

Is The T Close?

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ABSTRACT

In this paper, we describe the design and testing of a system mapping and tracking Boston's MBTA (Massachusetts Bay Transit Authority) subway system.

Author Keywords

Human-computer interaction; HCI; Massachusetts Bay Transit Authority; MBTA; subway.

ACM Classification Keywords

I.4.8: Scene Analysis

General Terms

Design; human factors; reliability; standardization; management; measurement.

PROBLEM

Boston's MBTA system somewhat already has methods of tracking the trains, finding your way around the Greater Boston Area, finding schedules, etc. There exist both first- and third-party solutions to solving these problems, including MBTA's own website, signs at (almost) every station stop, Google Maps, iPhone and android apps, etc. However, these "solutions" are not exactly the best solutions possible for solving the aforementioned problems. A sign at a subway stop may be telling its customers that a train is only one minute away for five minutes. Any iPhone or Android app or schedule you could find is more of a guess, estimate, or approximation. Looking up directions on MBTA.com or Google Maps may tell you where you are going, but like when finding a schedule in an app, it only tells the user some approximation of a time and may leave that user standing around waiting for inordinate amounts of time. However, with the app "Is The T Close?," the goal is to solve the problems that these solutions do not solve. With "Is The T Close?," a user will never have to ever again sit waiting for the Green Line going Inbound as three other trains pass by going Outbound. A user will never again have to wonder why a train is taking five minutes to travel a distance that should only take one minute. "Is The T Close?" will relieve the stress of transferring across multiple subway lines. "Is The T Close?" will let a user see where trains are on each subway line. "Is The T Close?"

gives tangible, relevant, and useful information to the user simply at a glance.

Users

Since Boston is primarily a college-town filled with young adults, most of the potential users privy enough to use a smartphone app to track the MBTA for their own peace of mind would be relatively tech-savvy young adults with smartphones from ages 18-25. However, this does not exclude any other demographic. Potentially any person from any demographic could be a user of the system. Age is the biggest factor to consider, but it is not the deciding factor for use of our system. Race/nationality is not a determining factor as to who would use our system. The most important facet to note is that users will be residents of the Greater Boston Area.

Tasks

Most any task a user could have to accomplish is related in some form or another. Since "Is The T Close?" is primarily meant to be used as a source of information, users will want to use "Is The T Close?" to obtain said information. Any task a user would do would be somehow related to obtaining that information.

Upon entering the application, a user will be prompted with two drop-downs, one for each going to a subway map or going to a subway station map. A task that a user will be most commonly and consistently accomplishing is simply to navigate to one of these two options. And frankly, most users will probably even pick their favorite of those two options. However, the task the users will have to tackle constantly is to pick their preferred option from its respective drop-down menu.

Sometimes a user will need to go further than the reaches of simply the MBTA subway. The user may need to go somewhere accessible only by bus. In this case, the user will have to find bus information from the subway station they are going to. For example, the user may be looking at a map of a line. They will then have to touch or tap on the station where they want to travel to find bus connections from that station.

Other times, a user's trip will take them across multiple subway lines instead of onto a bus. The user, in this case, will have to go from one MBTA line map to another line map. The user will have to constantly accomplish the task of hitting the correct buttons to navigate to a second line, if need be.

Users are not always just looking at maps of subway lines. Sometimes, they will want to see detailed information about the station they are coming from or going to. Since the point of "Is The T Close?" is to track where the trains specifically are on the subway, going to a station map will effectively "zoom in" onto the station that you click on, giving you the same relevant and useful information that a user would get on the subway line map. This is a task users will be accomplishing on a constant basis.

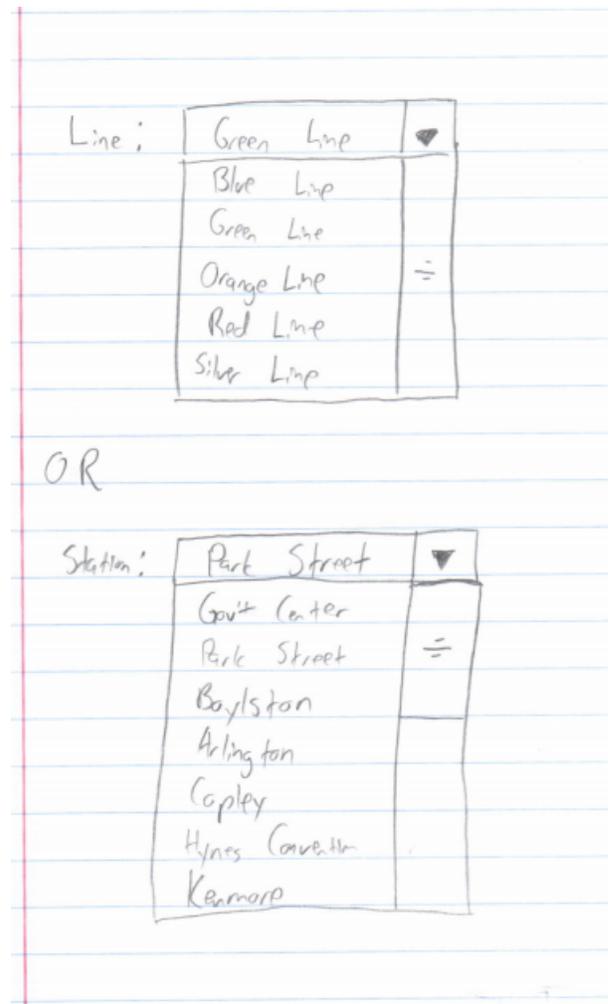
If a user is on the detailed map of a station, they could very possibly want to go back to the over-arching line map. Maybe there are no trains are not anywhere near that station and the user wants to see where the trains are actually currently located in other parts of that line. Or maybe the user wants to see where they are going, how long it will take to get to where they are going, or how far away (distance) their destination is from their current location. On any detailed station map is a link or links to the lines the station is located on. Selecting these links will take the user to that line map.

The user may not always want to have to select where they are every time they open the application. There is some way to turn on GPS tracking (if possible based on the phone or tablet the user is using). If turned on, simply opening the application will send the user directly to where they are located. This could be either the line the user is on or the station the user is at, based on settings the user may want to change. For example, if the user is close to a stop on the Green line, tracking based on line, it would open up a map of the entire Green line, displaying tracking information for the line. Or it could simple show the nearest stop to the user, showing how close incoming/outgoing trains are to that station.

DESIGN

The design of "Is The T Close?" was relatively thought-out and consistent from the beginning of the design process. There were little obvious or evident changes as time progressed. Most of the changes were either implicit or small and hard to notice. Regardless, every choice of an addition or deletion from the interface was thought-out,

conscious, and intentional. While some of these came



simply from user or peer suggestions, a lot of changes were added because of limitations of previous versions or to fix problems that became apparent only after observing users.

Design Alternatives

Figure 1. Much of the main idea of the interface was laid out and kept from the very beginning.

While we had the idea to make a smartphone app from the beginning, it was a bit of a challenge to design appropriately from the beginning. Even with knowledge of and first-hand experience with smartphones, designing an app for a smartphone, even if only the interface, meant taking a lot more than we had planned into mind.

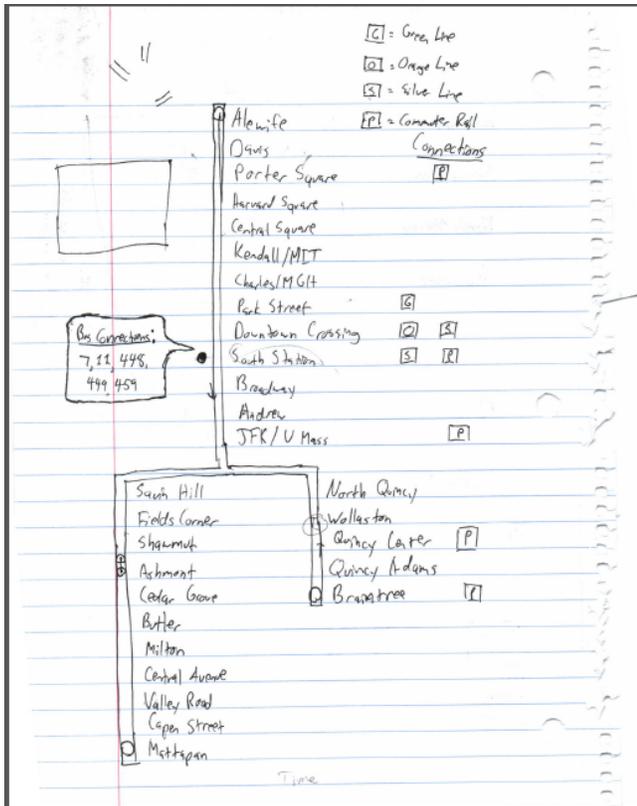


Figure 2. Some features and designs simply became too cluttered and/or out of scope.

For example, a drawing or picture on a computer of a subway map is trivial at best. As shown, it is simple to just draw a map on a piece of paper and label it with no sense of scale or perspective. And being a drawing, it is easy to simply pile on more and more features without a second thought about the proper screen size, resolution, touch-screen implementation, placement of buttons, etc. We loaded our subway line pages with features and images that just could not have been done properly on a real system.

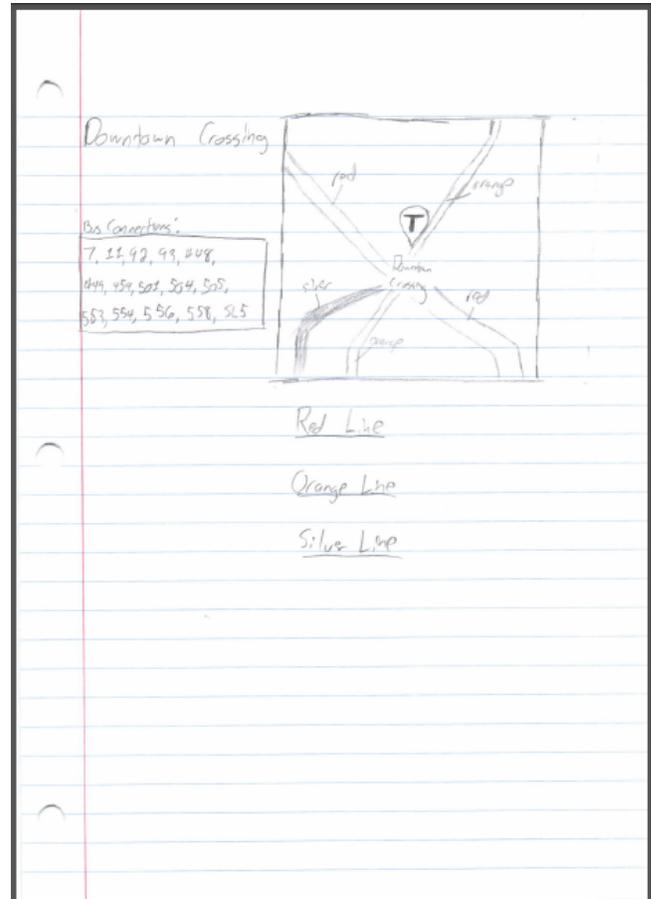


Figure 3. Others ended up being good ideas from the beginning of the design phase.

However, some aspects of the design ended up being good ideas without having to take other considerations. The design of our subway station pages was minimal enough while still being laid out and displaying enough information that it works reasonably well for the final product. The only differences, mostly cosmetic, were trivial to us as designers and completely unnoticeable to any users or testers.

Paper Prototypes

To our surprise, paper prototyping was probably the most useful testing we came across in the entire design process. It gave us lots of great, useful information without having to spend valuable time and efforts on finding and implementing in some sort of design tool.

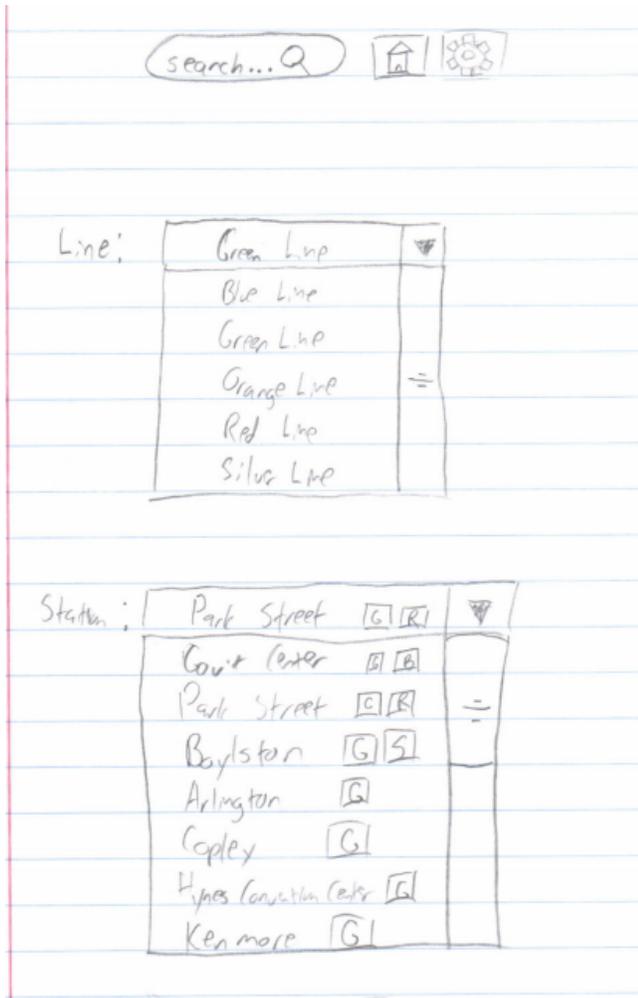


Figure 4. Very few features were added between the design sketch and paper prototypes.

For tasks we had users perform tasks similar to those laid out earlier in the project. With the inclusion of the search box in our paper prototypes, we made sure it was a task we tested in our paper prototypes. Other than that, we tested the users' abilities to properly navigate between subway and station maps as well as being able to obtain specific information when necessary.

Surprisingly, the users had a difficult time accomplishing the tasks as we had had in mind. Instead of searching with the search box, users would use the drop-downs to “search” for the station or subway line they wanted. Instead of tapping buttons to go from a subway line to a station, for example, users would touch the “home” button to go to the main screen and navigate back to the station they desired, completely missing the buttons provided. And instead of tapping a station directly from the subway line to get bus connection information, they would again go back home to get to the station they needed information for.

Obviously, we had to make some changes. We rearranged, repositioned, and redesigned these buttons and boxes for our next design iteration.

Heuristic Evaluations

While maybe not as helpful to the inner workings and implementation of our system, heuristic evaluations were very helpful to round out the edges and streamline our system.

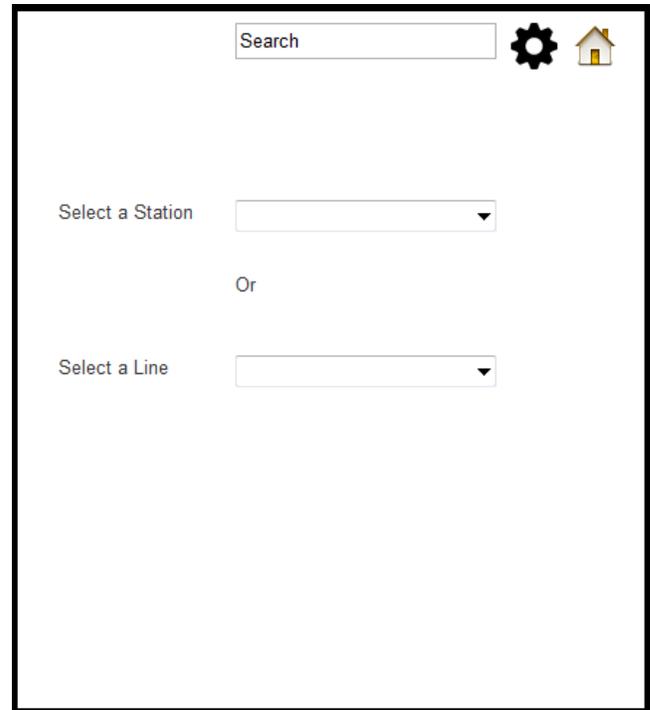


Figure 5. We tried to create a tighter design to make all features obvious upon opening the application.

We used space to our advantage as best we could. We did so to make all features we wanted to show off as apparent as possible. Now, ideally, users will not overlook features we intended for use.

To further drive that point home, we kept a consistent design across every page. Instead of just having a search box, home button, and settings button on only the home page, we added that same design and feature set to every single page, making it as obvious as possible to the users that it exists.

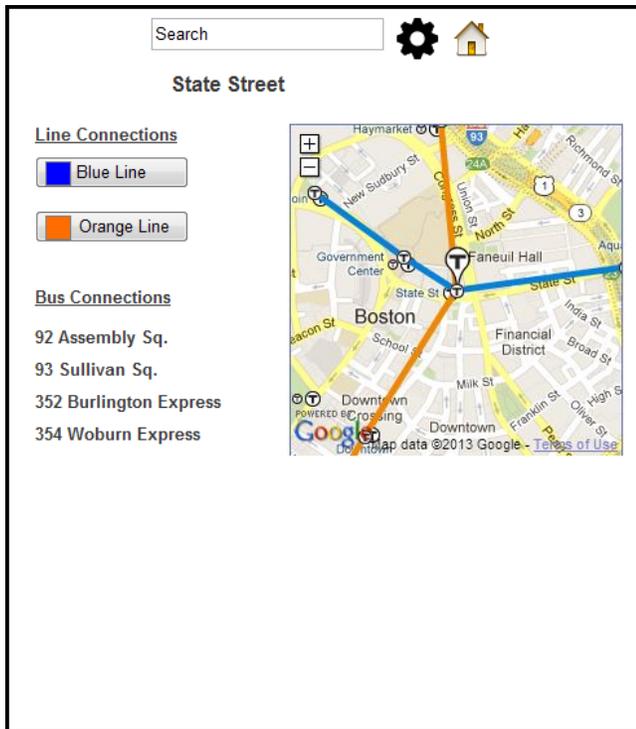


Figure 6. We tried to maintain a formatting as consistent as possible.

However, our heuristic evaluations gave us results on the contrary. We found out from multiple users that having a search box on each page was redundant, due to the base functionality of the entire system being “searching.” We also had the words “Select a” too many times on our system. It also ended up being redundant. It is something small, but it was very helpful to our final product to remove it.

When it comes to the aesthetic design of the system, we got even more useful feedback. We had not created maps, subway lines, or train images on our own. This made the system look tacky and simply unappealing. Recreating those images on our own gave our system a much more comfortable look-and-feel. On top of that, we added a logo onto every page of the app, keeping the entire system consistent and cohesive while simultaneously reminding users of their goals when using “Is The T Close?”

User Testing

By the time we got around to doing our user testing, we had worked out most of the major kinks of the system. Using similar tasks to our paper prototyping, the users had few problems accomplishing the tasks laid out for them. The only new additional task, messing with settings in the settings page, was trivial for any user to accomplish.

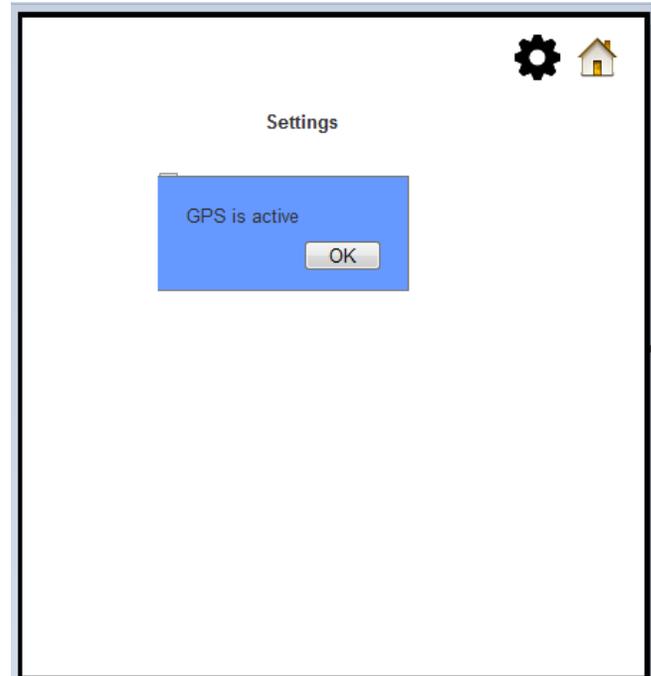


Figure 7. Users had no problems changing settings.

However, users consistently had problems navigating from one subway map to another subway map the way we had intended. Perhaps this is only because users did not have the proper knowledge of the MBTA layout to know to navigate from the subway to one specific station to another map from that station map. Or maybe it was not clear enough to the users what the end goal for that task was. Regardless, we finally got around to implementing buttons to navigate between subway line maps. This gave greater accessibility to users who may know where they are going in the MBTA subway.

IMPLEMENTATION

Over the course of this project our main system changed greatly. At first it was meant to be able to have images overlaid onto a Google Maps image of the area that the person would then be able to search around. The main page was just a screen that had a drop down for the various lines and one drop down for each of the stations. There was also a search box option allowing users to search for a station that way if they so chose to. Every screen also had a home option and a settings option as well. We had no idea to place a GPS at first. Our first system was meant to just allow searching for a line or station and to allow swapping between these. Each selection would allow for the user to see the corresponding line(with trains overlaid) or station according to whatever they picked. The user would be able to see all the stations on a line if they selected a line and could see the corresponding line connections. If they selected a station they could see the bus connections as well and selecting it again would cause the corresponding station screen to appear showing the map along with all bus and line connections. We felt that this would be a streamlined way of allowing users to quickly move through lines and see the information they would want for each one.

At first this seemed like a nice set up but our second version (our computer prototype) was the same in terms of the main page but we learned that the way we had the lines set up was not possible to do. It was difficult to fit the bus connections in the way we had previously planned so we decided to just leave them on the page for each individual station. Another reason for this was due to people selecting the stations from the home page rather than tapping on the station in the line screen to see the connections from there. How we had planned it was not obvious as it was to us and it became apparent that people would only click on the stations to actually select them from the line not to see connection information. . This caused issues with our scope so we decided to narrow everything down. Apart from this each station page now had a static map instead of a Google map that the user could move around to see what was near them. This was due to bugs with the Google maps in Axure that we ran into. Other small changes that we made were that the line connections on the line pages were not selectable. This was because during the paper prototyping we noticed users would ignore the line buttons. We had left them there with the idea that people would use them but most people wound up selecting home and searching for the line in that way. The pictures for our lines and the station pictures were taken from the MBTA site as to be more recognizable to most users as we felt that many had used the MBTA site before to get information about the stations.

For our third prototype we decided to remove the search bar from the home page and every page. This allowed for a cleaner screen and a less confusing way to search. Our systems entire point was to search and having the bar was redundant and took people away from the main point of

being able to utilize the Select a Station or Select a Line functions that were the focus draw on our main page. In reference to those we then took them out because we learned that it may be confusing to some having the word Select twice on there twice due to the implication that one may have to perform both actions rather than one. We made this explicit by removing one Select and adding an or in between both drop-downs. One major change in this prototype was adding a Google Map version of a station map. We felt that people may prefer to see what is in the immediate area rather than having us tell them what specific area they are allowed to look at. In order to replace the search box that we removed for redundancy reason we decided to create a logo and put that at the top of the page in order to remind people what application they were using.

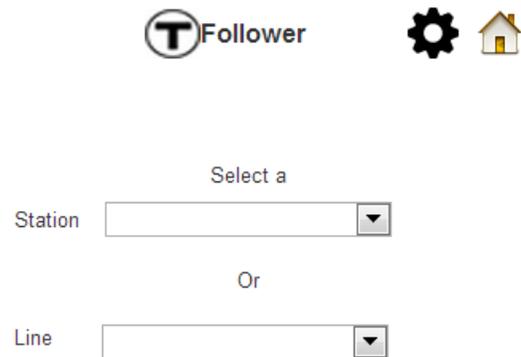


Figure 8. New image layout

Previously we had not done this so it was just some generic application that could really be anything. You had no idea what area it was for there was no context. Besides all of this we had major aesthetic issues. Each of the lines and maps we had felt were helpful to users due to them being familiar were in fact making the whole application look cheap. In order to rectify this we decided to create our own pictures of the lines and replace them. This allowed for a much cleaner look as they weren't snipped and completely differing sizes. At this point our settings were still empty as we were unsure of what to include in them. Our stations pages were also different as one had a Google Maps view

and the other one was a static image. We also finally placed “trains” on the station pages to show where the trains should be as they weren’t there before. We differed them by detailing below which was inbound and which was outbound selecting by color. We also added time tables to each station page to inform the users of when the next few trains would be arriving.

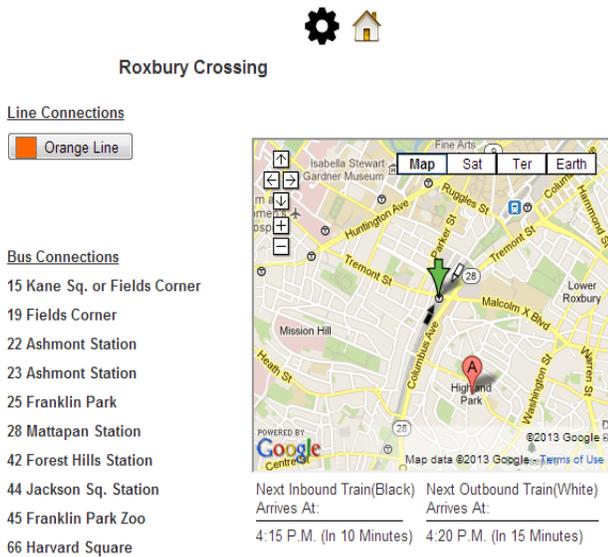


Figure 9. Google Maps version

Our final version of this yet again changed certain aspects. We decided to stick with the static map images as we were unsure of how to cause the “trains” to remain static on the map and moving around caused the trains to move with the scene causing some rather peculiar looking issues. Another issue we changed was making all the station buttons on the lines look similar now. Before only the stations we were using had buttons and everything else just utilized a name and looked different.

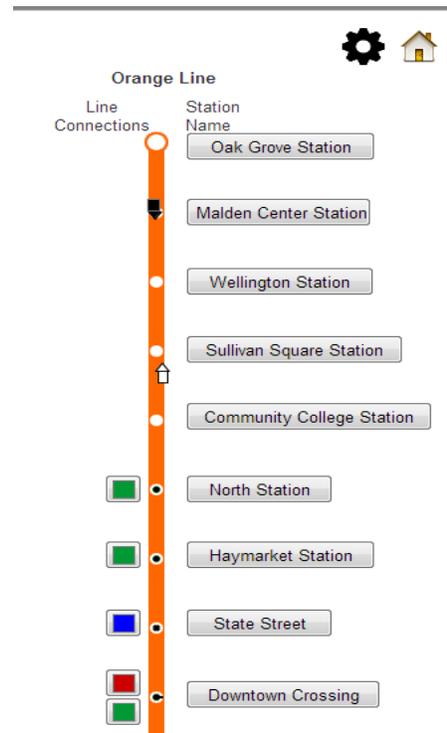


Figure 10. Updated Line map.

The line maps also now included the “trains” overlaid onto them as well to give users an idea of where they would be compared to the stations. We also made each line connection button click able once again going back to our original plan. This allowed users to jump between lines much more seamlessly than going to the home page and then selecting the new line. Overall each line page got a much needed design upgrade to make everything look much smoother and much cleaner. The only problems we wish we had been able to tackle was maybe add in some more color here and there due to each page being a blank one with some images overlaid on to them to provide functionality. Besides this we were very happy with how everything turned out and the final implementation. If we were to add anything else it would probably be for bus connection support as well rather than just showing the connections and no interactivity besides that. We would also like to look into the possibility of utilizing Google Maps all over again but finding a way to make the “trains” look nicer and stay static until they needed to refresh and show where they have moved to.

REFLECTION

Work on this project turned out very rewarding and productive. A benefit of having the small group that we did was that we could work more jointly. That is, we worked well as partners instead of any sort of leadership roles. It allowed more creative control over the project than a larger group would. As a group, we got work done by similar methods. It was nice to have somebody similar in that sense to work with. However, it could also be considered a detriment. If we ever got stuck in some sort of rut, there was not a "foil" to our personalities that could get us back on track. We kinda just got stuck together.

Part of a way we could get a better work ethic as a group would be to have more members. Just having one or two more people would give us more variety in how we tackle problems. Even though having a small group with a clear vision and no "red tape" to go through yielded great results, having a larger group for future projects might yield a more rounded-out end result.

The most important facet into the success of our design, however, was our clear vision and good planning from the

beginning. We knew straight away what goal we wanted to accomplish and how we could accomplish it. We had a passion for the idea that gave us intrinsic motivation. There was little need for it to feel like "work." It was a system we wanted to exist and had the means to create. Proper planning and designing before any implementation is a surefire method to ensure a successful system. If nothing else, we were greatly successful at the planning aspect of our design.

Overall, it turned out to be a great, successful project that was accomplished with a successful method. If there was never a need to do it again, there would be no other choice about how to approach the situation.

ACKNOWLEDGMENTS

We thank all our volunteers, peers, testers, friends, roommates, classmates, and professor for guidance through the design and influence on its implementation. We thank all publications support and staff, previous students, and our professor who wrote and provided helpful comments on previous versions of this document.