Project Title: UIUC Bus App

Project Summary:

For our CS 411 Project, our group will create a bus app that takes in data from the CUMTD database to create an app that allows users to find bus stops and figure out what buses are coming to those stops. This would also allow users to find a way to get from one place to another based on what bus they are taking. For our app we'll also have a simple frontend which allows the user to easily put and get the information that they need. The goal of our app is to be the best and only bus app that's trusted by the students of UIUC to get them to the places they need to get to.

Description:

The main problem that we are trying to solve is to create the best possible bus app for UIUC students. Oftentimes there are certain issues with existing apps which can cause inaccurate timings to be shown. We are trying to make sure that none of these issues are in our app as these can cause students to be late to class or an exam or to wherever they need to go simply because the timing of the bus on an app was inaccurate. In our app, we want something that's easy to use and gives out all the information needed.

The main things that our app needs to display is the bus information and bus stop information. These are important for our app because we need to be able to know what stop the students are taking the bus at and what buses are running on the different lines at that certain point during the day. To prevent issues with inaccurate information, we need to be pulling this information very regularly to display to the user. We also need to make our app have certain features. For example, we just can't display all the information in a list on the app page, we need to have features like a search bar that can make life easier for the user, but also make our app work better for them. Essentially, we are trying to make the best UIUC bus app that we can.

We believe that the main reason for other bus apps being rather inaccurate at times stems from the limited number of requests (1000 per hour) that can be sent to the MTD API. As a result, there must be a period of time between each update on a bus's position, sometimes upwards of a whole minute. There may be a multitude of other factors leading to inaccuracy as well, such as a miscalculation of the speed in which a bus is traveling, causing a lack of accuracy as to when the bus will be reaching the bus stop. For example, there have been times where a bus is said to have already passed the bus stop, when in actuality it hasn't reached the stop yet. This comes from a combination of the delay between updates, as well as miscalculating the ETA of a bus.

To combat these issues, we can try to optimize the algorithm in which calculates the delay between requests sent to the API. For example, when there are less buses operating, i.e. at night, weekends, not enough bus drivers, etc., we can optimize the delay such that there is less time in between requests, and thus our knowledge of the position of the buses will be more accurate. We have also thought of having two different clients requesting calls to the API at different delays, but we aren't sure whether this strategy would be viable.

Usefulness:
Buses are the main form of transportation for students on campus. As such, we chose to build a bus app to help students to better navigate on campus by streamlining the process of finding a bus stop and getting to their destination. There are similar applications out there like the bus app we want to build. One of such apps is the UIUC Bus app currently available on the App Store. Similar to what the UIUC Bus app has, our app wants to also provide a list of closest bus stops, a live view for buses and the different routes, and the expected departure/arrival times.

Additionally, what our app hopes to accomplish that is different from the existing UIUC Bus app, is to provide functionalities besides the basic search, find path, see eta usage that over all helps the user experience. Some examples of these functionalities we hope to implement are to show the actual direction the bus is heading in on the map, instead of just showing the path, allowing users to see their most recently/frequently used/searched routes/stops and to favorite them. We hope that these functionalities will minimize confusion and streamline the overall bus app usage process.

Realness:
We will get our data from the public MTD Bus API. We can get the data from this link, https://developer.cumtd.com/. With this API, we can get real time data for the bus routes, locations, and stops. Locational information will be given through latitude and longitude. We will also be able to get the eta for arrival and departure for each bus, thus allowing us to implement the functionalities we have listed previously.

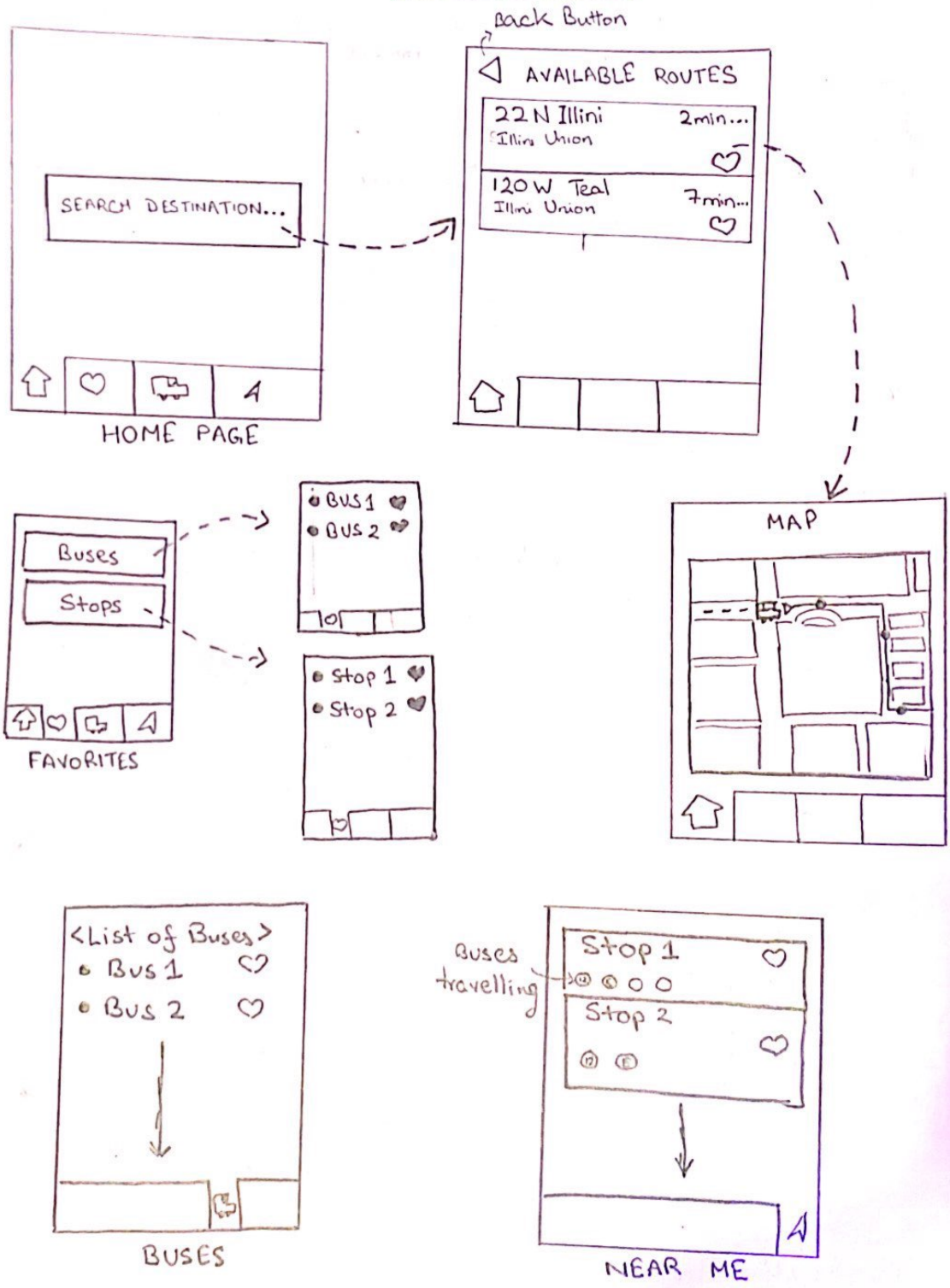
Functionality:
Data that should be stored should include all information related to buses and stops. This includes the number and color that a bus corresponds to, as well as the direction that the bus is going. All bus stops and their respective location on the campus will also be stored, along with the direction as it corresponds to a bus direction. We will also need to store which buses correspond to which stops, as well as the paths that the buses take as they travel. All of this information should be retrievable either through the MTD API, or other websites that include bus information about the Urbana-Champaign area. We will also be storing user data, such as personal favorite stops/paths, as well as most recently or frequently used routes and/or stops.

Basic functions of our application will include being able to click on a bus to see the closest stop nearby that the bus will be traveling to, as well as an estimated time in which the bus will arrive. There will also be a search function/bar, in which a user should be able to search up a destination stop/location, and the application will display both the nearest, as well as the most efficient routes that the user can take to arrive at the searched location. Users will be able to input personal favorite stops or buses that will take precedence over other stops and buses, or most recently searched stops in order to easily access that same route. There should also be a map which shows all of the bus stops, including the user's location if that information is

available, and a user should be able to click on a stop and see the buses that will be arriving at the stop.

Something that would be cool to implement would be if given a user's location, it would be able to correspond that user's location with a bus/route as we receive that information from an API, allowing for the app to automatically recognize the frequently/recently used buses/routes without the user manually inputting in the data. This would make it easier for the user, but would be difficult because of the intricacies of receiving a user's location, and matching it with a bus and its supposed location given the fetched data from an API.

BUS APP (UI)



Project Work Distribution:
Siddhant will be responsible for the general frontend systems, including the application's UI, the interfaces, as well as the links/connections between the interfaces through buttons, etc. Joseph will be responsible for the API fetches, and utilizing that information to create the estimated time approximations for when buses will be arriving to each stop. Rahul will be responsible for storing all information of the buses and stops, retrieved from the CUMTD website, into the database, and creating the connections between the tables/schemas such that the buses will be properly corresponded to each stop, etc. Bernie will be responsible for functions of the system, such as the favorite/recently/frequently used functionality of the system, and storing the information into the database as the user's preferences. He will also be responsible for other operations such as the search function, and retrieving the proper information from the search.

This can be further expanded upon as we create/brainstorm ideas or other functionality for the application, and those responsibilities will be assigned and reflected on this document.