Team Optima

CPSC 4140

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Project Overview

Our project will be addressing the domain of “be a more efficient you” to identify and alleviate a common daily hassle that wastes time and reduces efficiency. We are interested in this domain because we think there are many common daily problems and difficulties that can be easily avoided or eliminated through the application of positive human-computer interactions. Being a more efficient person allows for less stress from unnecessary challenges, opens more free time in your schedule, and allows for a greater amount of energy and thought to go towards what you find more important. Trivial tasks such as identifying the best parking lot on campus to check on the way to class or work, the optimal route from one location to another, and finding a location to study that meets the environmental needs you have.

Users in the Problem Space

When the problem space is limited to just Clemson University, the three groups we identified are primary users, internal users, and external users. The primary users group includes faculty, staff, employees, students, alumni, student families, visitors, partners, and sponsors. The internal group includes the system technicians, Parking and Transportation Services, and maintenance. The external group includes shareholders and other universities. We also recognize that there are other factors that affect the problem space, including events such as football games, moving-in day, and moving-out day. The problem space can be expanded to a national or global scale and the groups will also expand to accomodate. The primary users group will expand to include all drivers that want to park. The internal users group will expand to include the owners or people in charge of parking spaces and people that service the system. The external group will expand to include people that interact with anyone that are not in the previous groups but still interact with them. These groups were determined from our survey data and research [1]–[5].

The groups may have members that are in multiple groups since some members have multiple responsibilities and everyone wants a more efficient way to park. The primary group will use the system to find convenient parking spaces faster and easier. The internal group will maintain the system or parking spaces. The external group may not interact with the system as much as the other groups but they will be affected by the system in some way.

Existing Solutions

Constructing More Parking Lots/Parking Garages:

A frequent topic into Clemson parking is about creating more space for commuters to park and the considerations of creating a structure such as a parking garage to have a large parking footprint in a fairly small space. As a growing campus, Clemson must address the higher demand for quality and straightforward parking on campus, however, as the university has grown the amount of parking has also grown as well with the incorporation of park and ride lots, lots adjacent to bus routes, and converting former freshmen lots into commuter. The main problem with this solution is it avoids the most common problem with parking and that is quickly finding a spot since there are many lots available, but the best tend to fill up early and there is no way to tell whether a lot will be full or not on campus over simply checking. This causes a greater strain on the road networks around here and wastes time because commuters have to commit time to browsing through a list of decreasing desirability of parking to ultimately find a spot when a solution that tracks the status of lots would simplify and expedite this process.

When talking about a parking garage solution, this is often very popular with students as it would allow for a large amount of parking in a small space but comes with the same problems that it is unknown if there are spaces available without checking. This also runs into the problem with campus planning since space on campus is becoming more valuable and lots are being relocated to accommodate for more building space on campus and this would be a very permanent structure on campus. The primary difficulty with this solution is although it is popular with commuters and students, it is highly unpopular with the alumni association here on campus and with a majority of the board of trustees who ultimately have to approve a project like this.

Priority Tier Parking:

Under this sort of a system, parkers (including students and faculty) are required to select a level of parking they would like and pay greater amounts according to how good they would like their parking to be. This helps to differentiate out the types of commuters on campus as it is expected that those who more heavily rely on it or don’t like the hassle will pay the greater fee for the better parking and those who do not will purchase the cheaper passes for more distant parking. The pros of this are that it gives some options to the people who are trying to do the parking and each lot is managed for different ratios of passes/spots based upon the frequency of use so there is a greater level of management for the experience of the commuters. Campuses that employ this type of system include Auburn [6] and Michigan [7]. Complaints to these systems at these universities are they allow for significantly higher prices and Clemson in particular enjoys some of the lower university parking prices for commuters. This sort of system also leads to a heavier reliance on the parking services systems ability to predict the use of lots, which frequently results in commuters being forced into far away lots, while there are many empty spots closer to where they would like to park and a purchase frenzy when it comes to choosing the lots you want as they fill up quickly.

Disallowing Freshman Parking:

This is an analog solution to the amount of spots on campus already being worked on as new lots are becoming available. Many universities completely disallow freshmen parking including Ohio State [8] and Stanford [9], which helps to alleviate the demand for parking by cutting down the population by over ¼ of the student population. However, it is notable that the universities that employ a policy like this are generally in more largely populated areas and Clemson very much does not match that aspect. It is also important to recognize that Freshmen on campus are already assigned to lots that are not particularly good for commuter parking and many park in lots off of the main campus. The numbers below show a comparison between commuter and freshmen parking.

	Freshman	Commuter
East Side	856	2559
West Side	1,301	2061
Total	2,157	4,620

Although the numbers look promising, very few of the lots that freshmen currently park in are good candidates for commuter parking, so the overall impact would be low as this has been a serious consideration for parking here. This also relates to the solution above in failing to address the problem for most commuters, which is more often being able to efficiently find a parking spot rather than the actual number of spots.

Cutting down on the number of Commuters with Alternative Transportation:

The university is heavily engaged in developing programs for alternative transit with such projects as BikeShare, the new Clemson bus contract, more bike lanes, car pooling services, increase ZipCar availability, and Park and Ride lots. Although this solutions help to alleviate the overall strain on the road and parking system here, it does little to improve the experience of those who still would like to drive and park on campus. These solutions are tend to serve small proportions of commuters relative to the number who park, so a large part of this involves convincing commuters to consider alternative transportation over their preferred method, which for many is to drive themselves. So we see it as a valuable consideration to improve that experience rather than trying to convince people it's so difficult that you need to consider other means of transit. These efforts are great, but still leave a large population of commuters with their issues largely unresolved.

Data Analysis

We collected data from both Parking and Transportation Services as well as a poll that was sent out to Clemson students that had questions that would help us get a better understanding of the problem, as well as some demographic information about potential users.

The survey made via Survey Money was sent out to many different student groups and we received 54 responses. The summary of each of the questions and their answers are below.

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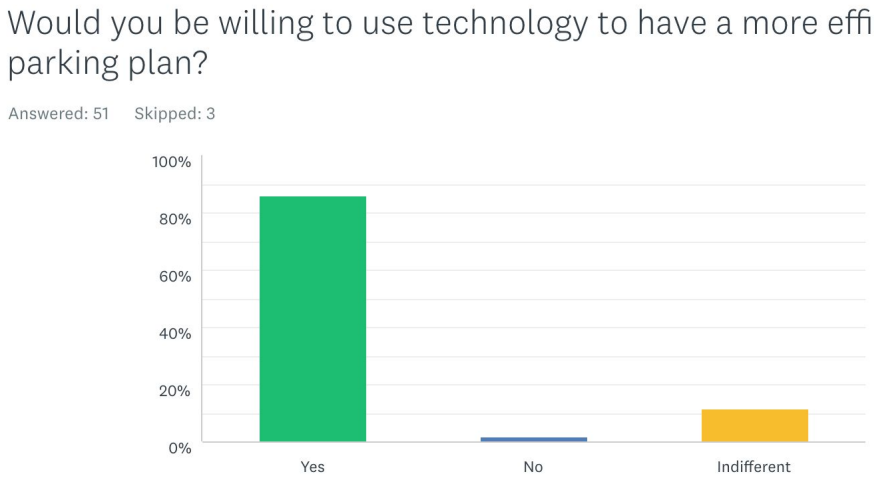
<td> 
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<td>86% of respondents said that they would be willing to use some form of technology.</td>
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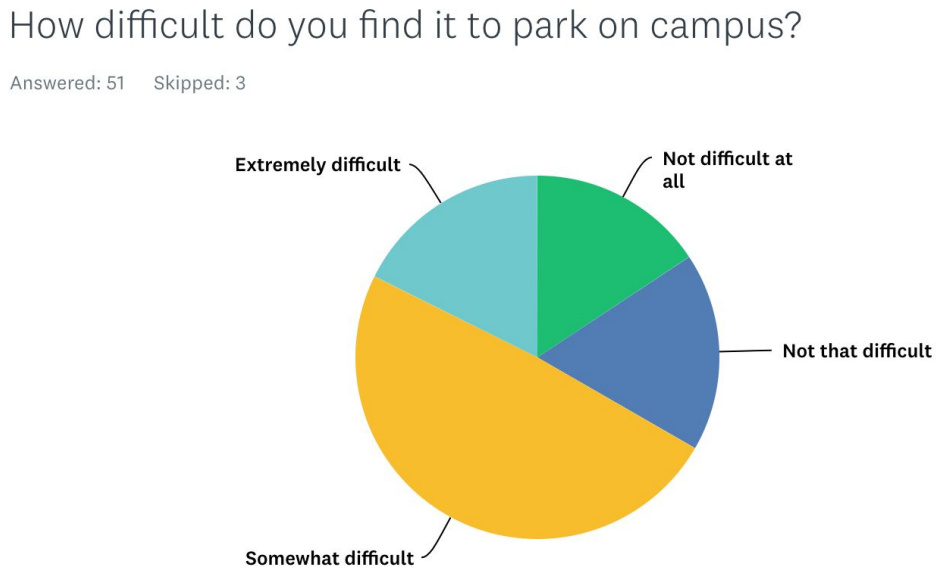
<td> 
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<td>2 out of every 3 people that responded said that finding parking is “somewhat difficult” or “extremely difficult” to do.</td>
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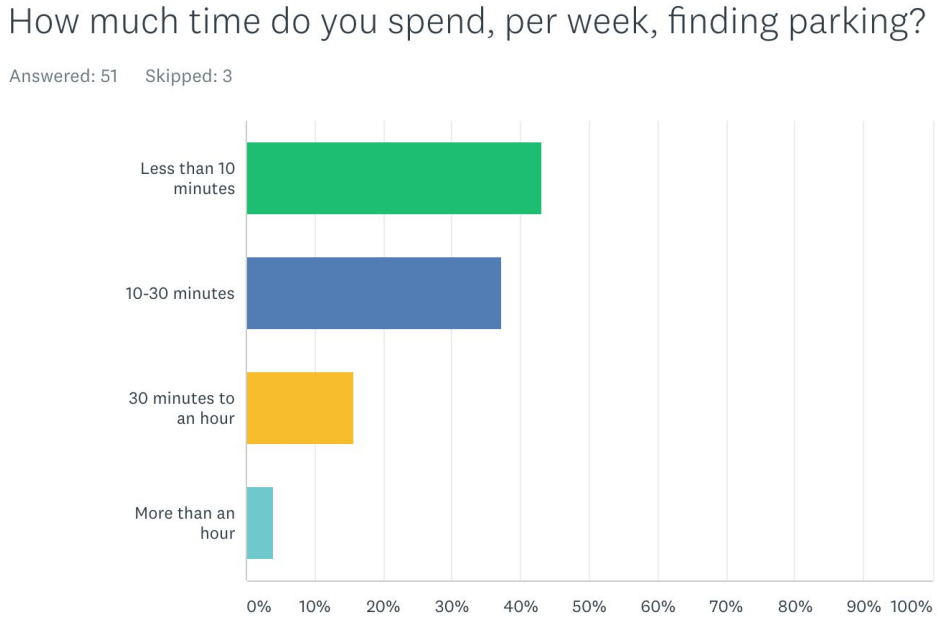


57% of respondents waste at least 10 minutes per week while finding parking.

19% spend at least 30 minutes.

Taking all of the survey data into account, it seems that there is a problem on campus with parking that students would be willing to use technology to help solve. In terms of user groups, a majority of survey respondents both have a “Commuter” parking pass (37%) and live 1-3 miles away from campus (37%).

Criteria for solution success:

A) System accounts for persons with disabilities
- Colorblind
- Blind
- Physical hindrance
- Deaf

B) System increases efficiency of parking on campus

C) System can be transferable to other environments or locations

D) System prototype works to the standards that are specified during the requirements phase

E) System innovates, and does not imitate

F) System does not pose potential safety problems

Task Analysis

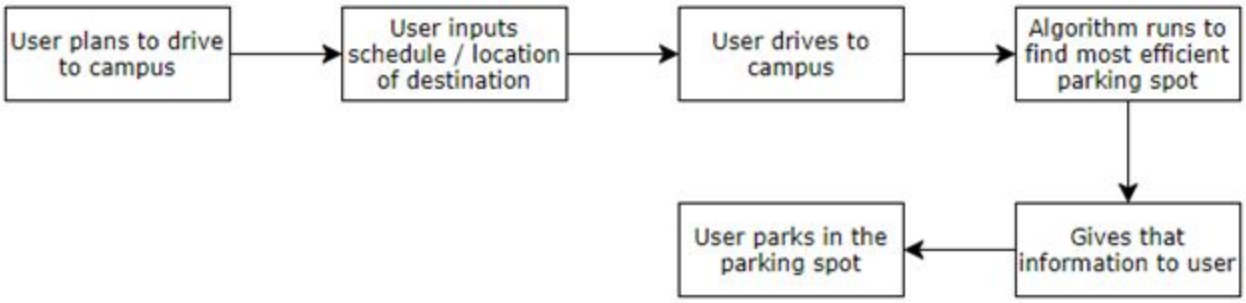
Important characteristics of tasks performed by users

There are a few tasks that a user would need regardless of how the problem is eventually solved. The most important task is keeping our solution safe. It's common knowledge that you should not be distracted when you are driving an automobile, so whatever solution we come up with should put safety as the most important factor. Secondly, to find the most efficient spot on campus users must know how to input a location or a schedule for our algorithm to work at its highest level. Whatever is developed needs to be easy to use and conform to the technological habits of today's users. The solution should make a meaningful impact on how people find their parking spots at Clemson. We will hopefully be able to make finding a parking spot on campus much less frustrating (faster) than it currently is [3].

Important characteristics of the task environment

The main environment our solution will be dealing with are the roads in and around Clemson's campus and the parking lots on the campus. Roads are dangerous enough as they currently stand, so we want to make sure whatever we make doesn't have a significant distraction on drivers. Heavy traffic events such as home football games will most likely put a strain on the system we end up developing so we have to be mindful of these events when we are creating our product [4].

Structured Task Analysis of the Problem



Functionality the system should provide

The system we develop will have a few functionalities that will exist no matter what we find from further research on how the system should be developed. It is safe to assume we will have to know the user's current location when they are driving to our parking lot. Where they currently are will allow us to guide them directly to the parking spot. We will also need to have some functionality for the user to input what parking permit they currently have at Clemson. Since there are restrictions on where you can park based on your permit and time of day, it is necessary to have that information so we can choose a parking spot that they are actually

permitted to park in. It is also safe to assume that the parking spot we give may be taken by another driver before the user reaches that spot. So we need to be able to have real time information on what parking spots are available and have our system recalculate the best spot in real time.

Moving Forward

We determined that parking is an area that can be optimized for various groups of people. However, we may have limited our scope too much by focusing on just Clemson University and broadened our scope too much by expanding it to globally. The main concern of our classmates was that the focus of the studio presentation was too narrow and too centered around a specific solution. We have since tried to do even more background research and will continue to do so in order to gain a full understanding of the problem space. Also, this problem may not need a technological solution and a technological solution may even be detrimental since users will most likely be driving while using it. Our plan is to take a step back and redefine the scope of the problem and determine alternative solutions.

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