Campus Sherpa

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ABSTRACT

In this paper, we outline the motivation, development, and testing of Campus Sherpa, a mobile application for iOS 7 that allows users to make and take custom tours of the MIT (Massachusetts Institute of Technology) campus. The app was inspired by a generative study which showed that people were unhappy with the one-size-fits-all approach of traditional campus tours and desired a tourism experience which catered to the varying interests of tourists. So Campus Sherpa was developed to allow users to create and takes tours of the MIT campus. It serves as a platform for students to make tours to remember their experience at MIT, and for visitors to take a tour which caters to their interests at MIT. Our field evaluation, conducted after the development of our application, showed us that Campus Sherpa was well suited to improve upon the tour taking experience at MIT.

Author Keywords

Geolocations; campus; tours; location tracking; tourism; college; sharing

INTRODUCTION

Every day, MIT receives a large number of visitors from different backgrounds.

The visitors include tourists exploring Boston/Cambridge, prospective undergrads, prospective grad students, middle/high schoolers attending Splash, researchers attending a conference, and professionals attending an event or career fair. Each visitor has different interests when visiting MIT. For instance, an incoming freshman may be focused on exploring the undergraduate residences while a prospective biology graduate student may be more interested in the biological research labs. However, many of these visitors will take a campus tour which will take them to the main sights at MIT (ex. the Student Center, gymnasium, auditorium, main hallway, and architecturally impressive computer science laboratory). However, this "one-size-fits-all" nature of the tour fails to take into account the interests of each visitor and show them all the sights that they would enjoy seeing.

Figure 1. A large group of tourists on MIT's campus

Campus Sherpa is a tourism app focused on MIT. Users can create tours, which are sequences of locations associated with media (ex. pictures, audio narration). Users can take tours, which takes them on a guided trip to interesting sites on the MIT campus and shows them relevant media for each site.

Primary research questions include: "How can we fix this with an easy to use mobile application?", "Is a mobile application the right way to solve this problem?", and "How can we take advantage of modern cell phone technologies to make use of our application as easy as possible?"

One goal of this application is to allow users to pursue a tour (likely after the main campus tour) which will help them make the most of their time at MIT. For instance, a prospective graduate student in Biology would follow a tour of the biology labs while a tourist interested in history would be taken to the most historically important sites at MIT.

The second aspect of this application is to allow users to chronicle their tours and share them with others. As prospective students compare MIT to other schools or as tourists reminisce about their visit to MIT, the ability to record their tours (by associating locations with text, photos, videos, and links to related content) will aid them in remembering. For current students, this offers a way to record the precious memories they make at MIT and share them with others.

Since smartphones offer location awareness and mobility, they are the obvious platform choice for this application. By

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deploying this application for iOS, users can take out their smartphone when they arrive at MIT, select a tour based on their interest, and then begin exploring sites that will be most useful to them. Also, they can create a tour so that they can revisit their memories later on.

Thus, the primary audience will be people who aim to tour MIT and record their experience there. The secondary audience will be current MIT students who would like to chronicle their lives at MIT. While some MIT tours will be pre-installed, the majority would be user-created.

Based on our own experiences and the results of our interviews, people have varied tastes and desired destinations when visiting MIT. We therefore aimed to make sure that their trip to MIT is as enjoyable and productive as possible. By creating an application to let users create, share, and follow custom tours of MIT, we hoped to make college tours custom fit to each person's taste, to make memories of MIT easy to record and share, and to make a platform for sharing tours.

RELATED WORK

There exist a number of products and applications aimed at making tour taking more exciting and enjoyable. Interactive exhibits at museums and college campuses aim to improve upon the tour taking experience by allowing tour takers to interact with what they are touring. These interactive kiosks often serve many tourists at once, and fail to provide a custom tailored experience to each user. Often, these interactive stations can get bogged down with traffic, resulting in long wait times which only frustrates the tourist.

There exist a few mobile applications that try to enrich tourism as well. Applications in this domain fall into two main categories: applications that try to replace the tour taking experience all together, and applications that try to supplement existing tours. Applications in the first category include the Library of Congress Virtual Tour, Canadian Museum of Civilization, and the American Museum of Natural History mobile applications.

Although these virtual tours allow more users to "explore" a tourist destination, they fail to replicate the experience of touring in person. A 3.5" to 5" screen is not a good way to replicate a tour.

Applications that try to supplement existing tours include: the Boston Freedom Tail, Walking Cinema: Murder on Beacon Hill, and LAT Star Walk mobile applications. These applications do take in the users position so they can serve them content when they reach specific locations, but they lack the ability to create and share custom tours made by other users. With these applications, users are limited to the content made by the developers. While these applications usually only provide users with information specific to one tour, Campus Sherpa allows users to browse and take many tours of MIT, as created by other users.

We also looked at the mobile applications Geotour, YouVisit, TourBuddy, and MyTours. Like the applications mentioned above, these applications failed to successfully complement the tour taking experience; however, we did take note of a few
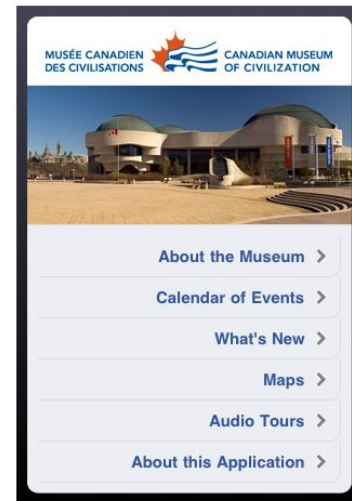

Figure 2. The main screen of the Canadian Museum of Civilization app. One drawback of this app is that it does not support user generated tours.

features from each application that we enjoyed and wanted to implement in Campus Sherpa. We enjoyed: Geotour's location triggered changes, YouVisit's audio narration feature, TourBuddy's tour builder, and MyTours' tour browser. Figure 4 illustrates the map feature of GeoTour that we really liked.

BACKGROUND

Motivated by the above observation, we first identified the types of people touring MIT. We decided that for the purposes of campus tours, we can broadly classify people as current students, prospective freshmen, parents, and tourists. In order to gather information about these groups, we conducted a survey of these four groups, with some questions common to all four groups and some tailored to a specific group. We reached out to tour groups, classmates/colleagues, and friends/family. Each participant was interviewed for approximately 15 to 20 minutes. Here are some of the questions we asked:

Everyone:

- What is the most memorable site you've visited here? Why?

- What is the one thing you most wish to see here? Why?

- Have you gone on a tour of MIT?

  1. Are there any questions the tour guide didn't answer?
  2. Did the tour take you everywhere you wanted?
  3. Did the tour leave out any place you wanted to see?

Current Students:

- What are three things you looked for when touring MIT?

Figure 3. The map screen of the Freedom Trail app. The app's user interface is well polished. However, it is tailor made for the highly specific Freedom Trail, and forces a user to download a very specific app for a very specific purpose, when a similar experience can be provided by a more inclusive app, thereby reducing the storage occupied by the app.

- What is one place that the tour didn't cover, which you think tourists should see?

Prospective Freshman:

- If you could ask a current student one question about MIT, what would it be?

- What aspect of MIT do you want explore the most?

Parents:

- What are three places you want to tour at MIT that you think your child might not want to?

- If you could ask a current student one question about MIT, what would it be?
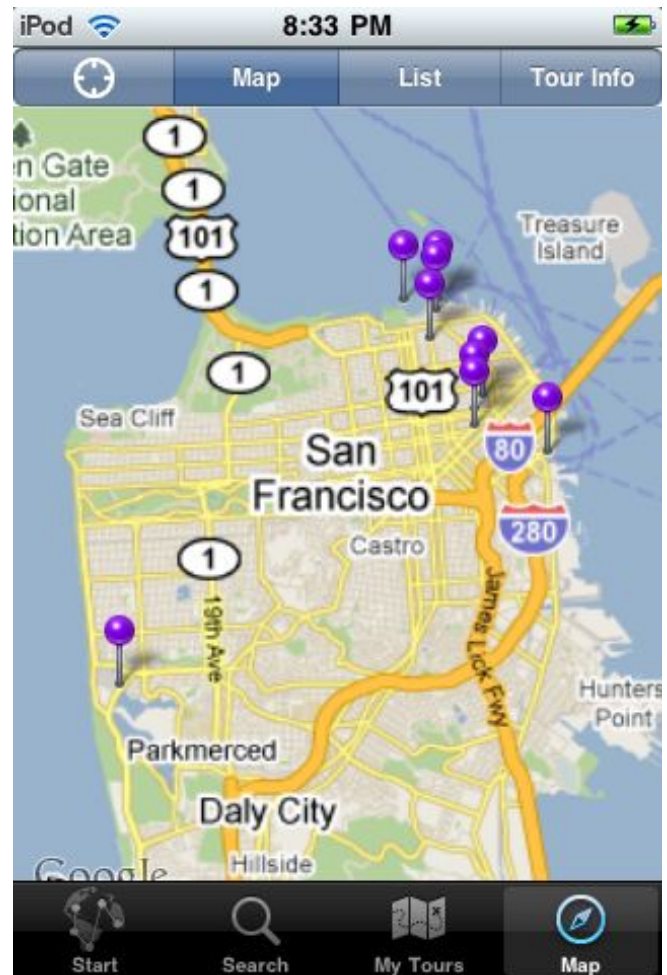
Tourists:

Figure 4. The map screen of the GeoTour app. We chose to incorporate a similar element in Campus Sherpa

- How long will you be visiting MIT?

- In a sentence, why did you want to come visit MIT?

Approximately twenty people responded to the survey, evenly distributed across the four demographics. Some of the responses to the survey are:

"There are always too many things to see . . . I am wishing I can see more later" (current student)

"Campus Preview Weekend (CPW) was really rushed, and I did not get to see everything" (prospective freshman)

"I wish I could get a better sense of MIT culture. The tour guide briefly touched on how each dorm was different, but did not go into detail. " (prospective freshman)

"I wish they had shown us where the students hang out " (parent)

"I wish I could get a better sense of MIT culture. The tour guide briefly touched on how each dorm is different, but didn't go into detail. " (tourist)

From the above responses, we saw that a common complaint was that people were not able to visit places they wanted to with the regular campus tours. In order to solve this problem, we proposed an application that helps create and share custom tours of the MIT campus called "Campus Sherpa".

Since smartphones offer location awareness and mobility, they are the obvious platform choice for "Campus Sherpa". By deploying this application for iOS, users can take out their smartphone when they arrive at MIT, select a tour based on their interest, and then begin exploring sites that will be most useful to them.

The second aspect of "Campus Sherpa" that we wished to support is to allow users to chronicle their tours and share them with others. As prospective students compare MIT to other schools or as tourists reminisce about their visit to MIT, the ability to record their tours (by associating locations with text, photos, videos, and links to related content) will aid them in remembering. For current students, this offers a way to record the precious memories they make at MIT and share them with others. Thus, the primary audience will be people who aim to tour MIT and record their experience there. The secondary audience will be current MIT students who would like to chronicle their lives at MIT.

While some MIT tours will be pre-installed, the majority should be user-created. Based on our own experiences and the responses to our survey, people have varied tastes and desired destinations when visiting MIT, and we aimed to make sure that their trip to MIT is as enjoyable and productive as possible.

By creating an application to let users create, share, and follow custom tours of MIT, we hope to make college tours custom fit to each person's taste, to make memories of MIT easy to record and share, and to make a platform for sharing tours.

SYSTEM DESCRIPTION
"Campus Sherpa" allows users to achieve two goals:

- Take custom tours

- Create tours based on experiences.

When users launch the application, they are presented with a screen (Figure 5) that lists all tours that have been created (by any user). If they would like to take a tour, they can select one from the list, and they will be directed to a "Start Tour" page (Figure 6), which includes a map of all of the locations on the tour. If any of the location pins are clicked, the name of the corresponding location is shown.

Once the user starts a tour, they are presented with a screen for the first location. The screen contains a picture of the location, two buttons for navigating to the previous location and the next location, another button that brings up a map with all of the locations (the same map from Figure 6), and a final button for the related media (Figure 7). The "Show Map" button has been included based on the field study - users indicated that they wanted to have access to the map of locations at all times.
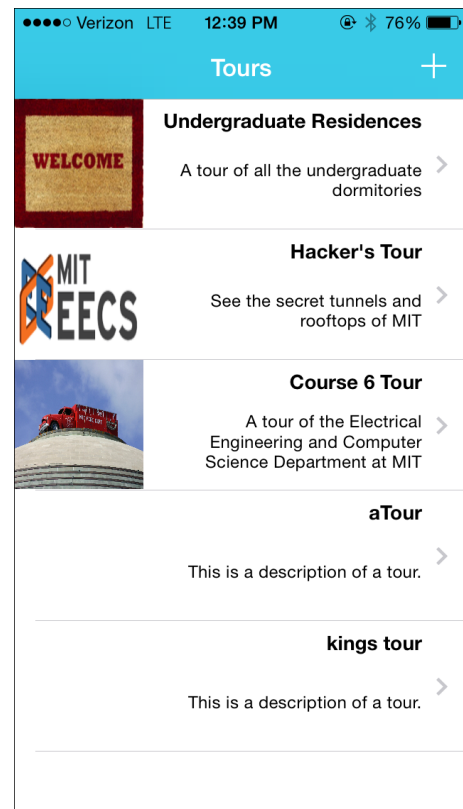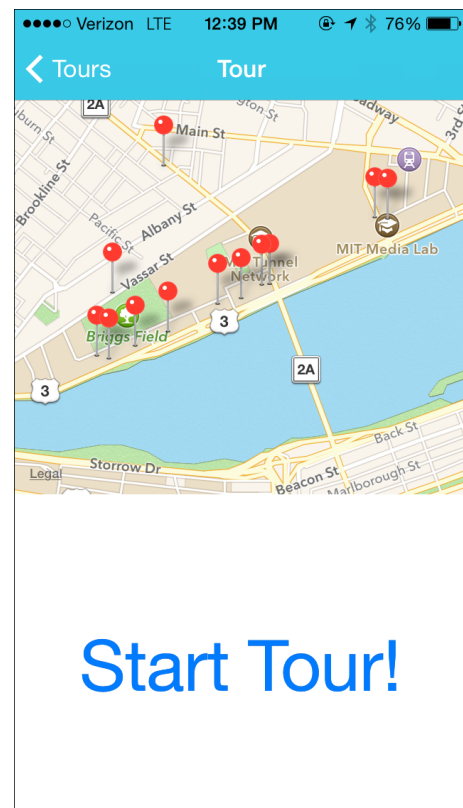

Figure 5. The tour browsing screen.
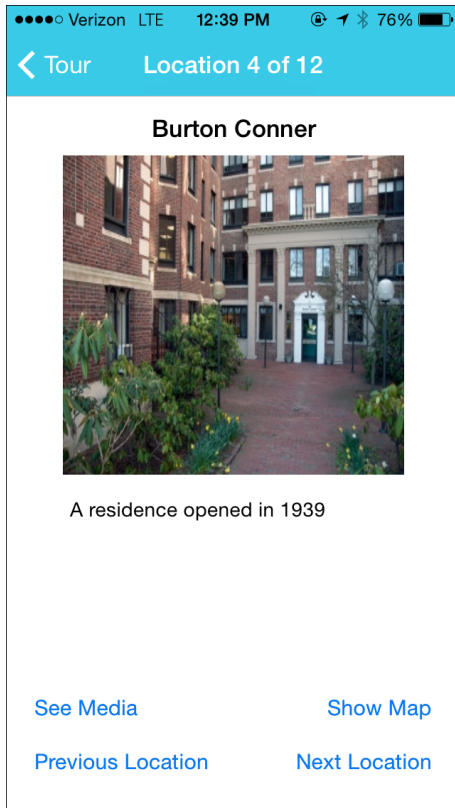

Figure 6. The tour preview screen.
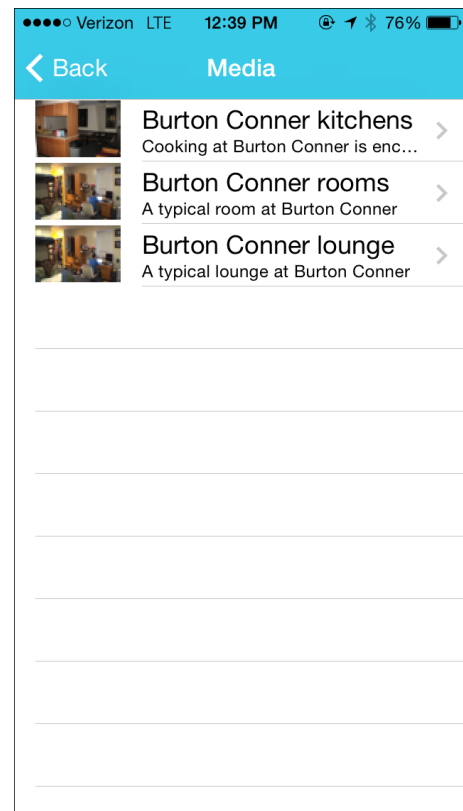
Figure 7. The location screen.

Figure 8. The media list for a given location. It can contain images and audio narration.

If the user clicks "See Media", then a list of media is displayed (Figure 8). The media includes images (such as pictures of the location) with descriptions. It also includes audio narration that can describe the locations. Based on user testing, we found that users wanted some form of audio in the tour. We experimented with text-to-speech and found that it sounded robotic and often mispronounced words. So, we decided to support audio narration instead, so that users can record descriptions of the location, which would be more natural than text-to-speech. The screen for listening to audio is displayed in Figure 9 (the screen for recording audio is similar).

The second part of Campus Sherpa is the tour creation aspect. Initially, tour creation was done in just two screens, but field testing showed that users were confused by the large number of UI elements on one screen. So, the app was update and tour creation was broken into multiple screens. For instance, Figure 10, asks the user to enter the tour name.

Then, the user enters the location. To simplify location entry, we either utilize the GPS to locate the user's location (i.e. "Use Current Location") or we allow the user to enter the address (i.e. "Use Above Address"). The address is converted to a latitude/longitude pair using the Google Maps API. The location entry screen is shown in Figure 11. By modifying the tour creation mechanism as described, users were able to create tours with less difficulty and were easily able to navigate through the app.
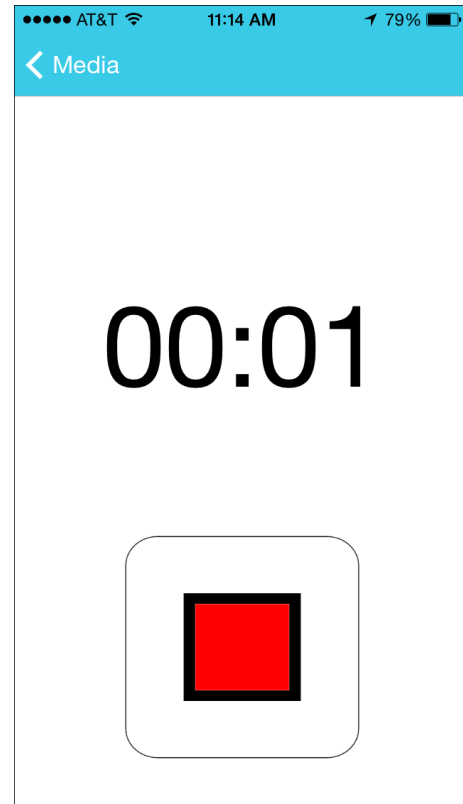

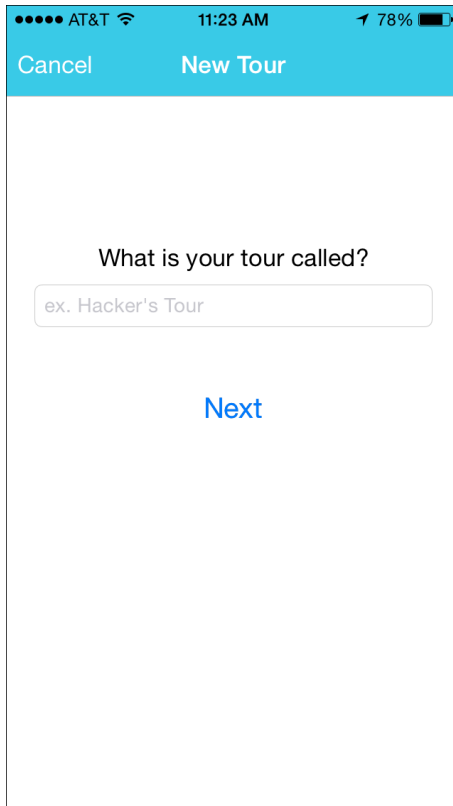**Figure 9. Users can record audio for tours.**

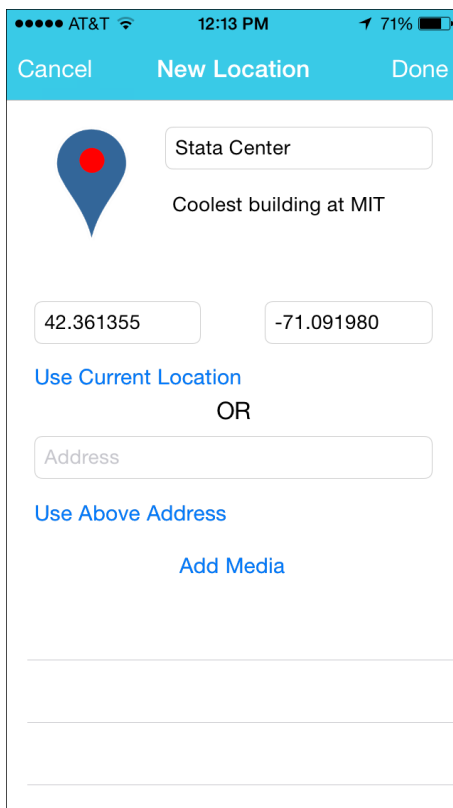**Figure 10. Tour creation is broken into simple screens**

Figure 11. Location entry via address or GPS

Technical Details

We use Parse for the backend. Parse is a backend-as-a-service which provides an SDK for iOS which allows users to persist objects in tables on the server. We chose Parse because it provided all the backend infrastructure we needed and it allowed us to focus on the interface and usability of the app. On Parse, we persist four kinds of objects.

- **Tour**, which consists of a name, description, thumbnail, and list of locations
- **TourLocation**, which consists of a latitude/longitude pair, name, description, thumbnail, and list of media
- **TourMedia**, which consists of a name, description, image, and audio.
- **Log**, which consists of a User ID, message, and time

We utilized Parse Analytics and Parse queries to analyze usage statistics and log messages.

The application is implemented for iOS 7 using the Objective-C programming language. The application is designed using native UI controls (paper prototyping showed that users were not able to recognize custom controls). The layout and navigation were designed in according to the Apple Human Interface Guidelines.

FIELD STUDY

Since our app is targeted at tourists of MIT, a demographic we did not have ready access to, we primarily focused on gathering information from two more available groups: iOS experts, who could critique the user experience of the app, and recent prefrosh (current MIT freshmen), who could asses the app's utility for prospective students. We had 4 students from each group take one tour (a brief tour of some locations in the Infinite Corridor) and make one tour, and we took notes on any difficulties they seemed to be experiencing while using the app. After they finished both tasks, we asked them for any feedback they had. We used a few standard questions:

- What additional features might it be useful for this app to have?
- Was any part of the user experience awkward or difficult?
- Do you see this app being useful in its current form to prospective tourists? What advantages would it have over tour guide-led tours?

We received a large volume of feedback. Some of the most common responses and insights follow:

- The "Show Map" screen (visible when taking a tour, looks much like Figure **??**) should have shown the pin for the current location in a different color.
- The keyboard on many screens was hard to dismiss – the iOS experts suggested converting many of the views to ScrollViews so that users could scroll down to see elements obscured by a keyboard.
- If one location has a picture and the subsequent location does not (when taking a tour), the subsequent location's

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picture is set to the first location's picture, causing confusion.

- The workflow for the make tour portion of the app was a bit confusing – the "Publish Tour" button appeared too early, so users sometimes clicked it before adding any locations to the tour.

- It would be nice if the app provided users directions to get one from one location to the next.

We modified the app to address the most common concerns of the testers. An interesting use case we discovered from running the field study is that many users actually like to step through tours in the app without actually moving physically from place to place. Thus, our app could prove incredibly useful to prospective students who are unable to visit the campus but want a sense for the rich variety of locations and sights at MIT. This use case could also help people plan what places they would like to visit during a trip to MIT. In essence, the app, if populated with a sufficient number of user-generated tours, could serve as a catalog of all of the interesting sets of related locations on campus.

After they tested the app, the testers were asked to fill out a brief survey consisting of the following questions, with responses being ratings on a 1-to-5 scale:

- How useful do you think this app would have been for you during CPW?, with 1 being "Don't think tours would have played a big role in my decision, or tour guide-led tours would have been more than enough" and 5 being "Seeing different parts of campus would have been crucial to my decision, and this app would have helped me with that"

- As a current MIT student, could you see yourself using this app to explore different parts of campus when you had some free time?, with 1 being "Not at all" and 5 being "Definitely"

- Could you see this app being useful to tourists who want to get a better sense of MIT?, with 1 being "No, there are much better ways to do this" and 5 being "Yes, this app could offer much more information than tour guide-led tours or other options"

With the second question we explored yet another use case – the physical tour for people who are already familiar with MIT in general but might want to explore a very niche part of campus. For example, there could be a tour with destinations popular for "hacking," which might include the roofs of various buildings and instructions on how to reach them. The results of this survey are plotted in Figure 12. The results seem to indicate that users are very optimistic about the utility of the app to tourists, but are more skeptical about its usefulness to prospective undergraduates. This is reasonable, as it sounded from personal conversations that the CPW experience is more about meeting other future students than exploring every nook and cranny of the campus. The strong response to our second question also indicates that the use case for people already familiar with MIT is legitimate.
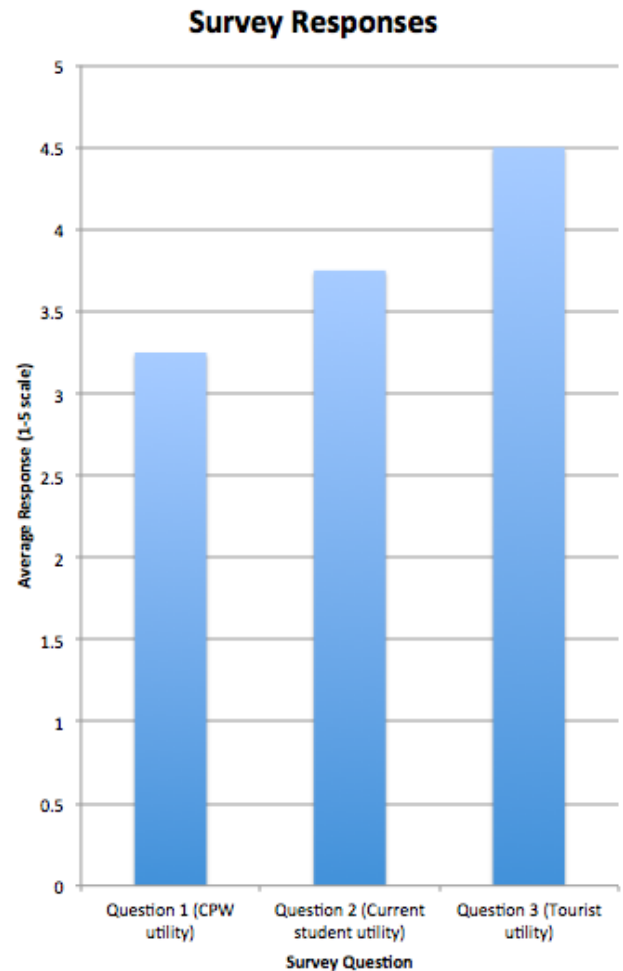
Figure 12. Average responses, on 1-to-5 scale, to our survey questions.

Log Message	Count
Started taking a tour	267
Opened media list	116
Clicked on media item	157
Going to next location	377
Going to previous location	594

Table 1. Log message counts over all uses of the app for the take tour segment

Log Message	Count
Started making a tour	114
Adding location to tour	77
Entered address for new location	12
Used current GPS location for new location	38
Opened add media view for new location	69
Taking new picture to add to tour	17
Choosing image from library to add to tour	13
Cancelled library image picker	5
Finished adding image to tour	37
Cancelled out of add image view	6
Finished adding location to tour	42
Cancelled adding location to tour	87
Cancelled create tour	49

Table 2. Log message counts over all uses of the app for the make tour segment

We also added quite a bit of logging to the code for our app. A summary of the logging output over all uses of the app by testers is shown in Tables 1 and 2. There are many interesting conclusions we can derive from this data. Starting with Table 1, we can see that the "See Media" button ("Opened media list") was clicked on at least one location in fewer than half of the cases where a tour was taken ("Started taking a tour"). This tells us that the "See Media" button should have been made more prominent.

Looking at next at Table 2, in many cases where a user started making a tour, he or she did not add any locations to the tour ("Adding location to tour", "Finished adding location to tour"). This further corroborates the suggestions of testers that we make the "Add Locations" button more visible on the initial make tour screen and make it more difficult to click the "Publish Tour" button without adding any locations. Furthermore, it seems that testers used their current GPS location to specify the latitude / longitude coordinates of a new location more often than they explicitly entered a street address. This indicates that they often physically walked to the locations they wanted to add to their tours, which seems reasonable considering tours are meant to cover only locations on the MIT campus. In addition, only a third or fewer of the created tours included any images ("Finished adding image to tour"). We intend for all locations, and certainly all tours, to contain at least one image, so it seems that we should make the add image / media forms more central to the tour creation experience. Finally, there were many cancellations of created locations, which suggests that editing the state of a partially created location was so difficult that users decided to cancel the location altogether and start from scratch.

DISCUSSION
TODO: Add Discussion

Future Work
As can be seen from the field study, although a number of the key objectives of Campus Sherpa were met, a number of improvements are possible.

From a technical standpoint, the user interface could be improved to make it look more professional. Although our UI has the advantage of being simplistic, with the addition of more features such as video, the UI might need to be reworked. For instance, to increase interface safety, a mechanism for managing tour creation (ex. save, undo, redo) could be implemented. Another technical improvement is the creation of our own backend for the app. For the purposes of the field study and initial deployment, we chose to use the Parse framework. Parse greatly accelerates the rate at which one can get an initial app deployed and running, and eliminates the need for managing the backend with its associated servers and databases ourselves. Moreover, Parse provides excellent data visualization and logging tools that greatly simplified the initial deployment of the app and the collection of data from the field study. However, as Campus Sherpa reaches more users, we believe it would be beneficial to switch to writing our own backend because of Parse's pricing and for the advantages of relying on our own infrastructure. Yet another advantage of using our own backend is that it makes the performance characteristics and bottlenecks of the app transparent to us. We did not receive any negative feedback regarding performance from our field study, but we do anticipate running into performance issues as the app reaches more users.

A relatively simple change that should help in making Campus Sherpa reach more users and improve their experience with it is the addition of video to tour media, since at the moment Campus Sherpa supports only text and audio. Video is a key element in most of the related tourism apps that we examined in the related work section, and the results of our field study as well as feedback from others suggested that we should include it. Another related feature that could be of great benefit to the visually impaired is the addition of text to speech capabilities to the application.

The next major milestone for Campus Sherpa is to create a recommendation system which suggests tours (or perhaps combine existing tours) that cater to a user's unique interests. This was omitted from this version of Campus Sherpa because 1) There weren't enough tours such that a recommendation system would be useful, and 2) The algorithmic and machine learning challenges of building a recommendation system were outside the scope of the class. Moreover, we felt that they were too complex for a proof of concept application.

In similar spirit to the recommendation system is the integration of popular social applications such as Twitter and Facebook. This will enable users and tour creators to utilize the existing vast reach of networks such as Facebook to advertise a newly created tour. The success of Campus Sherpa is closely tied to the spread of awareness about it, because with very few users, not many tours get published and with a lack

of good tours, the purpose of Campus Sherpa is defeated. We believe that social networks can play a critical role in making a large number of people aware of the app and its capabilities.

Another possible improvement suggested by our TA is making the user's location a more integral part of the app. Right now, the app can be run in "armchair tourism" mode, where a user simply sits somewhere and browses through all available tours. This is positive in some respects, since it allows users to view the available tours prior to experiencing them first-hand on campus. However, this comes at the cost of a loss in immersion. One way to address this is the creation of a new mode where users can take a tour "realistically". For instance, only tour locations near the user's current geographic location can highlighted, and the rest are grayed out.

Conclusion
TODO: ADD CONCLUSION

REFERENCES