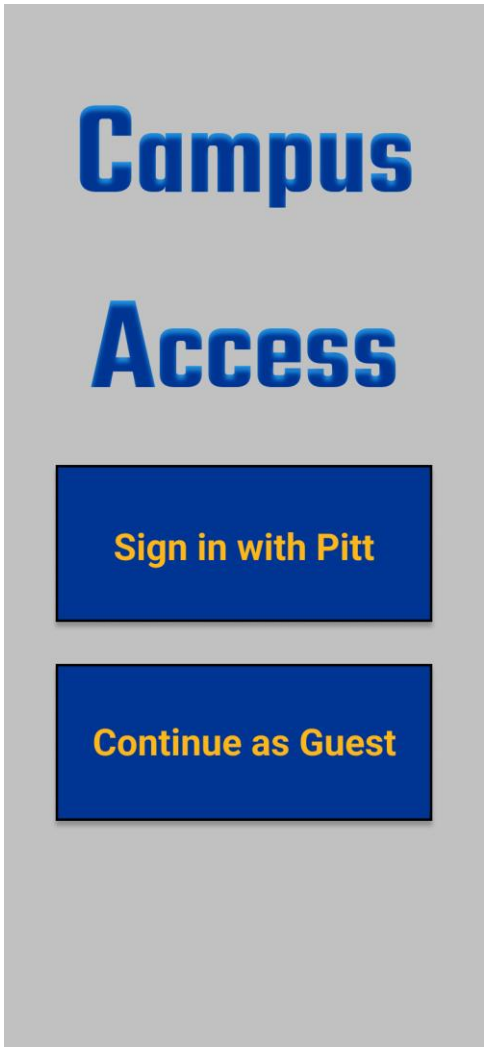
Because we will integrate the app with accessibility features such as text-to-speech, we will develop a separate app in java. Java will be used to code the app because it is optimized for performance, which is important because having a smooth and responsive interface is integral for allowing users to find information they need. We explored the possibility of a mobile wrapper, where the website would simply access the same website in a mobile format. This would not be beneficial because we would not be able to integrate mobile device accessibility features with the app [4]. For the desktop website, we will incorporate the web framework Angular, which will improve overall production time because frameworks make use of pre-existing templates to cut down on the amount of required written code.

Sustainability Requirements

We intend to launch Campus Access to be available just for University of Pittsburgh Students, with hopes to expand to other college campuses and universities. We believe that starting just with Pitt students will allow us to work out potential issues and bugs at a smaller scale before releasing to a larger audience. By collaborating with Pitt's Disability Resource Services, we will be able to keep up to date on the latest disability services on campus and ensure our product reflects these services. We will maintain our communication with DRS through biweekly Zoom meetings with their staff. For our servers, we mentioned using Firebase for cloud-hosting of our product. Their customizable service allows us to change the amount and type of servers we need based on the growth and development of our product, and the range of users we hope to expand to. They also offer app versioning and location based maintenance. This is extremely helpful in automating update rollout processes and performing maintenance in areas that require it. Using the numbers we have listed earlier in this document, we expect there to be about 350 wheelchair users on Campus Access. Based on a population of 32,000 Pitt students (rounding down from 32,277) since there are about 3.6 million wheelchair users in a US population of 330 million (rounding down from about 333 million) which is about 1%. Our same logic applies to people who are blind. Since about 4% of Americans are blind, we expect there to be about 1,280 blind users. Campus Access will have about 20 Pitt Angels. There will be 5 in the morning, 5 in the afternoon, 5 in the evening, and the other 5 will work overnight/be subs for the others if someone else cannot volunteer that day. The beta version will have about 100 wheelchair users, 500 blind users, and 10 Pitt angels. Users will be able to leave reviews on the Campus Access, which we will use to add features, fix bugs, and design thoughtful updates to best suit the changing needs and desires of our users.

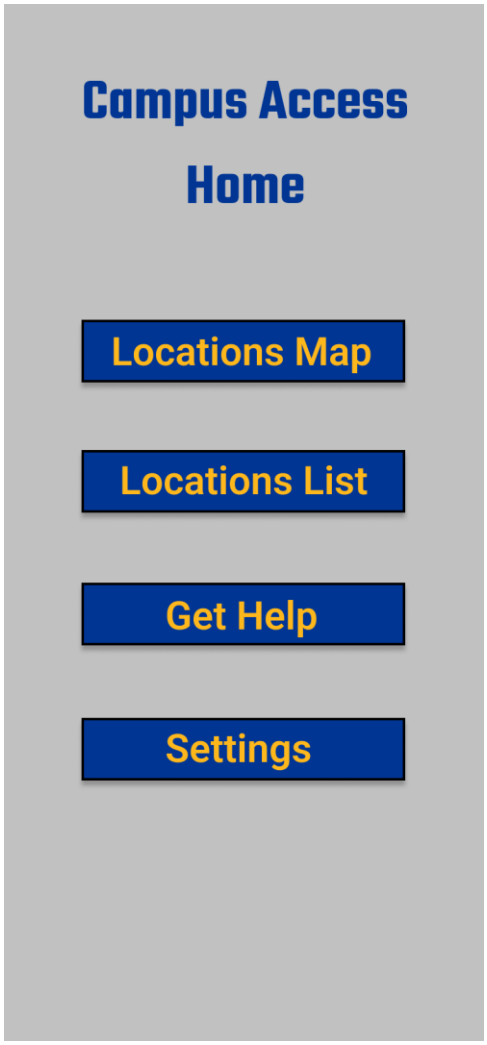
User Interface Requirements

Our product should be simple to navigate and look clean and organized whether a user is viewing it on their phone, tablet, or laptop. For the following screen mockups, a mobile phone orientation was selected because we expect most users to navigate our app on their phone. We believe a simple, clean interface will best integrate with any existing accessibility features users may have programmed on their device, such as text-to-speech. We also wanted to be cognizant that excessive color and design can make it difficult to navigate an app when the user already has a form of disability.



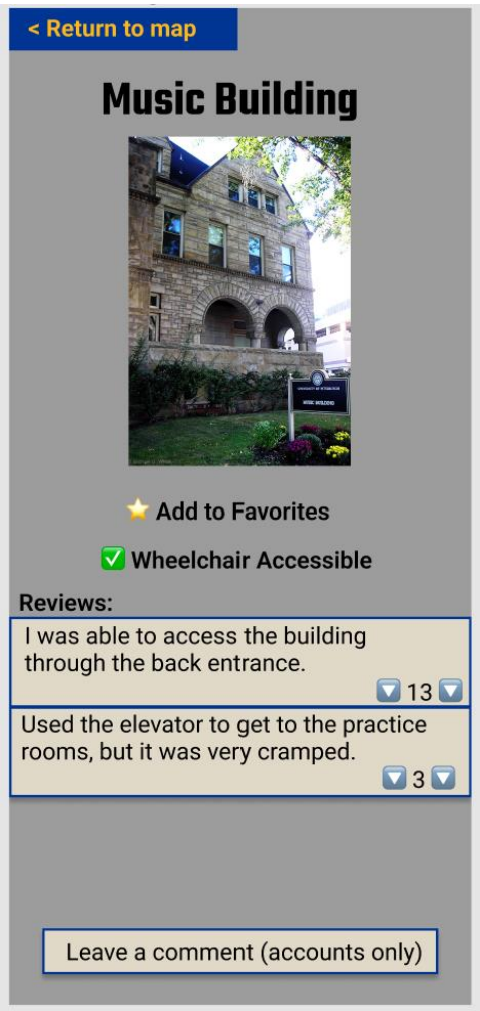
Login Page: The first thing the user will see is the login page, which will allow users a choice whether they will be a registered Pitt user or a guest. This choice will determine the amount of access they have in the app, which will be outlined in later requirements. If "Sign in with Pitt" is selected, the user will be directed to Pitt Passport to authenticate their status as a Pitt student, and they will then be redirected to the **Profile Setup** page. Selecting "Continue as Guest" will take the user directly to the **Home Page**.

Profile Setup: The profile creation screen will allow users who log in with their Pitt email to create an account that stores their name and allows them to select the disability category that best describes them. This personalized login allows data to be saved to the user's profile, such as their disability type, any favorite locations, and any emergency contacts they may add.

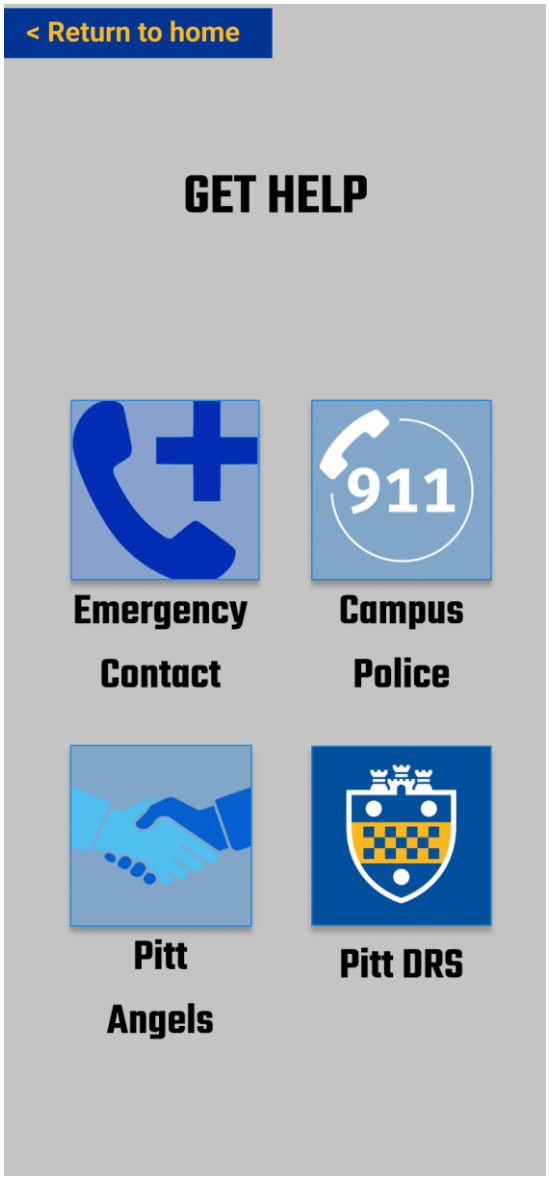


Home Page: This is the main home page where users can navigate to different areas of the app, including the locations **Map Page**, **Locations List View**, the **Get Help Page**, and the **Settings Page**. After logging in, this is the main page users will be rerouted to so they can select what feature they want to utilize based on their current needs.

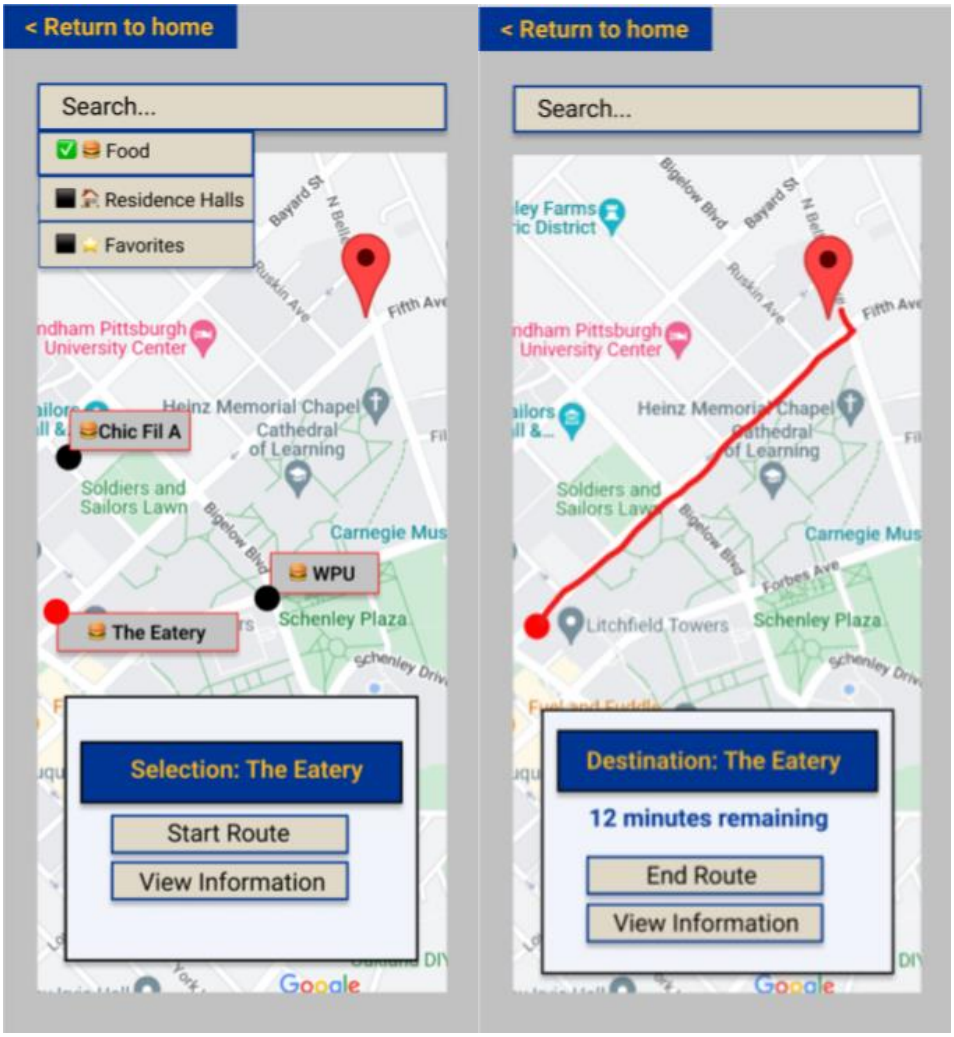
Locations List View: This page will provide a visual interface in a list format to all locations that exist in the database for the Pitt campus. Users can either search (through typing or text-to-speech) or select a category to narrow the amount of locations shown. Clicking on a location will bring up a popup allowing you to view relevant information about the location, such as accessibility features and user reviews on the location. More information can be found on this below in the **Building Information and Comment Page**.



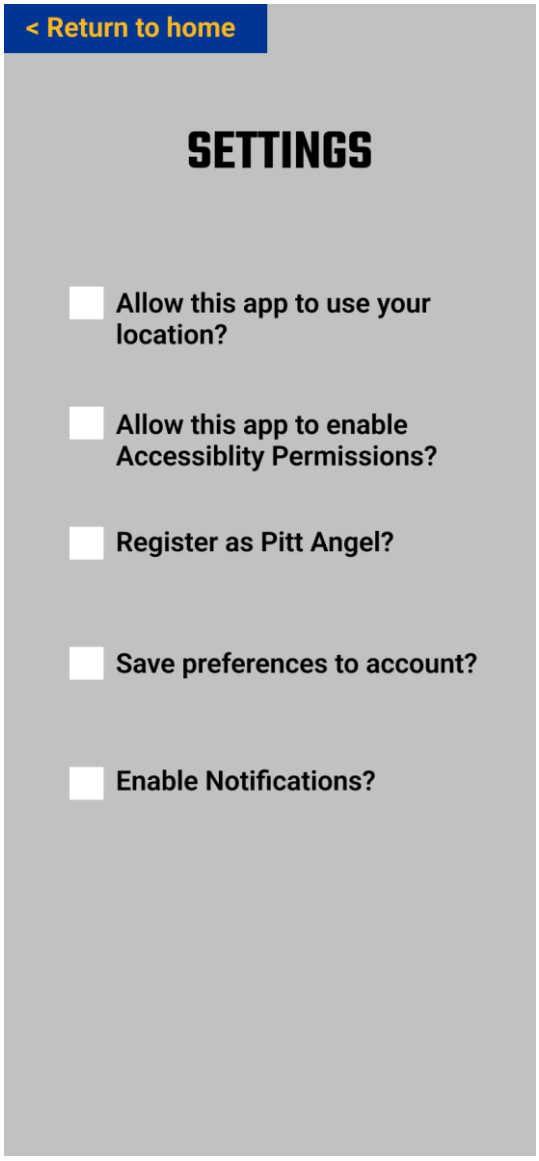
Building Information and Comment Page: Here, users are able to view important information about their selected building, such as if it is wheelchair accessible. They are also able to view and leave comments regarding their experience navigating the building and any information that may be helpful to other users with disabilities. This page pops up for the users whether they navigate from map view or list view, so they are able to find this information easily depending on their preferred viewing method.



Get Help: This page will assist users who are stuck somewhere on campus and are in need of help from another person. They will have different options to call based on their needs and the severity of the issue, including custom emergency contacts, campus police services, the Campus Access Pitt Angels System, or the Pitt Disability Resource Services phone number.



Location Map View: This page will provide a visual interface in a map format to all locations that exist in the database for the Pitt campus. Users can either search (through typing or text-to-speech) or select a category to narrow the amount of locations shown. Clicking on a location will bring up a popup allowing you to A) create a route that you can follow to reach that place or B) view information about the place, as in be redirected to the **Building Information and Comment Page** (listed above). If you begin a route, the most optimal path will be drawn on the screen, just as Google Maps can do in its app, except showing the fastest accessible route based on the user's disability. Routes that are not accessible to wheelchairs will be avoided, which Google already has the ability to calculate.



Settings Page: The settings page allows users to configure certain parts of the app, as well as give the app permissions to use data such as user location and system settings for accessibility, such as speech-to-text. This also allows users to register as a Pitt Angel, so they can receive notifications from Campus Access when a disabled user requests help.

Appendix

Appendices

Personas:

1. Jessica is a freshman at the University of Pittsburgh who uses a wheelchair to assist her mobility. She is still new to navigating the city campus, and finding paths and entrances that are accessible to her wheelchair can be difficult. She always tries to plan her route and schedule ahead of time so that she can be on time to her classes, but it's tough to find the specific information and updates she needs.
2. Ryan is a junior at the University of Pittsburgh who is living off-campus for the first time. He has been blind his entire life and uses a cane to help him get around, but being in a newer environment has proven difficult at times. He wishes there was an app that could help guide him to campus from his new location, and that made it easier to ask others for help.

Scenarios:

1. Jessica has begun to plan her spring semester classes. She uses Campus Access to check out the accessibility features of the buildings she may have class in. She appreciates that she can read real student reviews from people like her that have experience in the buildings, and from that can gauge whether she should schedule the class or look for another section in a different building. She adds the buildings to her favorites list, so she is able to revisit the pages easily and read any further comments users leave pertaining to the buildings.
2. Ryan has the locations he frequents added to his favorites on the Campus Access App. Whenever he leaves his house for the day, he uses the map feature in tandem with his voiceover accessibility feature on his iPhone, and the directions he needs are read aloud to him as he walks, as well as any important route changes or construction paths he needs to be aware of. Whenever he finds himself stuck at a busy intersection that doesn't have a stoplight, he uses the Pitt Angels feature to ping a student volunteer nearby who assists him in safely crossing the street.

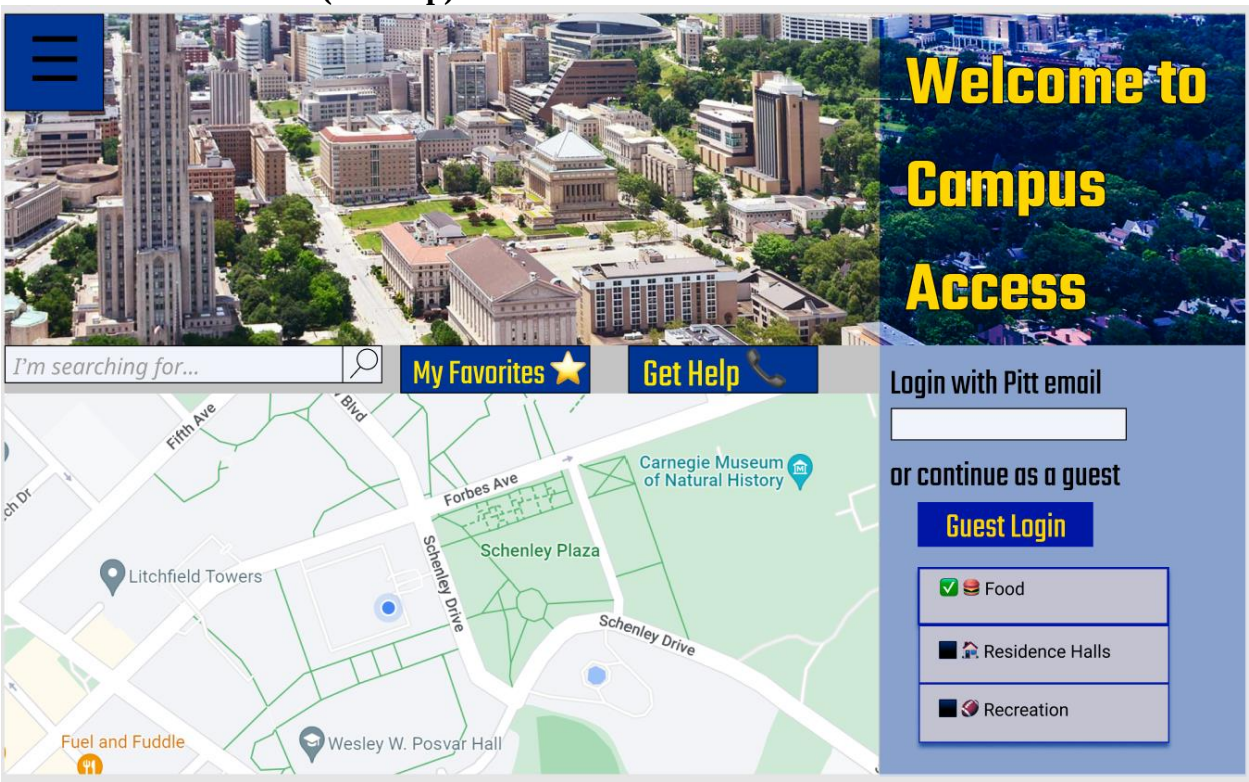
Preliminary Requirements List

- Must have: map interface, compatible with existing phone accessibility tools, search bar for campus buildings, ability to leave comments on building pages, add to favorites feature, hybrid architecture (mobile app and desktop site), get help page
- Nice to have: comment moderator, Pitt Angels feature, ability to log in with Pitt email or as a guest, integrate with Pitt DRS for updated features, overall building ratings
- Future versions: more disability categories/tailored support for less common physical disabilities and "invisible" disabilities, integrate with Pitt RideSystem

Other Device Interfaces (desktop view):

The full Figma wireframe can be accessed here.

Other Device Interface (Desktop):



Glossary

- **UI:** User Interface; what the user is seeing
- **UX**: User Experience; what the user experiences while using the app
- **Pitt:** University of Pittsburgh
- **Pitt DRS:** The disability resource service at Pitt, responsible for all disability accommodations
- **Pitt Angels:** Our buddy system, when you press for help, a Pitt Angel will show up
- **Voiceover:** iOS feature that allows blind people to hear what is being clicked on.

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