

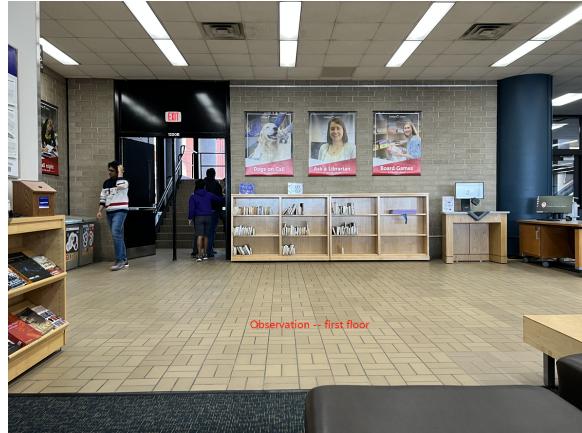
PROJECT 2: NOVEL INTERFACES

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# PROJECT 2: NOVEL INTERFACES

## INTRODUCTION

The main goal of our body interaction project is to improve the efficiency of finding seats for all students. University libraries are always popular places for students to go and spend time learning there. However, the libraries are always full of people, especially during exam week. Sometimes students require to spend lots of time finding a relatively good place to study. At the same time, university libraries always have different sections and levels. All these factors may cause students hard to find a seat they like. As a result, we decided to assign the setting to the College Library of the university. An AR map should be helpful to save time on finding a perfect seat for every student. It is a system that can direct students to find study places based on their personal preferences. Which could increase the efficiency of finding a seat or a specific room in the library and doing their work in a short time. Besides, if there is not enough seat for more students, the system could notify them about that which could prevent students waste time in this library.



Setting on the first floor



The second floor - open study area



The second floor - open study area

# PROJECT 2: NOVEL INTERFACES

## INTRODUCTION



The third floor - open study area



The second floor - computer area

When we reach first arrived there. College Library generally has three primary levels for students to use, and it also has different sections, for example, quiet room, study room, open area, and computer room. Besides, compared with another popular library, the Memorial Library, which only has very few seats and some private study rooms, it is hard to observe students' activities. On the contrary, the College library has an open area at each level for us to observe students' choices in selecting a

floor, a seat, and a section. Besides, students' choices can be marked by their movements (each section of the library have a relatively large area, so long as students have a clear moving direction, it is easy to know where they want to go).

As a result, based on the large area of the setting we chose, our primary goal is to analyze how different functions of the different areas of the College Library affect students' seating preferences.

Then design an AR system to improve users' experience in a library. The system we design should have several properties: distinct (each student can tell what is navigating them), accessible (can be used in a short time).

## PROJECT 2: NOVEL INTERFACES UNDERSTANDING

Generally, we followed the principles of ethnography which are holism, descriptive, and members' point-of-view. Above all, we observe participants' activity in the setting we chose, the College Library. As a result, this activity is meaningful for us to observe. We checked every floor and observes how people act differently as a whole, for example, how many people stay on this floor, and how many people leave. Then, we something notice some people didn't finish their activity in a short period of time but walked to different areas. We just apply "descriptive" to study and record what they did and marked some points we don't understand. In order to apply the last principle of ethnography, we used the points we recorded and do the interview. Use the interview to understand the activity in participants' eyes, then understand how it acted in their world.

For the process of students looking for a seat in the library, we made a rough guess and classification of the students' behavior in advance. The data we collected includes but is not limited to students who stay on the first floor, students who remain on the second floor, students who choose to share tables, students who go to use computers, etc. Then we observed for about ten minutes on the first, second, and third

floors of the library. During the observation, we roughly recorded the situation of students and added possible new categories of students. We also observed the behavior of students after finding a seat, considering that students may have made appointments with others to meet in the library or other conditions exist. However, due to the limited number of students and technical reasons, we cannot count every possible student in detail, so we only count the students' stay on this floor, which is divided into stay and find a seat, stay but Didn't choose a seat and left, didn't stop.

For some students who seem to be extraordinarily hesitant or very decisive, we will conduct interviews after waiting for them to find a seat. We interviewed three students/groups in total. Through open-ended interviews, we first guessed their seat-seeking patterns. For example, they went upstairs because they didn't see a seat and didn't want to share a table, or they went straight to the seat because they made an appointment with a friend. Then we will ask the informant how to find the seat, such as how you will act when it is full. During the interview process, we obtain the consent of the interviewee in advance and record the conversation using a mobile

# PROJECT 2: NOVEL INTERFACES UNDERSTANDING

phone, which is then transcribed into an Excel document.

Based on the comparison of the data of students staying on the floors, combined with the specific situation of each floor, we roughly analyze the students' seat selection tendency and possible situations. Then, through the factors of the informant's choice of seats obtained from the interview data, we can finally get the general logic of students' choice of seats.

14	Field note		
15	Observation on the first floor(14:00 - 14:10):	Most people choose to turn right and go upstairs. Very few of people will choose to stay in the first floor although there are many available seats. Some group of people chose to stay in the first floor, it is an open area. As a result, they choose to seat there to do the group project, because they need to discuss. Some people come here directly and looking for their friends or group member. The social relationship affect people's choice here.	Most of group will choose the open area, our "system" could recommend them to the open area as long as they enter the library.
16	14:00	14 people come in and go to the second floor directly, and one person out.	Different people have different preference
17	14:01	one person come in and check his phone about something, then he looks around and goes to the second floor. A group of people come in and one person said "let's go to the second floor"	First floor is not that popular
18	14:02	12 individual peoples come in and only one chooses to sit in the first floor	
19	14:04	6 people come in and go to the second floor, one person is waiting on the couch	
20	14:05	a group of 5 people come in and walk around on the first floor	
21	14:07	this group of people go to the second floor, 2 group of students come in and go to the second floor or third floor	May be all open area are popular for groups
22	14:08	two people come in and ask people who are waiting on the couch. They also check the table on the first floor. Then leave the first floor.	
23	14:09	16 people come in, 15 people go upstairs and one chooses the quiet room on the first floor	The seat in quiet room of the first floor doesn't have many seats
	Observation on the second floor (14:10-14:20):	I was sitting on the entrance of the second floor computer area on the left, open area behind and quite area on the right most. Most of people (70%) come here will go directly to the open area, which is behind me. However, it always full of people. And 20% people choose computer area 10% choose quite area. As long as people cannot find a seat in open area, most of them choose to go up the stairs and few of them choose the quite place. Here shows people's preferences. Especially for more than two people come together, they will choose the open area, they may students have the same class, the open area allows them to discuss some questions. However, some people choose to leave as long as they saw the second full of people.	Individual people and groups all prefer the open area than computer room, then quiet room
24		In the second floor, I chose to interview a person who chose the seat in open area. (nickname: Jackson)	
25	14:10	one person comes in and goes to the computer area directly	
26	14:11	8 people come in and find a seat in open area. 3 people go to the computer area, 4 people go to the quiet room	
27	14:12	3 people check the open area first, then leave to quiet room	
28	14:13	3 people (a group) checked the computer area first, then came back to check the open room and found a seat there. 2 people go to the computer area and find a seat	Computer doesn't work for a relatively large group
29	14:14	1 person checks the open area first, then computer area and open area again. At last, he finds a seat. 6 people chose the open area.	
30	14:16	2 people come in and check the open area really quickly and then go upstairs	What they saw first affects their choice
31	14:18	1 person comes in and out without checking any area and then goes up the stairs. 3 people come in and go to the quiet room, 7 people go to open area.	
32	Observation on the third floor(14:20-14:30):	Same like the second floor, most people choose the open area, then computer area and quiet room. However, most people didn't choose to leave and go back to the second floor even though there were only a few seats left that they did not like very much.	Similar like the second floor
33	14:20	6 people come in and find seats in open area	
34	14:22	5 people come in, 3 people go to open area, 1 person goes to the computer room and 1 goes to quiet room	
35	14:23	5 people come in and go to the computer room	
36	14:24	13 people come in and 10 people go to open area and 3 go to the quiet room	
37	14:27	2 people come in and go to the quiet room together	
38	14:29	2 people come in and find seats in open area	

Figure 1. Zhiwei's fieldnote

# PROJECT 2: NOVEL INTERFACES UNDERSTANDING

60	Field note		
61	1st floor	Almost all of the seats are occupied. Sofa is empty. A student came in and went upstairs without hesitation. A student went to Cafe.	
62		The two students came in together, looked around and went upstairs.	
63		A student came in, went straight to the seat, and started a conversation with the person in the seat.	Find the friend!
64		A student came in and went up to the second floor after a circle on the first floor.	At this time, there are still a moderate amount of free four-person tables on the first floor.
65		The three students went up to the second floor after a little discussion at the door.	
66		A student went straight upstairs.	
67		A student came, looked around a little, and sat down on the sofa.	(?)
68		A student came in and left immediately.	
69		Their area is almost full.	
70		The two students directly found a seat in the outer area and sat down to communicate.	
71	2nd floor	A student went straight to the computer area and sat down	
72		The three students went to the silent area together and found three adjacent positions.	
73		A student turned right to the computer area.	
74		Four students went to the innermost study room.	There are a lot of people, and individual seats are generally not selected.
75		A student went upstairs after looking around for a while at the top of the stairs.	
76		A student went straight upstairs.	
77		One student sits at the same table as another student after questioning.	There is no communication. Guess sharing a table.
78		Only about 35% of the seats are occupied.	
79		After a student came, he found a seat and sat down.	
80	3rd floor	One student waited for a while at the door and took a seat with another student.	Friends are here!
81		Five students found a table with fewer people around and moved a stool.	
82		A student chooses a seat after walking around.	
83		A student went downstairs after walking around.	
84		A student sat directly in the nearest empty seat.	
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Figure 2. Yiyang's fieldnote

	A	B	C
59			
60	Field Note		
61	First floor	70% seat occupied	
62		Three student directly go to an empty seat	No preference of seats
63		Two students wait for a while, seems looking for an empty table	
64		A group of students, wait for a while, seem looking for an empty table, go to the second floor	Talking with his friend, try to find the seat where his friend sit
65		One student, wait for a while, talk with other people through phone, go to the second floor	
66		One student directly go to an empty seat	
67		One student, wait for a while, go to the second floor	
68		Three student, stop a while near the guiding map, seem confusing, go to an meeting room	Difficult to find the meeting room
69		One student directly go to an empty seat	
70		One student directly go to the second floor	
71		One student, stop a while near the guiding map, seem confusing, talk with the people in front desk, go to an meeting room	Difficult to find the meeting room
72	Second floor	60% seat occupied	
73		One person go to the third floor	
74		One student, come from the third floor, go directly to an empty seat	Try to find a seat in third floor, failed, go to second floor instead
75		A group of students, wait for a while, sit in an empty table	Empty table available, might had a reservation in a study room
76		A group of students directly go to third floor	
77		Two students wait for a while, go to an empty table	
78		One student sit in the seat that close to window	have strong preference
79		Three student directly go to empty seats	
80	Third floor	40% seat occupied	
81		Four student directly go to empty seats	
82		One student choose an empty table	
83		One student wait for a while, and meet with his friend	unable to find his friend in library?
84		A group of students go the study room	
85		A group of students sit in the table	
86			
87			

Figure 3. Bowen's fieldnote

# PROJECT 2: NOVEL INTERFACES UNDERSTANDING

39	I took an interview with a student who go directly to the second floor and went the open area at the beginning then go to the computer area then open area.				
40 1	Q: Did you check the seat on the first floor?	personal preference			
41 2	A: No, I always go the second floor directly, the second floor is my first choice.				
42 3	Q: Could you explain why?				
43 4	A: Compare with the first floor, the second floor have more privacy.				
44 5	A: The entrance is on the first floor and a lot of people come in and out. There are too much distraction for me, I am a people who cannot take much distraction.	The entrance affect people somehow			
45 6	A: Besides, there are not much seat in the open area, many some of them are always reserved although that looks unoccupied as long as I enter the library, but I know that always happen.				
46 7	A: Then I seldom choose to check there and have a seat there. Besides, the area beside the stair is more like a cafe area.				
47 8	A: Coffee shop and vending machine are distraction for me. People always walk around there. Moreover, food smell is the biggest distraction, of course.				
48 9	Q: When you arrive the second, I saw you go the open area directly, could you explain that?	personal preference			
49 10	A: Yes, it is very obvious for me, may be for everyone.				
50 11	A: It just in front of me, and my eyes will check that as long as I open the gate of the second floor.	The location also affect people's choice			
51 12	A: Besides, I like the atmosphere there, everyone doesn't look like stressful, and they are talking about their project or assignment.				
52 13	A: Doesn't like the quite room there, everyone looks stressful and have lots of work to finish today. I really come here during the weekend. I want a easy atmosphere. By the way, the view here is nice.	personal preference			
53 14	Q: Then why you go the computer room?				
54 15	A: Actually, I come here today with my friend and he said he is on the second level and I am looking for him.				
55 16	Q: Could you explain why you go there?				
56 17	A: I thought his first choice is the open area as well, so I check the open area first. I didn't find him at first there, so I thought he will be computer area.				
57 18	A: After all, it is not allowed to talk in quite room, so I just go there after I check the open area.				
58 19	Q: Could you please give an example what kind of people will go to the computer area at first?	personal preference			
59 20	A: Maybe people who need computer to do some work, and STEM major students. I have to say that two screens are very convenient.				
60 21	Q: Then why you come back from computer area and go to the open area again?				
61 22	A: I didn't find my friend there either, so I choose to recheck the open area to make sure I checked all seat there.	It is hard to find a specific seat without navigation, there is no number or something for a seat			
62 23	A: My friend give a very vague location. The second floor is not that small. There are lots of people today as well. It is hard to find him though.	A function called find friend would be helpful, social context part			
63 24	A: There only the instruction about different area, but no map for a specific people or seat.				
64 25	A: I wasted lots of time of finding my friend today.	This activity affect the efficiency			
65 26	A: Actually, when I come alone, I also spend time on finding a seat.				
66 27	A: You know, many exam week, quiz week or group project week occasionally.	will worse sometimes, for efficiency part			
67 28	A: The seat are limited, and most people prefer to have a whole desk, I guess. Because I prefer sit alone.				
68 29	A: Sometimes I think that is awkward to sit the place that already occupied.				
69 30	A: So I seldom choose to sit with people I don't know although there is no other available seat in the open area.				
70 31	Q: Tell me about a time when you have to share a table with others.				
71 32	A: You know, during the exam week, especially the final week, there is no seat in library.				
72 33	A: But I really like the atmosphere here, so I usually try to walk through the whole library first.				
73 34	A: Make sure that there is no seat is available now, then I will try to share a table with others.				
74 35	A: Of course, I will ask them does they mind or not. Actually, I believe everyone will say "no they do not mind at all".	people's preferences may not visible or real			
75 36	A: I will say that as well, although that is not my really feeling. Say no is too mean.				
76 37	A: I mean, everyone comes here for studying, it is ok to share the table physically, but not ok psychological.				
77 38	Q: Emmmmm, I see.				
78 39	Q: So where exactly you choose to share the table with other, under condition that no available seat at all. I mean.				
79 40	A: It is strange, you know.				
80 41	A: After I check all the seat, I should in the third floor. Then it is reasonable to share a table with people in their floor.				
81 42	A: However, I still chose to go back to the second floor. The open area.				
82 43	A: I don't know why, maybe it is my first choice all the time. I guess.				
83 44	Q: Could you give a example when you reserved a study room?				
84 45	A: yeah, I always make a reservation online.				
85 46	A: However, you know, there only a number of the room you reserved.	Navigation system for finding a room			
86 47	A: It is still hard for people who never use that room before.				
87 48	A: You know what, since I come here one years ago, I never use the map before.				
88 49	A: And I even do not where the map is. It there? Oh no. I have no idea where that is.				
89 50	Q: Maybe a distinct map will be nice, right?				
90 51	A: Definitely, as you can see, I even don't know where the map is.				
91 52	A: However, I think the map only useful when people want to find a specific room, like study room they reserved.				
92 53	A: For most of people, they are just come here and find a preferred seat.				
93 54	A: Besides, the seat doesn't have a number or something else which cannot be directed.				
94 55	A: People also choose their seat randomly to some extent, most of seat cannot be reserved. It generally base on the situation they come here.				
95 56	A: Then a static map of works for people who have a clear goal				
96 57	Q: Alright, I see you point, thanks a lot for your time!				
97 58	A: No problem!				
98					
99					

Figure 4. Zhiwei's Interview

## PROJECT 2: NOVEL INTERFACES UNDERSTANDING

1	(Skip the greeting and confirming interview section)	
2	Thank you for taking the time to cooperate with our interview.	
3	It's no big deal.	
4	So.....Let's get start?	
5	Cool.	
6	Do you often come to the library?	
7	Ehh, not usually, maybe once or twice a month.	
8	So when you came here, did you find it hard to find a seat?	
9	(Look around)	At this point we are on the second floor.
10	I can actually find the seat...but I have to walk a little bit each time.	
11	So how did you find your seat?	
12	Wow, that's a big question to answer.	
13	It's true, so let's change the question, did you stop and look for a seat on the first floor?	
14	No, I went straight to the second floor.	
15	The reason is?	
16	I haven't really thought about it...	
17	(brief silence)	
18	I guess it's because there are no many seats on the first floor, so I am used to going directly to the second floor.	
19	OK. Is there any tendency when you choose your seat?	
20	What do you mean about tendency?	
21	En, like, the seats with computer or near windows.	
22	Oh, I understand.	
23	So, any?	
24	Let me think.....I always take my own computer so I don't need it.	
25	But the seats there is quite expensive.	
26	What? Really? I will try next time!	
27	(laugh)	
28	I prefer the seat near windows.	
29	Anything else?	
30	Stay away from the door or aisle.	
31	It was really noisy with people walking around.	Interviewees prefer quiet places when in the library
32	Yep. And I prefer places with no people.	
33	Then why don't you go to the third floor	
34	Sometimes, if there is no seats here.	
35	Climbing one more floor is tiring.	
36	You find the point.	
37	If there are really a lot of people, would you be willing to join a table, like a table for four.	
38	Maybe not, I don't like that feeling.	
39	Then you just go home?	
40	Why not?	
41	(laugh at the same time)	
42	OK. Then if you see your friend, will you go and sit with him or her?	
43	It's possible, ah, but only if my friend is also sitting alone.	
44	Got it. It's hard to get along with strangers.	Interviewees are reluctant to socialize with strangers
45	That's true.	
46	So do you think the library has improved your learning efficiency?	
47	To be honest, not really. Like, I just came out to walk around and then I think, why not go to library and sit for a while.	
48	Sounds more like a café.	
49	There is indeed one on the first floor.	
50	I remember there are a few more seats over there.	
51	Indeed there is, but...	
52	Eh-huh?	
53	Can you really learn well in the smell of coffee and food?	
54	No.	
55	You see.	
56	OK. I think that's it for today's interview. Thanks for your cooperation.	
57	Has it ended?	
58	Yeah. Thank you!	
59	You're welcome.	

Figure 5.Yiyang's Interview

# PROJECT 2: NOVEL INTERFACES UNDERSTANDING

		Annotation
1	Interview Transcript	
2	Interviewer excuse me do you mind to do an interview with me	
3	Interviewer we are gathering ideas about the project that we are currently designing	
4	Participant sure	
5	Participant what kind of question do you want me to answer	
6	Interviewer first I must apologize for observing you without notifying you	
7	Interviewer but I noticed that after you'd reach the third floor, your seems are looking for something	
8	Interviewer do you mind to explain why	
9	Participant I'm looking for an empty table for the discussion	
10	Participant and since there are multiple available table, I'm trying to decide which table should I choose	choose a table based on preference?
11	Interviewer okay got it	
12	Interviewer and I'm assuming that there are no available seats on the 1st and the 2nd floor	
13	Participant yeah I'm trying to look for a seat on the first floor but there are no available table on the 1st and the 2nd floor	
14	Interviewer have you checked all the individual areas in the first and the second floor	
15	Interviewer I think there are several rooms that have many tables	
16	Participant yes I did	
17	Participant I even go to the computer room to look for available seats	
18	Participant there are so many separate areas in the library, sometimes it's difficult to check if there are available tables	
19	Participant I hope there is only one public area for each floor so it will be clear to see if there are available table in this floor	
20	Interviewer yeah I totally agree	
21	Interviewer I think it would be much better if you're able to know if there are available table in advance	
22	Interviewer in that case we don't need to spend time on checking each rooms	
23	Participant yeah definitely, I have wasted about 10 minutes on look for an available table	waste time on searching for available table
24	Participant I think in the next time I will directly go to the third floor	
25	Interviewer yeah that are always a lot of available seat on the third floor	
26	Interviewer I think it's mostly because people don't want to climb stairs	
27	Participant yeah, the next time I will definitely willing to do so	go to the third floor is not always an optimal solution, but doing so can save time
28	Participant it's much better than to spend times on searching for the seats	
29	Interviewer Sure thing	
30	Interviewer another thing is, you said that you want have empty table to hold a discussion	
31	Interviewer do you mind to tell me what are the people that are going to a join this discussion	
32	Participant well, it's just a bunch of people that have met in class	
33	Participant we are planning to discuss the class material and prepare for the exam	
34	Interviewer how do you get to know those guys	
35	Interviewer I mean under the covid people are keeping social distance and its kind of difficult to know some of your classmates	
36	Participant yeah, I agree. Those guys are my classmate in some of the classes that I have taken, so I got to know them before the class begin	people are welcome to have study partners
37	Participant but for another class, I barely know anyone and it's kind of difficult to review for the exam without any help	people are having a hard time on finding classmates to study together
38	Interviewer Okay, let's change to another topic	
39	Interviewer supposed you're coming to library alone	
40	Interviewer how would you choose a seat	
41	Interviewer I mean do you have any preference or you're okay to sit wherever is available	
42	Participant well I don't think I have a preference on which seat to choose	
43	Participant oh wait sometimes I will choose the seat with the computer and screen to work on the project	
44	Participant also during the weekend I come to the library to read a book in the seat near the window	
45	Interviewer oh you mean a seat on the second floor, the one near the large window and the lake view	
46	Participant yeah is a nice place to relax and do things other than study	
47	Participant but during the weekdays, you don't have much choice on the seat	choose seat based on preference(only during the weekend)
48	Participant I will choose any place that are available	
49	Interviewer got it	
50	Interviewer in extreme circumstances, for example there is no seat available, would you choose to share a table with others	
51	Participant Well, I hardly ever meet that circumstance	
52	Participant But in that case I'm willing to share a table with others	
53	Participant Sorry but I need to guide my friends to this table	
54	Participant do you mind to help me save the seat for a while, I will come back in a minute	
55	Interviewer sure, but why don't you just tell your friends the position of the table so they can just come over here	
56	Participant well it's kind of hard to describe where I am, I mean the table do not a number or something	hard to describe and find a specific table
57	Interviewer okay got it	

Figure 6. Bowen's Interview

## PROJECT 2: NOVEL INTERFACES UNDERSTANDING

We applied the “Fly-on-the-wall” observations technic to collect data. We sit at a table near the entrance of the College library and observe students’ behavior without interrupting them. To be specific, we focus on decisions that students make on finding a seat for themselves. During the observation, we write the field notes to record the action pattern of the students. Our observations and interviews show that students have a variety of preferences in finding a seat. For instance, some students prefer the seats that are close to the window, and some students do not want to share the table with other students. For the students who have a strong preference in picking a seat, they are willing to spend more time searching for a preferred seat. There also are students who do not have much preference on the seats and are willing to choose any available seat.

1. For the students who are not familiar with the structure of the library, they may find it difficult to locate a specific study room. In College Library, there are maps that can guide students to find the study room, but there are neither maps nor signs to help students to locate a specific table. For students who want to work with their group

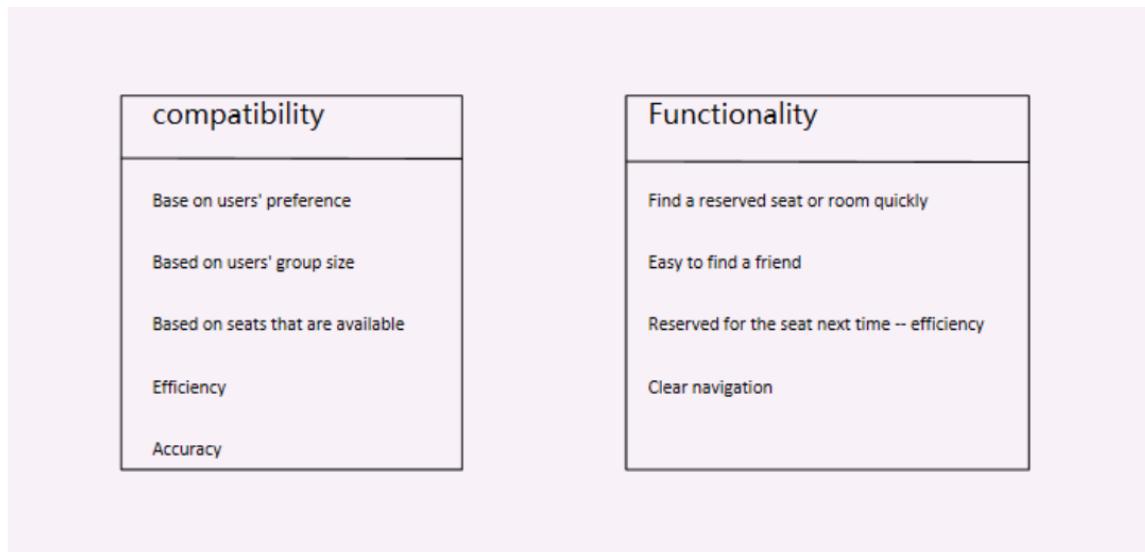
members at a table located in an open area, it is hard to describe the position of a table to other group members. They can only use a rough position of the area to describe where they sit, like the “left corner.”

2. Students will waste their time finding a table or seat that matches their needs. For example, some students may want to hold a group meeting with others at a table that is located in a common area. However, students need to search every room on each floor to find such a table, which is time-consuming and inefficient.
3. Students come to the library to complete homework, work on group projects, review materials for the exam and prepare for the class. While some students prefer to study individually and do not like to share the table with other students, there are still a considerable amount of students who want to work and study with their classmates.
4. For the College Library, a student can use an online reservation system to book a study room. However, there is no way to book a table or an individual seat. There are students who want two adjacent

## PROJECT 2: NOVEL INTERFACES UNDERSTANDING

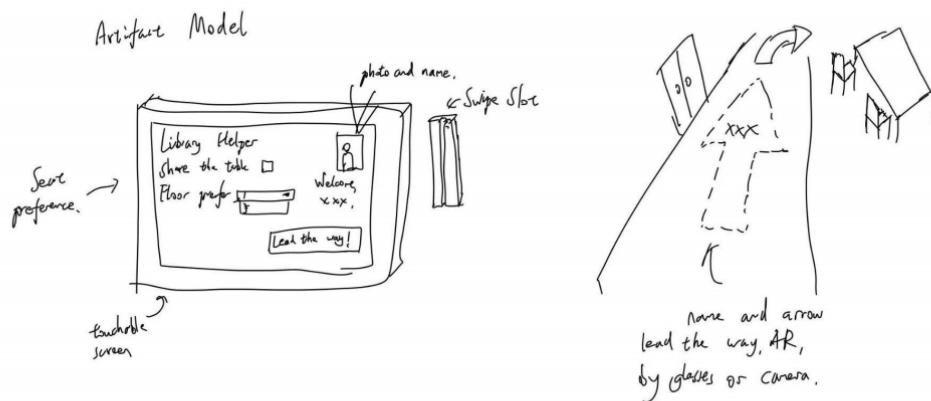
seats for themselves and their friends. Also, due to the limited number of study rooms, a group meeting will have to take place at a table in the common area. It is frustrating to find that all the tables are occupied after students arrive at the library. For a group of students who did not reserve a seat in the open study area and a study room, it is tough for them to find a big enough table to do a group project or a group meeting, especially in the area that allows talk.

### Affinity Diagram



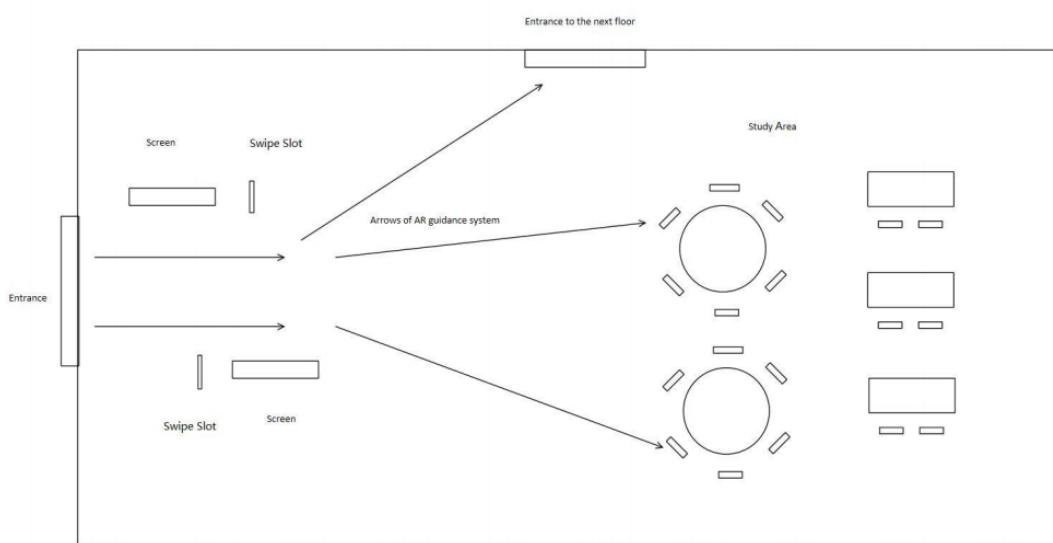
# PROJECT 2: NOVEL INTERFACES UNDERSTANDING

## Artifact Model



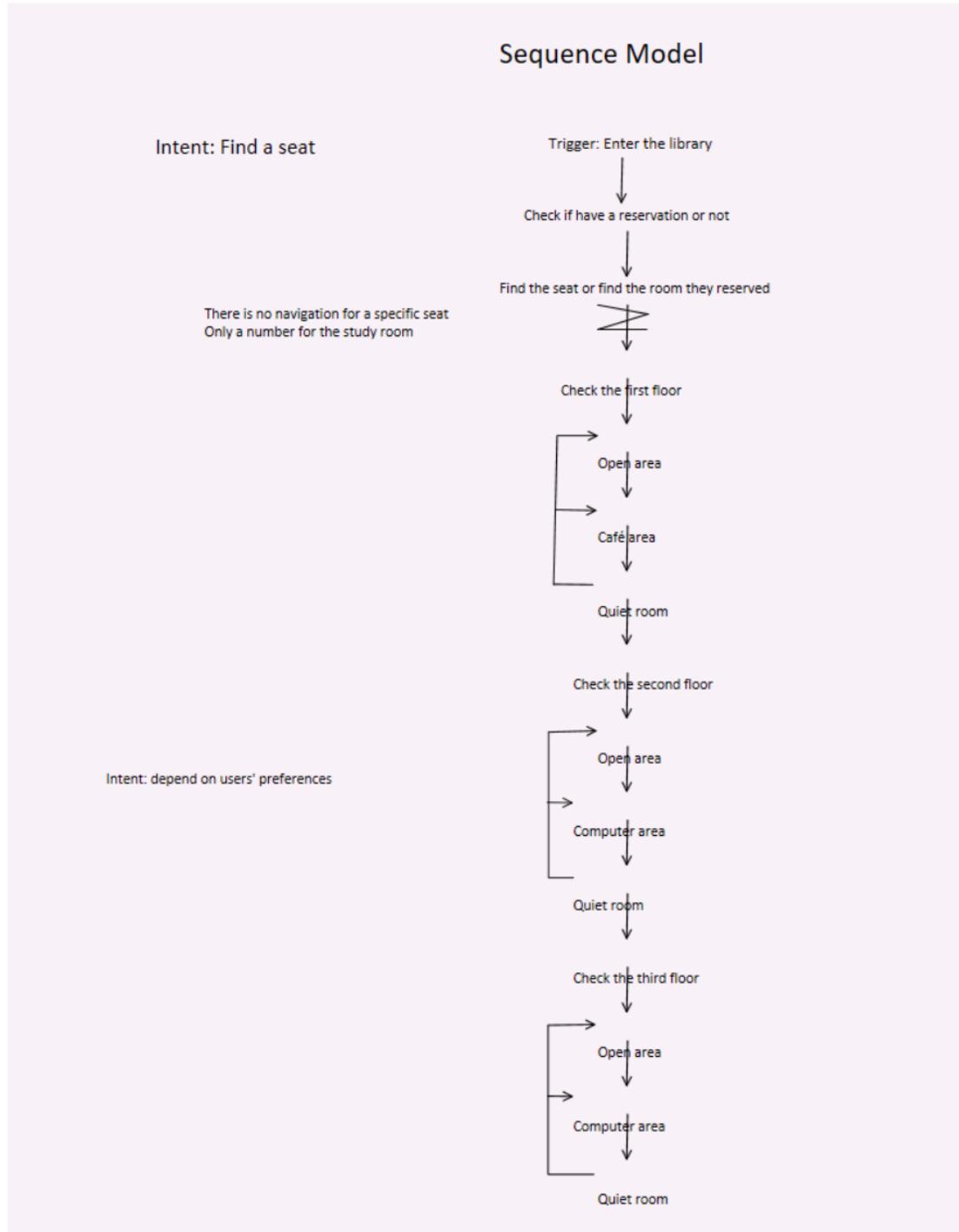
## Physical Model

Physical Model



# PROJECT 2: NOVEL INTERFACES UNDERSTANDING

## Sequence model



# PROJECT 2: NOVEL INTERFACES

## IDEATION

### 1. Seat Navigation

It is the primary function of our "Library Helper" system. As long as students enter the library and swipe their student id cards, they can choose their preference on the "Library Helper" system. For example, would like to share the table or not, the sections they preferred, and so on. After they enter this information, the "Library Helper" will project AR on the floor with directions with distinct colors with the student's name to navigate the student to find a seat they preferred. Meanwhile, the preference they entered the first time will be the default preference, which will save time the next time the students enter the library. They can change their preferences the next time they enter the library.

Moreover, if the student reserved the study room or has a friend in the library, the "Library Helper" will also show that for students after their swipe the id card. Then the system will navigate him to the room or the specific seat beside his friend. It is helpful when the student's friend only provides a piece of vague seat information.

### 2. Find Study Friends

When swiping the student card, the student information and class schedule will be read.

Then the "Library Helper" system will prompt whether to find people who have the same class this semester. Once a student chooses yes, the "Library Helper" system will give priority to selecting the seats next to those students. Students can also choose to find a study friend later by the "Library Helper" on their desk as long as they really need some help. At the same time, in order to ensure privacy, students can also choose to set themselves not to be found. This function can only access if the students sit in an open area that allows talking.

### 3. Make a reservation for next time

Students can reserve a study room, a table, or a single seat online. This function allows students who have a strong preference in the choice of seat to secure a seat based on their preferences. Also, students can use the "Library Helper" system to choose seats without reservation.

## PROJECT 2: NOVEL INTERFACES PROTOTYPING

In the process of development of our video prototyping, we designed three scenarios for our "Library Helper" system, which corresponds to our ideations for this project. Three scenarios include the function of accessing the "Library Helper" system, the function of navigating students to a specific seat or room, the function of finding a study friend, and the function of making a reservation.

### 1. Access the "Library Helper" system

This is the most basic part of the system we designed and the most commonly used part by students, the interactive system. Our system is actually something like a database that sits in the background, giving students seats or other information. Then students need an interactive front-end to obtain this information, so a very simple solution we propose is a device. This little device consists of two parts: a touch screen and a swipe slot. Students need to use Wiscard to gain access to the system. Once the card is swiped, the screen will display the student's name and photo, as well as some preferences that were set on first use, including seating preferences or whether they can be found by other students. In addition, there are buttons for finding seats or finding classmates.

This way, students can use the following functions, including finding a seat or finding a classmate. We will set up three to five terminals at the entrance of each floor so as to minimize the possibility of students queuing in front of the terminal and also enable students don't need to go back to the first-floor entrance to use the terminal if they don't find seats on a certain floor.

During the video production, we had a team member stand at the entrance to the library and have him "use" a non-existent terminal on the wall and take a photo. Then use the video synthesis technology to make the appearance of the terminal and complete the video.

### 2. Navigation

Another essential part of our design is the seat navigation system. Based on our observation and interview results, some students find it challenging to locate a particular seat. Take the College library as an example. This library has three floors, and each floor is divided into several sections for different purposes. Some sections are designed for quiet study, group meetings, and computer users. In addition, there are meeting rooms across each floor. While each floor has a guiding map, the complex design always confuses students,

## PROJECT 2: NOVEL INTERFACES PROTOTYPING

and it is especially difficult for new students. In this case, the persona would be a freshman who had just begun studying at the university. He needs to attend an in-person meeting in the Group Meeting section of the College library. He came to the library on time but was confused by the guiding map. He is too shy to ask other students for help. In the end, he finally found the correct section. However, he was late by 10 minutes. Thus, we intend to design a guiding system to help him. This seat navigation system used the AR technic to project arrows on the ground. The student can choose his target seat in the "Library System," follow the arrows and find the seat easily and straightforwardly. During the video production process, we demonstrated our product by asking one of our group members to pretend to be a student who is following the arrow on the ground. We asked him to stand at the intersection in the library to demonstrate that our product can handle such situations by using arrows in different colors.

### 3. Finding a study friend

In order to develop this function, we are concerned about when a user needs to access this function first. For the persona in this function, he is a student who usually goes to the library and studies by himself,

so he only needs help occasionally. As a result, it is not a good idea to assign that function at the entrance of the library if the student wants to access that function after they find a seat or have already studied for a while which requires them to go back to the system located at the entrance. Then allowing them to access that function on their desk could be a better solution. On the one hand, it allows students to access this function as long as they need, which improves the accessibility; on the other hand, students do not share one single machine at the entrance, which improves the efficiency a lot. Students could decide if they need some help from other classmates after they find a seat. It can make sure that each student has a more flexible plan in the library, and the study group could be a helpful tool for them when they meet questions. Besides, they can also set the preference in the "Libray Helper" system as well. They can choose "visible for other classmates" or "invisible for other classmates," which ensures each student's privacy. After all, some students only want to do some individual assignments and do not have enough time to help other students sometimes.

The reason I choose the AR projection is that the "Library Helper" system should not

## PROJECT 2: NOVEL INTERFACES PROTOTYPING

be a distinct decision on each desk. It should be helpful as long as students need it if there is a big physical screen on each desk that will cover most of the vision and stop some groups from doing the group work or group meetings. The AR system can solve it perfectly when students do not want to use it as only a small device like a socket. It will project a transparent screen when users use it, which can finish users take and will not block users' vision as well.

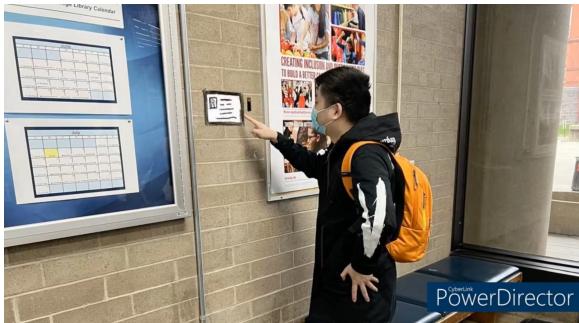
As a result, we chose to take a picture in the library of a student who had already found a seat and studied for a while, then designed a "fake" "Library Helper" system on the desk to show how that works.

### 4. Making a reservation system

The first part is the seat reservation system. According to the result of the interview, some of our participants mentioned that they have preferences in the location of their seats. One of the participants wants a seat near the window, which has a lake view. Another one prefers an individual seat where no others sit nearby. Also, some students who want to study in pairs need two seats next to each other. Based on our observation, it would be great if students were allowed to reserve a seat based on their preferences. Thus, we designed a seat

reservation system. This system is similar to the reservation system for the study room, and the only difference is it allows the student to reserve a particular seat. Students can make their reservations online. After they log into the system, the system will provide a top-down map of the library and indicate which seats are available. Students can make the reservation by clicking on the icon of a seat, and providing the necessary information, like the start and end time of the reservation. The seat will be reserved for that period of time.

## PROJECT 2: NOVEL INTERFACES FINAL DESIGN



**Figure 7 - Access the “Library Helper” system**

Figure 7 shows the student using the terminal. It consists of a touch screen and a swipe slot. Students need to use a Wiscard to access the system and use its subsequent functions. In addition, when students use it for the first time, they will also be required to make some preference settings.



**Figure 8 - Seat Navigation System**

Figure 8 is the Seat Navigation System. After a student chooses a seat in the “Library Helper” system, several arrows will be projected to the ground. Those arrows are colored and have the student’s name on them. This design is intended to distinguish the arrows for different students. The

student can simply follow the arrows to find his seat.



**Figure 9 - Finding a study friend function**

Figure 9 is the final solution for the function of finding a study friend. There is a small device on the desk which is our “Library Helper” system. It will not take much attention from students due to its small size. At the moment provided in figure 9, a student is trying to access the find a study friend function, and the “Library Helper” system project an AR screen for him and allows him to access that function. Then the “Library Helper” system will navigate the student to the recommended places in the open study area or empty study rooms (because these two places allowed to discuss). Besides, students can edit their visible status on this machine if they do not want to be interrupted by other classmates.