CS/PSYC 6750. HUMAN-COMPUTER INTERACTION

"DRIVEWAY"

Development of the Optimal Parking Space

Searching System for the Drivers

Project Report #4. Evaluation

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AUGMENTED

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1. **Introduction**

Driveway connects people who own a parking space with people who need to use one. If a homeowner isn't using his driveway from 9:00am to 5:00pm while at work, then he can monetize its downtime by letting a nearby worker park there. If someone from out of town wants to park near a stadium for the game day, she can rent a local's driveway for a few hours.

This document presents and discusses our user evaluation of Driveway's interface for hosts. Our objectives for this paper are to not only describe the evaluation, but to also interpret and apply the results to our current design and how they would influence further development.

2. **Evaluation Method**

2.1. **Methodologies and Procedure**

The evaluation facilitator first briefed the participants on our concept, what we expect of their participation, and what data collection methods we used for the evaluation. We informed them that their participation was voluntary, that they could cease the evaluation at any time, and that their identification would be obscured and safeguarded.

The facilitator then stepped through a brief questionnaire that would contextualize their data and feedback during analysis. The participants then were asked to try completing tasks on the prototype. The seven tasks selected for this procedure were chosen based on how common a task would be in normal use, as well as evaluating whole user journeys. This allowed us to understand the user's mental model of our service through the interface. The facilitator set up the necessary conditions on the phone, starting from the app's home screen, and then asked the participant to reach an objective, such as adding a new parking space. Each of these were broken down into sub-tasks in the facilitators' notes. For each sub-task, the facilitator would note its completion time, number of errors and mistakes, and other observations. Users were also notified to attempt what they expected to be able to do in certain cases, even though affordances like text entry weren't programmed into the prototype. Otherwise, the facilitator urged the participant to make their best guess of how to reach the objective, rather than supplying explicit instructions.

At the end of each scenario, the facilitator ensured that all tasks were attempted and conducted a brief interview to learn whether they had any trouble completing a task. After all scenarios were evaluated, the facilitator conducted a semi-structured interview to learn about the participant's overall experience using the app, whether the participant found the service useful, and gather any further comments on the interface or service and its implications.

2.2. Evaluation Participants

Our two primary user roles are hosts and drivers. Hosts are people who manage parking spaces for others to borrow, and drivers are people who would park in those spaces. A single user may also take on both roles, but we are only evaluating the host's interface for this project.

For this evaluation, we selected participants only for the host role to use our prototype. These people had recently managed one or more parking spaces of three categories.

1. Personal parking spaces, such as driveways and front lawns. This is our primary use case, so we primarily targeted this category.
2. Assigned spaces, such as in a duplex parking area or apartment lot/deck
3. Commercial-scale parking areas, like mixed-use parking decks and very large lots. Since we did not design our app for this use case, we would only consider this for a sort of stress test if time permits.

The participants' parking space category influenced some phrasing in the questionnaires but were evaluated the same. It was more important for contextualizing the results.

2.3. Evaluation Scenario Tasks

We have considered eight scenarios so far, all of which being primary functions of our app with few overlapping tasks and these representative scenarios are further broken down into tasks. Table 1 summarizes the tasks for evaluation. For each task, we will take notes based on the participants' actions. These notes will help guide us for the brief structured interview to follow the scenario.

Table 1. Tasks Specification Table

Tasks	Task description	Seconds	Errors	Notes
Start the app	Open the app from the phone app menu			
	Log in			
Edit your phone number	Settings			
	Profile			
	Edit			
	Change input			
	Done			
Add a new space (complex)	Host			
	Add space button			
	Get current location			
	Next			
	Title			
	Photo			
	From			
	To			
	Done			
Change a space from closed to open	Host			
	Click space to edit			
	Click close			
	Done			
Call the person who just claimed your space	Host			
	Click name on space			
	Click phone number			
Close all spaces	Host			
	Close all spaces			
Delete a parking space	Host			
	Click space to edit			
	Click delete			
	Ok to confirmation			
Log out	Settings			
	Log out			

2.4. Evaluation Materials

i. Development of Prototype

We developed an evaluated prototype interface using, "AppCooker", which allows us to easily administer different high-fidelity scenarios on an iPhone 5. When users were unfamiliar with using an iPhone 5 or smartphone, a brief tutorial was enough to let them use it sufficiently.

ii. **Pre-Questionnaire**

We recorded their responses to verbal questionnaires via Google Forms and our observations on Google Sheets. The pre-questionnaire just to get some general information the user before the user does working through the interface. Table describes the pre-questionnaire for evaluating our concept, "Driveway".

Table 2. Pre-Questionnaire

1. **Name** (Just used to match to scenario spreadsheet)

2. **Do you have, or have you ever had, a personal parking space anywhere that you have some claim to or control over?**
   > (1) Yes
   > (2) No
   > (3) Other:

3. **How many?**

4. **How would you describe your parking space(s)?**
   Ex coding (1): personal, driveway/lawn (2): assigned, lot/deck (3) commercial-scale

5. **Have you ever used the following services or something similar?**
   If the user has used another similar service, add it to "other"
   > (1) AirBnB as a host
   > (2) Couchsurfing as a host
   > (3) Lyft as a driver
   > (4) Uber as a driver
   > (5) Other:

iii. **Post-Questionnaire**

After the evaluation, we conducted a post-questionnaire to get any subjective feedback. This questionnaire is going to ask a few more open-ended questions

about Driveway's usefulness, how easy it was to use, and how you felt about the whole experience and concept. Table 3 illustrates the Post-Questionnaire.

Table 3. Post-Questionnaire

1. Do you recall any serious issues with the tasks we asked you to perform?

2. Did you find yourself making any mistakes or errors?

3. When someone rents your space, would you want to be able to contact them directly (e.g. phone) or them contact you? How, or why not?

4. Were the options for scheduling a time to open your space okay? Would you prefer a different way of scheduling it?

5. Did you have any other privacy concerns?

6. Would you accept payment for hosting your space?
   If so, what methods would you accept?

7. Overall, would you use this service?
   If so, how many of your spaces would you manage with it?

8. Did anything seems missing? Any steps or options that would be important for such a service?

9. Do you have any other feedback, comments, or questions?

3. **Evaluation Results**

3.1 **Results of Pre-Questionnaire**

We picked up 3 students in Undergraduate Clough and the other 3 students in TSRB. A half of students had or have ever had a personal parking lot anywhere that they have some claim to or control over (Figure 1).

Yes	4	57%
No	2	29%
Other	0	0%
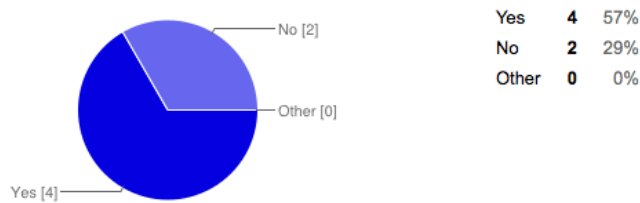
Figure 1. Result of Experience of Having Personal Parking Space

Among them, there are not anyone have one more parking space. They have only one space. Among suggested three coding: (1) personal parking lot, (2) assigned and (3) commercial parking, Only personal space had 33 percent, parking lot assigned or locked had 50 percent (Figure 2).
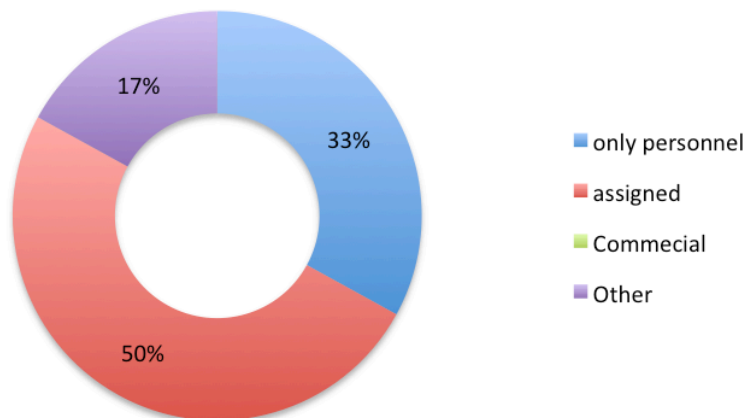
Figure 2. Description of the Shape of Parking Space

In addition, there is only one person have experience the similar services with other concept, "driveway". The respondent had couch surfing as a host.

3.2 Results of Walk-Through

Table 4 shows the results of those six students'walk through for usability testing.

Table 4. Results of Tasks Walk-Through

Users		User1	User2	User3	User4	User5	User6
Tasks	Task description	Sec	Sec	Sec	Sec	Sec	Sec
Start the app	Open the app from the phone app menu	1	1	1	1	1	1
	Log in	1	1	1	2	1	1
Edit your phone number	Settings	1	2	1	1	2	1
	Profile	1	2	1	1	2	2
	Edit	1	11	1	1	2	1
	Change input	1	6	2	1	2	1
	Done	1	1	1	1	2	1
Add a new space (complex)	Host	1	2	1	10	1	20 (Error1)
	Add space button	1	2	1	1	1	0
	Get current location	3	3	3	4	2	12
	Next	11	2	1	3	3	10
	Title	1	4	1	0	2	5
	Photo	1	1	1	0	2	5
	From	3	1	1	1	2	5
	To	3	1	1	1	2	5
	Done	1	2	2	1	2	3
Change a space from closed to open	Host	1	1	1	1	1	1
	Click space to edit	1	3	1	1 (Error 1)	1	1
	Click close	3	10	2	4 (Error 3)	3	5
	Done	1	1	1	1	0	5
Call the person who just claimed your space	Host	1	1	1	1	1	1
	Click name on space	4	0	1	6 (Error 4)	0	20
	Click phone number	1	1	0	3	1	2
Close all spaces	Host	1	1	1	1	1	1
	Close all spaces	5	1	1	2	1	3
Delete a parking space	Host	1	1	1	1	1	1
	Click space to edit	1	1	1	1	2	2
	Click delete	1	2	1	2	2	3
	Ok to confirmation	1	1	1	1	1	3
Log out	Settings	2	4	3	2	2	16
	Log out	1	1	1	2	1	3

3.3 Results of Post-Questionnaire

Table 6 describes the results of post-questionnaire after conducting walk-through.

Table 6. Results of post-questionnaire

1. Do you recall any serious issues with the tasks we asked you to perform?

- Straightforward, limited choices, well guided. Remember this is an exclusive iOS user
- Logging out should be possible from any screen at the top (she does use android), add my profile to the top. On push notification, she expected to see the details about the person rather than go to the space select screen. She also wanted to approve the claim rather than being able to undo it (calling him)
- Knowing to click the person's name to get that person's info, he's seen it on other apps, but his initial expectation was to open the space and get the person's info there
- Nothing (3)

2. Did you find yourself making any mistakes or errors?

- Knowing that "host" was where she'd find spaces, but it makes sense after she found out
- Often, she's a new smartphone user, and she expected, search button
- Missing the blue button (Peter Parker) was not clear, and he mistook the "close space" button as being closed when the toggle was grey (not green).
- Nothing (3)

3. When someone rents your space, would you want to be able to contact them directly (e.g. phone) or them contact you? How, or why not?

- Would prefer an anonymized or obfuscated messaging. This is definitely necessary, though.
- Assuming that she's approved the space, she wouldn't expect that to be a big deal, phone or text for other reasons. She understands the anonymity, but she's not for either way in particular
- Both phone & texting, not going to a business, so it's ok to share the number.
- Text or email similar to Craigslist would be the best. Anonymized would be preferred, but he's already trusting a stranger to park in his driveway.
- Would prefer in-app messaging, but calling would be good, too. Concerned about giving out his phone number. Having all info in the app rather than using multiple apps would be easier to him.

4. Were the options for scheduling a time to open your space okay? Would you prefer a different way of scheduling it?

- Would prefer a gird calendar first, then time selection.
- It's fine
- Typical with iOS
- "No, It makes a lot of sense".
- Didn't notice the "all day button" for a future day

5. Did you have any other privacy concerns?

- Comfortable with logging in via email, "easy to change quickly". Googlen't known to store info youshare, same with facebook, so i wouldn't feel as open to using that considering it's her address and she doesn't post of that anyways. "I'm super paranoid"
- Has shared number via email from Craigslist ad after verifying the person is for real
- She would probably not use this because she doesn't want people to know her address. She would use this within a particular circle of acquaintances or friends.
- None (3)

6. Would you accept payment for hosting your space?

If so, what methods would you accept?

- If the community were important and helpful, or if he were getting out of it what he put into it, or if there were a service points system, he'd do this for free. Otherwise he'd prefer an integrated e-payment, but he'd also possibly do cash at the door.
- She would feel odd accepting payment from friends. Would probably accept payment from an acquaintance. Would prefer remotely, but she's not totally against in-person exchange. If it's in-app, then there's a better paper trail / history.
- Payment only, only remotely, Venmo or any direct money transfer app
- Prefer, exclusively remotely, would not have to wait around to meet up. No preference of integrated or separate. Would prefer Paypal and Venmo, not Bitpay
- Payment optional, students looking for a chance to make some money, paypal would be easy for her, would rather do payment through this app, she's familiar with venmo? Mailed cash, skeptical of meting in person.

7. Overall, would you use this service?

If so, how many of your spaces would you manage with it?

- His roommate has used something similar. Would definitely use this if he had a space to lease. "Great idea" when parking is really limited despite lots of driveway spaces.
- App
- She would use it not so much in a suburb but in a city "horrible parking" didn't decide to buy a parking pass, boyfriend's parking space at nearby apartment, stays nearby
- She would only use it for pocket money, but doesn't want to encourage dangerous strangers. Not likely to use it in general.
- Likes the idea of the concept of both hosting and getting a parking spot if it were cheaper in the city or more convenient, Would like to not necessarily schedule but locate parking spaces, then pay there.

8. Did anything seem missing? Any steps or options that would be important for such a service?

- If there's an approval process, then she should be able to claim several spaces, go to one, and cancel the others that didn't get approved.
- Did not notice an ability to "emergency cancel" a request, expects "close space" to do that with current options. Wants a button that says "cancel reservation" if she needs to do that.
- It's fine for basic functionality.
- None (3)

9. Do you have any other feedback, comments, or questions?

- She would rather do it remotely rather than in person, fear of being robbed if in person. Everything is where she expected, "overall very effective"
- When closing a space, the whole space button should be greyed out, or maybe a little transparent. Would be good to have ratings; he would trust the user verification (vouches) a little more than "verified by driveway". Both would be good, though.
- "Idea is great"
- It would be very important that the parking spot were some place safe. Very wary of being baited. She's also suspicious that people would sockpuppet their account with vouches, so being verified by driveway would be more important to verifying the person.
- Cool idea, similar to Uber and Lyft,

4.   Evaluation Discussion and Improvement

There were two buttons that frequently confused participants (Table 5). Figure 3 shows the problem of the button "Peter Parker" for conducting task "Click name on space".
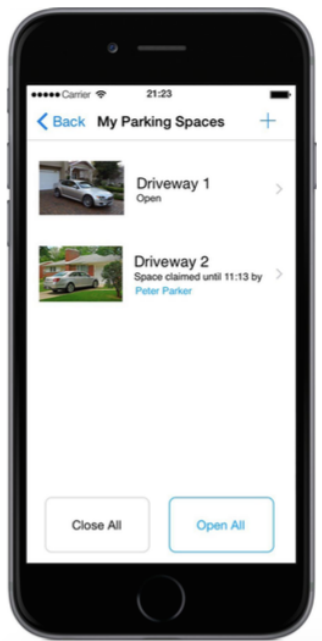

One was the link to a person's profile on top of the button for the space to be claimed. Although we had designed it similar to the official iOS style guide, which used the common blue text color to indicate a link, people were confused when they clicked on any other part of the button and did not see any information on the person who claimed the space. One participant expected to see the person's information on the space page rather than a separate profile page as we had designed. Others either clicked it by accident (they had clicked the button several times in different places) or gave up and required the facilitator to direct them.

Figure 3. The problem of button

We can conclude from this that layering buttons in such a way is a very poor design choice. It could be redesigned such that the button for the profile page appears separately from the rest of the button. Either way, it would likely be most beneficial to also include a link to the person's profile on the space's screen, as well immediately useful information like phone number and the time it was claimed.

Table 5. Number of Note on each Task

Tasks	Tasks Description	Number of Note
Add a new space (complex)	Host	2
	Add space button	1
	Get current location	1
	From	1
Change a space from closed to open	Click space to edit	1
	==Click close==	==**5**==
	Done	1
Call the person who just claimed your space	Host	1
	==Click name on space==	==**5**==
	Click phone number	2
Close all spaces	Close all spaces	3
Log out	Settings	2
	Log out	1
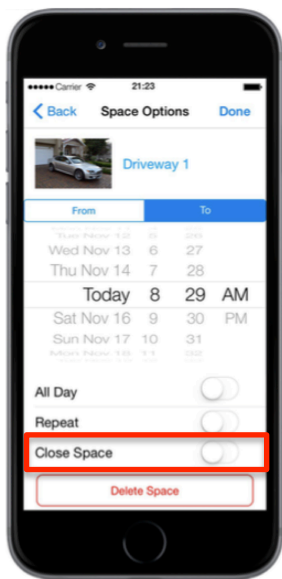
Another button that caused issue was the "close space" button when editing a space. Figure 4 shows the current "Close Space" button in our design. The function was to allow users to keep the space logged in the app, but making it unable to be claimed by others. We designed it such that the user would toggle the "close space" option on and off; however, the word choice seems to be what most confused users. They expected it either to be toggled on for "closed" or that being already toggled off meant "open". In fact, we had designed it the opposite way, leading users to mistakes.

Figure 4. Bad design of "Close Space" Button

Perhaps a better choice would be to rephrase the label from a verb to a state (e.g. "Availability") and the toggle switch to include both color and text (e.g. green and "open", grey and "closed").

An interesting commonality between participants is that they were less concerned with sharing their personal information, like phone numbers for contacting each other, than how they would accept payment. Most participants wanted to handle transactions only remotely, not in person. Many cited security reasons, like being "baited" to a place where they could be robbed. Users were generally very interested in the idea and overall satisfied with most of the app. Our results show that our experience design worked well with their mental model of the service, judging by the task completion time and follow-up interview.

5. Future Works

Our interface design had a few glaring flaws, notably the two buttons discussed previously. Correcting those flaws would be our primary technical concerns moving forward with actually implementing the prototype as a fully functional application. It would also benefit from having a web app interface, since the user is not necessarily mobile. Incorporating both the hosting and space-seeking user experiences was the primary motivation for designing this as a mobile app in the first place. However, hosts may prefer to administer their open spaces from their laptop at home, so a non-mobile interface may be more useful.

Since our service's interaction design seemed to be well received, improvements to the service would be largely concerned with payment and better discovery options. For example, we may integrate a payment method like Paypal that would allow hosts to associate a history of people parking in their spaces with a Paypal transaction receipt. Otherwise, payments would happen in a separate system, handled entirely between the host and parker.

Our prototyping software, AppCooker, scaled well for our complex user journeys, but it required the prototype to be well in control of its organization. It was a very useful tool for the two members of Team AR that did not have a design or user interface programming background, but it did get somewhat complicated to manage the many different interactive affordances and how they changed the user journey.

6. Development Business Model

Driveway is a mobile environment-based application, so users can access this app through a tablet or smartphone. In addition, it should be integrated with map or navigation applications to help take the user to a parking space. For these reasons, Driveway could make a relationship with Google as a key business partner, using their Maps app. Most users would have a smartphone and a car and would be familiar with map applications on Android and iOS. These markets could be a key source of potential users, supplying our application to the public market. In addition, these markets can help us to more easily access customers.

Driveway is based on concepts similar to Airbnb and Couchsurfing. These concepts can make revenue from commissions on deals between host and customer. Our application has similar revenue streams. The customer can be described as drivers who drive their cars and need to park their cars without wasting time. Therefore, we can create our value from their activities on the application. The users can get easily available parking space at a low cost. This is our simple business model for Driveway.

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