ICE: Interactive Campus Envoy
Part 1: Understanding the Problem

[Brian Lee](#)
[Mark Richman](#)
[Jeanie Miskelly](#)
[Ted (Tianfei) Liao](#)

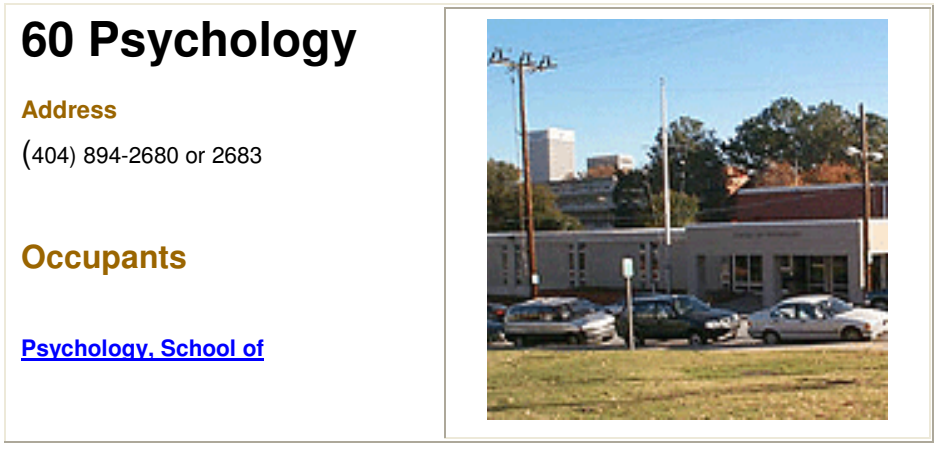
Overview

It is 4:55 PM on Tuesday of your first week at Georgia Tech. You have just arrived from Madison, Wisconsin, where it was 78 degrees. Here in Atlanta, the temperature is 96, the humidity is 90 and the blazing sun makes you feel as if you have landed on Mercury without a spacesuit. You have just activated your computer account at the Rich Building (#51A) and have five minutes to get to your Engineering Psychology class in the Psychology building (#60). You take out your Georgia Tech map and locate the buildings. You could walk along 4th Street, up Atlantic Drive, and cut over somewhere near the College of Computing, but it looks like a pretty long trek—and it doesn't appear to be a particularly direct way to the building. You don't want to give the impression that you're a slacker, especially on your first day. Isn't there an easier way?

The problem is getting from Rich (#51A) to Psychology (#60). It should be easy but it cost the author 20 minutes and a pound of sweat.

The Interactive Campus Envoy is designed to help students get around campus quickly and efficiently. Georgia Tech's campus poses a special challenge to the new student since many of its buildings are most quickly accessed via unnamed paths and alleys—byways that are learned through experience on campus but pose a mystery to the newcomer. Traversing these can get you somewhere quickly, or can get you lost in a hurry since many of the buildings on campus post their names on only one or two sides. Is that the College of Architecture, the Architecture Annex, or the Van Leer Building? There's no way to know without walking around it or asking somebody, that is, assuming there's someone knowledgeable around to ask. What if it is 7:50 PM and you're trying to make the opening curtain at the Ferst Center?

Some buildings don't even have a street address—as viewed by the entry for the School of Psychology (#60) on the campus map, which indicates an address of (404) 894-2680.



In any event, how useful are street names in getting from one place to another at Tech? Most of us travel the campus on foot and are better off with knowledge of the paths that connect the campus and offer more direct routes.

What if you have difficulty walking or are wheelchair-bound? Wouldn't you be interested in knowing the fastest way to get from one building to another without having to negotiate a staircase? You also might like to know which paths and sidewalks are wide enough to provide ample clearance even under crowded condition.

That's where the Interactive Campus Envoy comes in. We hope to address the following issues:

- How to get from here to there efficiently
- How to get from here to there when there's no one around to ask

- How to locate a department when you don’t know the exact name of its building
- How to get to an unfamiliar building
- How to locate a department when it has moved
- How to get around campus when construction or other obstacles renders a route inefficient or unusable

In addition, we may address situations such as helping people learn about and locate campus events, bicycle and wheelchair-friendly paths, locations of on-campus services such as ATMs, computer labs, emergency phones, and the like.

Once the envoy is in place, the campus will be at your service.

The Task

In general, finding the best way of "getting from here to there" embodies several characteristics. The user first has to convey to the information provider where he or she wants to go, which may be a location or an event. In the case of an event, the location of the event must be determined. The user also has to convey any special needs to the information provider. Such needs may include well-lit routes, motorist routes, and routes traversable by wheelchair.

The other major characteristic of the task is conveyance of a route back to the user. The user must be able to easily interpret the information and have it available until he or she has reached the desired destination.

Additionally, if a static map is being used for guidance, the user must perform more tasks, such as locating their current position and formulating a route. If the user has some information about the current state of the campus (i.e. areas that are unavailable due to construction), then it can be taken into account, but if that information is unavailable, then the user's route may not be optimal.

The Environment

Since the user is trying to find his or her way around campus, the environment is the campus itself, which provides a multitude of notable characteristics.

- *Campus Layout* – The Georgia Tech campus has both named and unnamed roads, short drives, and alleys. This means that the user cannot rely on road names alone, but may rely on landmarks and buildings to find his or her way around.
- *Lack of Prominently Displayed Building Names* – Building names may or may not be present, and of the present names, they may or may not be visible. Also, some buildings have confusingly similar names (the Student Center, the Student Success Center, and the Student Services buildings, for example). Users may not be able to use building names for quick localization.
- *Few Landmarks and Signs* – As one walks around campus, there are not very many signs to let you know where you are. Also, there are few landmarks that would be useful to a novice since they may require a bit of exploration to find or have unfamiliar names (the steam engine on Cherry Street or the “Burger Bowl”, for instance).
- *Mainly Outdoor Environment* – Traveling from one place to another on campus inherently carries one outdoors. The user may need to travel day or night, and in varying weather.
- *Presence of Other Students* – Usually, the campus will provide local experts in the form of students who know the campus well. This usually makes the user’s life easier, but if traveling late at night or on a weekend, there may be nobody around, so the user cannot rely on asking someone all the time. Also, different places at different times can be crowded and noisy, effectively making them undesirable to move through and impossible to stop and ask directions in.
- *Pedestrian Campus* – Georgia Tech is mostly a pedestrian school, and current construction and development of the campus continues to put emphasis on pedestrians and increased green space.

Task Analysis

0.0 Go from Point A (current location) to Point B (destination)

1.0 Determine Route

- 1.1 Identify Destination
  - 1.1.1 Identify Location Name
    - 1.1.1.1 Consult Destination Address
    - 1.1.1.2 Ask Someone
    - 1.1.1.3 Consult Directory
    - 1.1.1.4 Consult Map
- 1.2 Identify Current Position
  - 1.2.1 Analyze environment for known landmarks
  - 1.2.2 Ask someone current position
  - 1.2.3 Locate self on map
- 1.3 Convey Information
  - 1.3.1 Convey Desitination
    - 1.3.1.1 Convey Building Name
    - 1.3.1.2 Convey Destination Description
    - 1.3.1.3 Convey Event
  - 1.3.2 Convey Transportation Mode
  - 1.3.3 Convey Special Needs
    - 1.3.3.1 Request well lit route
    - 1.3.3.2 Request escort
- 1.4 Identify Route

1.4.1 Entire route method

1.4.1.1 Determine main pathways between current location and destination

1.4.1.2 Determine pathway from current location to closest intersection of main pathway

1.4.1.3 Determine pathway from destination to closest intersection of main pathway

1.4.2 Partial route method

1.4.2.1 Identify next landmark

1.4.2.2 Determine pathway from starting point to next landmark

1.4.3 Comprehend route

2.0 Travel Route

2.1 Determine travel direction

2.2 Travel along route

2.3 Identify landmarks to confirm on route

3.0 Arrive at Destination

Plans

Plan 0:

do 1.0 - 2.0 - 3.0 in that order

Plan 1.0:

do 1.1 - 1.2 - 1.4 if determining route yourself

do 1.1 - 1.2 - 1.3 - 1.4 if route is created by someone/something else

do 1.1 - 1.3 - 1.4 if someone/something else can determine current position

Plan 1.1:

do 1.1.1 if destination is not a specific location name

Plan 1.1.1:

do any of 1.1.1.1, 1.1.1.2, or 1.1.1.3 in any order. Repeat as necessary.

Plan 1.2:

do any of 1.2.1, 1.2.2, or 1.2.3 as available in any order. Repeat as necessary.

Plan 1.3:

do 1.3.1 - 1.3.2

do 1.3.3 if you have special needs

Plan 1.3.1:

do 1.3.1.1 if you know building name or

do 1.3.1.2 if you know event

Plan 1.3.3:

do 1.3.3.1 or 1.3.3.2.

Plan 1.4:

do 1.4.1 or 1.4.2, then do 1.4.3 in that order

Plan 1.4.1:

do 1.4.1.1, 1.4.1.2, 1.4.1.3, and 1.4.1.4 in any order. Repeat as necessary.

Plan 1.4.2:

do 1.4.2.1 and 1.4.2.2 in any order. Repeat as necessary.

Plan 2.0:

do 2.1 - 2.2 - 2.3 in that order. Repeat as necessary.

Existing Interfaces

A popular on-line campus map is found in the following website of Georgia Tech at http://gtalumni.org/campusmap/index.html.

This website shows a colorful map of the full campus, with schools shown in blue and service buildings shown in pink. A user can “zoom” in on a section, click on a building and learn its name and occupants. The website also features a search function where one can look up building and department names, which might be helpful for users who don’t know the exact name of the place they want to find. Despite its promise, this search function may be of limited use to new users, as will be examined when we look up a building.

The search function explicitly asks the user to enter a minimum of 3 characters. Entering ‘com’ returns a list of all buildings and departments that contain the letters “com” consecutively. This is a nice, useful feature that eliminates the need to spell out entire names and minimizes errors.

The website is inconsistent when indicating links. For instance on the main page, a colored font named “Current Construction Projects” indicates a link to another page, but a similar font just below is just a heading and takes us nowhere.

Getting There

Our task is to get from one place to another. How would someone use this to find a route from one place on campus to another? Without prior knowledge of the campus, one way to do this might be:

- Look up both buildings
- Trace a route from one to another

Let's examine this task using the online campus map.

Look up a building

Imagine we are at the "College of Computer Science.' We don't know the exact name of the department. First we try the following.

Search Building Names:
Type: "Computer"; Click "Search Campus Map"
Result: Another panel that says "Your search did not return any results Please try another search"

However, the panel that is returned does not show me what I just typed—so I don't know whether I spelled "Computer" incorrectly or whether no departments or buildings have "Computer" in their names. This error message doesn't provide me with proper feedback.

Look up building by occupant:
Type: "Computer"
Returned—A list of departments which include the word "Computer"
These are mouse-selectable. I select "College of Computing"
The following is returned:

50 College o Computing

Address

801 Atlantic Drive, N.W.
(404)894-3152

Occupants

Chemistry Annex

	Computing, College of Electrical and Computer Engineering, School of

After the building is found, the map zooms in on the section of the campus where the building is located. Its picture, index, address, and telephone number are shown to the right of the map along with links to the websites associated with the building's occupants.

The user is expected to scan the map for a building icon that matches the number of the building as displayed to the right. There is no explanation provided to direct the user to do this, violating two of Neilsen's principles—preventing error and reducing cognitive load.

A usability problem is revealed when the user tries to locate the College of Computing while looking at the entire campus map: nothing indicates the section in which the building was just located. There are no numbers on this map, so one can't locate building 50. There are no street names so we can't even find Atlantic Drive. Clearly we could use a bit more feedback.

The only obvious way to locate the College of Computing on the full campus grid appears to be the following:

- Return to the section map showing building numbers and take a close look at the building shapes
- Return to the entire campus map and try to match the shape of the buildings show to a shape on the map of the entire campus.

If the detail screen indicated which section of the map was being displayed, this problem could have been avoided. This violates the principle of minimizing memory load by making the user retain large amounts of information from screen to screen.

This process of locating a building as best as one can would be repeated for the destination.

Finding a Route

In order to find a route, a user would have to go back to the full campus map, locate the buildings as best as they can, and determine a route. However, since no street names are available on the full map, this is difficult. Paths are too small to be easily identified in this context. One might return to the zoomed-in version to identify the streets but this is inconvenient and requires memory load from screen to screen. Furthermore, after the map is zoomed in, there is no way to go from the current zoomed section to an adjacent section in order to determine a route.

Even if a route has been found, a user wouldn't know if he or she could drive there. For instance, one-way streets are not specified. It would be helpful if features were added to the website to highlight the paths by which people can walk and drive. If three-dimensional sketches of some buildings were included, it would make those buildings easier to identify while traveling and they could be used as landmarks.

Paper Map

This website is an online representation of a paper campus map. It is easier to find a route on the paper map because each building is labeled with its identification number, the entire map is visible even if it is large, and street names are available. However, buildings don't have three-dimensional representations and since paths are unnamed, they are not easily identifiable in the real world.

Conclusions

While this map may not be useful for people who are new to the campus, it can be very helpful to someone with some campus knowledge. Zooming in on a building would allow that person to identify other buildings that were nearby and precisely locate the area. The search function could clearly be improved to

minimize the problem of misspellings—both by finding similarly-named buildings and showing the user what he typed.

Information Gathering

Every person at Georgia Tech was once new to the campus. We have each had to familiarize ourselves with the buildings, street names, and pathways to find classrooms and offices. The ICE team has varied experience navigating the campus. Two of the team members have been here for less than one semester and often need to go to unfamiliar places; our own experience in doing so helped us formulate the tasks.

Each of us has experience using the campus maps and most of us have been called upon to give directions to others at Georgia Tech. Since beginning this project, we have also observed how people navigate their way around campus and what they do when they are lost.

In an attempt to understand the level of campus navigational skills of our potential users, we analyzed survey results from 53 students and faculty. The survey was distributed to four different classes: a graduate psychology class, an undergraduate computer science class which is required of all undergrad students at Tech, a graduate architecture class, and a Student Athletic Center options course.

To determine the types of handheld devices students on campus own, we conducted an oral survey. People were asked whether they owned a cellphone or a personal digital assistant (PDA), and if so, whether the device was GPS-equipped. Thirty-one people were asked in three different places on campus - at the Student Center, at the Student Athletic Center, and on the sidewalk between the Student Center and the library.

The statistics of the Georgia Tech population were from the Institutional Research and Planning's 2001 Fact Book.

Information about construction and beautification of the Georgia Tech campus was taken from the Campus Master Plan.

A variety of Georgia Tech campus maps were evaluated. We reviewed the 2002 campus map distributed by Institute Communications as well as many online maps, such as the Georgia Tech Alumni Association's campus map. We also looked at the virtual tour and a visitor's parking map.

Implications

So how does the information gathered on the target users help to guide the design of an interface? The most significant conclusion drawn from the data is that users prefer maps (online or paper) when trying to find their way around campus, followed by written directions, then oral ones. This implies that the best interface would be a map of some sort. Students surveyed seemed to learn their way around relatively quickly, but most indicated that it was not unheard of to need to go an unfamiliar place. Usually, when directions are needed, students use an on-line map.

The survey suggests that students seem to learn their way around campus well enough for their basic needs relatively quickly, and few of them carry around maps after their first semester. This implies that a stand-alone mapping device is probably not the best way to serve students' needs. Like the paper map, students probably wouldn't deem it useful enough to carry with them. This means that the interface should not require them to carry anything that they would not already have. Possible ways to implement such an interface would be with PDA's, kiosks, or cell phones, although the first two provide more options with maps. If a kiosk interface is used, however, they should be relatively closely spaced if they are to be convenient. The surveys suggest that students would prefer a PDA based interface, followed by cell phones; laptops and kiosks were also mentioned. The interface should also be designed to be availible to visitors so that, while they are not the primary target users, they can still take advantage of the interface if they choose.

As users become more familiar with the campus, they need assistance less frequently. When they do require help, it is usually when going to on-campus events for which they do not know the location or when giving directions to others. This means that a user will not need daily assistance, and ease of learning of the interface should be preferred in the design over ease of use.

Nearly any device would probably be usable by Georgia Tech students, since their statistics (high SAT scores and a large number of engineering and computing majors) suggest strong technical skills. Also, usually people in this demographic are more prone to have devices already that could have a campus interface incorporated into them.

Physical attributes of the users must be taken into account as well. Although the percentage is small, there are nevertheless students who, for one reason or another, require special consideration. For instance, those restricted to wheelchairs need some way to determine routes that are navigable by wheelchair. Another example stems from the relatively large male population of Georgia Tech with respect to the female population. We might assume that about seven percent of males are color-blind, so if seventy percent of the campus is

males, then about five percent of the campus is color-blind. This should be taken into account when actually implementing the interface. The possibility of completely blind users could also require an audio option.

The environment will also impact the design of the interface. It should be developed in such a way that it will satisfy the student's needs both day and night (full light and darkness) and in a wide range of weather (hot/cold/wet/dry).

Lastly, the language of the interface should be considered. Initially, we assumed that provisions should be made for a multilingual device, but according to the results of the survey, the demand is not sufficient to justify it at this time.