Cs3240 project

G1 2014

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# Design Problem Overview



## Problem Statement

Presently, users have to constantly monitor their progress on their desired app and try to reconcile the abstract map representation with the real environment that they are traveling through. The tracking applications lack a robust notification to alert users in a timely manner when they are approaching their desired destination or critical junctures of their journey, forcing the user to be constantly checking the application to know when they going to have to alight.

# Target User Groups

# Contextual Inquiries

In a bid to know more about the needs of our end-users, we conducted contextual inquiry on nine potential end-users, most of them are students in the early twenties. There was a good mix of both genders, coming in at four males and five females. In the case of one contextual inquiry, the conversation was recorded first and notes were taken only while replaying it. The summary of four most distinct contextual inquiries are as follows, with the more similar ones being placed in Appendix A:

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| **U1**  Gender: Male | Age: Early twenties | Job Title: Student | Location of interview: School | Conducted: Jia Jie | Notes taken by: Oswell | Time to complete: 35 mins  U1 reveals that he seldom travels to unfamiliar places but still misses his stops quite often. His main mode of transport is public transport, and attributes his constant missing of stops due to either oversleeping or being too preoccupied on his phone. When recounting his experience in travelling to a new area, he mentioned that he got off the bus two stops after his intended bus stop, as he did not know what the bus stop looks like. His navigational tools include GPS, goThere.sg, and the mobile site of Street directory. He lists his main reasons behind choosing these applications is that they are “free of charge, detailed and accurate”. He hopes to see the existence of a reminder function that can remind him to get ready to alight at a particular the bus stop when the bus is approaching his destination.  U1 was open in providing us with information but the data collected matched our expectations and was not very surprising. |

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| **U4**  Gender: Female | Age: Late twenties | Job Title: Admin assistant | Location of interview: Her residence | Conducted: Samuel |  Notes taken by: Samuel | Time to complete: 40 mins  U4 recounted her experience navigating in an unfamiliar territory, namely, Thailand. She was on a trip with her friends was the sole person responsible for navigating. Her main mode of transport was by walking, and states that “her phone would be out almost the entire time with Google Maps on display” while navigating. The major problems faced were a lack of real time updates on current location, difficulty in projecting map objects to real life structures, and having to juggle between navigating and talking to friends. An improvement that she wishes to see is for Google Maps to be able to inform her if she is on her intended route without reference to the screen quickly.  As U4 is related to the interviewer, she is quite open in providing information and contextual interview went smoothly. Data collected was interesting as it pointed out a few breakdowns we did not consider. |

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| **U5**  Gender: Male | Age: Early twenties | Job Title: Insurance Agent | Location of interview: His residence | Conducted: Kiang Kuang | Notes taken by: Jia Jie | Time to complete: 30 mins  U5 states that he uses public transport every day and it is the main mode of transport in getting to work and meeting clients. The locations that he has to travel to are often unfamiliar to him. He states that when trying out new routes to these places, he often misses his stop. As such, he tries to take routes that he is familiar with and prepares his route beforehand. Tools that he use to prepare his route includes street directory and word of mouth. For bus routes, he refers to the SBS website. He reveals that he prefers human input over mechanical ones as applications online do not give accurate information. Certain things like traffic jams are not accounted for, which human input can cover. Another problem he reveals while navigating is that often, it is hard to alight at right stop when it is dark. Landmarks are harder to spot and a crowded bus makes it hard to see out of windows. An improvement that he will like to see is an app that can show nearby buses and bus stops. The bus stops should reveal bus information and routes of the buses there.  In interviewing U5, he revealed many insights into the current transportation system that poses difficulties for travellers to unfamiliar places. Not much prompting was required and he elaborated on his replies whenever possible. |

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| **U9**  Gender: Female | Age: Early twenties | Job Title: Student | Location of interview: School | Conducted: Oswell | Notes taken by: Samuel | Time to complete: 30 mins  U9 reveals that she has only missed her stop twice in her life, and has never alighted at a wrong stop. The only two times she missed her stop was once, due to her oversleeping, and the second time, when she was too engrossed messaging. She explains that she has never alighted at a wrong stop as she always prepares her route the day before. On the actual day, she approaches people familiar with the location for directions, to check that it corresponds to what she has already prepared. When taking buses, she counts the stops in order to alight at the correct one. The app of choice she uses in preparing her route is the default map app in iPhone. An improvement that she will like to see is more updated apps and ability to calculate the shortest route between two points.  Interviewing U9 was surprising as it was uncommon to encounter a person who so rarely misses their stop. However, from the interview, we gleamed useful information on what is important in avoiding missed stops as well as justification for our project. |

In conducting contextual inquiry, we followed the key principles which are context, partnership, interpretation, and focus. Of these key principles, those that are easy to follow are context, partnership and focus. With regards to context, while we are unable to be with them as they travel, we were able to get them to give us a short demo in using the tools that they used to plan their route or navigate.  We were also successful in eliciting recounts of their previous experiences in navigating unfamiliar places. Empathy as public transport users enabled partnership, and being a focused team, we were able to keep the interview focused.

However, we did face some difficulties with regards to interpretation. Being users that use navigational apps and public transport ourselves, we had preconceived notions on the interpretations behind certain actions or events. This led to a situation where we assigned our own interpretations to the interviewees’ words and regarded them as truism. Eventually though, we managed to break out of it and always seek to reconfirm our own interpretation with theirs’.

Before conducting the interviews, we expected most potential end-users of our product to be similar to us, whereby there is some occurrence of missed stops every so often and we are irritated by it. After conducting contextual inquiries though, we found that not to be the case. We found that missing stops and alighting at wrong stops were almost nonexistent among some people, namely U3 and U9. There were even people that do not mind missing stops, such as U6. Furthermore, we were also offered new insights into the flaws of public transport and existing navigational apps, which we did not think of before. This prompted us to think of what other features we can include to cover the shortcomings of existing applications.

From the original list of questions prepared, we found the number of questions to be too few, and some ineffective in eliciting data. However, after the first contextual inquiry, we found new questions to ask based on the doubts generated from the interviewee’s replies. We also found that open questions that are targeted at recounting examples work best, as they triggered memories of difficulties faced and their experience in tackling them, allowing them to offer us more information. We learned from all that and changed our list of questions accordingly.

From the information gathered, we tried to create work models. The easiest model to create is the sequence model, as the information gathered suggested that the users work in sequential steps. The harder models to create are artifact and physical models, as there were not much artefacts created and the physical model was not applicable for most. We found that sequential model was the most helpful in developing our understanding, as it represented the data we had in a systematic fashion, and allowed us to identify the breakdowns and triggers. The least helpful would be the physical model. This is as it was incompatible in capturing breakdowns that have to do with non-physical environments, which is common is a number of our potential end-users.

# Data Analysis

For the analysis of our gathered data, we decided to go with an affinity diagram because it would allow us to organize the large amount of raw (language) data such as the ideas, opinions and issues brought up in the questionnaires into groupings based on their natural relationships. As such, our affinity diagram contains all key observations, user statements, breakdowns, insights, design ideas as well as any questions and ambiguities.  
  
The first layer of groupings of such statements were as such:   
  
I want to be able to do other stuff while traveling

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| --- |
| I get distracted while travelling  I end up falling asleep and missing my stop when I get too tired while travelling  I tend to fall asleep a lot while travelling  I miss my stop when I’m stoning (not paying attention)  I almost never miss my stops, expect twice due to falling asleep and engrossed in messaging |

I want an application that has up to date information

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| I want a navigational app that is free of charge, detailed and accurate  I want an app with updated and reliable information  I would like my navigational app to be up to date and finds efficient routes. |

I need a reminder function to alert me

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| I need a reminder function to alert me to get ready to alight a few stops before my destination  I need a reminder function to alert me to get ready to alight a few stops before my destination |

I am bad at navigating

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| --- |
| I have no sense of direction  I don’t know how to read maps  I don’t recognize places/destinations  I can’t plan walking routes with Gothere.sg |

I need more information about my destination

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| I want pictures of how the destination will look like (provide some recognizable prominent landmarks)  I miss my destination sometimes because the navigational app doesn’t update frequently enough  I want more information about the bus stops and the bus route to be shown  I got lost because the wrong bus stop I alighted at had the same name as the correct bus stop  I want pictures of bus stops and surrounding I missed my stop because my destination was misinterpreted by the navigational app. |

I need alternatives for when the technology does not work

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| --- |
| I plan my routes with google maps before going to unfamiliar places  I plan my routes a day before when going to unfamiliar places.  I count my stops while checking with the bus display of the bus stop names  I would like to carry a physical map if there is no GPS available  I try not to be heavily reliant on technology |

I need ways to deal with physical barriers to navigating

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| --- |
| I find it hard to count stops when it is at night  I feel hard to orientate myself to my surroundings if the bus is too full of people obstructing my view  I feel hard to orientate myself to my surroundings when it is at night |

I need real time information about my current location

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| I want real-time updates of current location  I can locate where my friends are relative to my location so that I can directly find them  I constantly check google maps and wish that it will update faster  I find it annoying to constantly change between google maps and google street view to do a map-to-ground comparison  I want google street view to update real-time with respect to my location  I need to the app to alert me if I am straying off from the intended route planned by the app  I want my navigational app to list the buses available at bus stops along with their waiting time |

I prefer suggestions from other people on traveling routes

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| I prefer real people’s input over suggested calculated routes  I ask people who know the area how to get to my destination. |

I want to not have to dedicate a large amount of my focus to navigating

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| I want to go overseas to enjoy the scenery while travelling instead of constantly checking on my google maps |

As can be seen from above, based on the results of our contextual inquiry, we have identified four potential broad areas of concern when they have to deal with the task of traveling. Although these four areas seem highly generic at first glance, since we performed a bottom-up method of generalization, we are able to gain further insights into the seemingly mundane categories of requirements that we have arrived at. With these insights, we are able to further analyze and draw some conclusions about the requirements of our target user groups.

# Task Analysis

1. **Who is going to use the system?**

Tourists, as they do not know the transport system and surroundings well, such as U4

People who lack a sense of direction, as they have a hard time keeping track of their own location and when they need to alight from the bus, such as U2.

People who gets distracted by other tasks or prefers to multitask while travelling, so they can concentrate on their own things and not have to keep checking the GPS every few moment, such as U1, U7, U8, U9.

People who frequently need to travel to unfamiliar locations, so that they can travel confidently, such as U5.

1. **What tasks do they now perform?**

Plan route using map apps by all users

Ask experienced people for directions

Counting bus stops

Keep track on the journey using GPS or map apps

1. **What tasks are desired?**

To not have to rely on constantly checking the phone’s GPS or surroundings and still be able to identify the correct stop. This can be accomplished by:

* Having a reminder function when the bus approaches the destination
* Having a view of the surroundings or landmarks to look out for around the destination
* Having a library of community suggestions of alternative routes
* Having an updated database of route information
* Being still usable in offline mode
* Having real time updates

1. **How are the tasks learned?**

The tasks are learned by trial and error and from experience of travelling to the places enough times to learn of the surroundings.

1. **Where are the tasks performed?**

Before or while on board the bus and MRT along the route they are travelling in towards their destination.

1. **What's the relationship between user and data?**

The user will research for data about the journey they are going to make by searching for information on Google Maps and bus routes.

1. **What other tools does the user have?**

Their smartphone, street directories, printed maps.

1. **How do users communicate with each other?**

Users will have to ask fellow commuters or even the bus operators on whether they are at their desired stop, or call up friends or family for directions and landmarks to take note of.

1. **How often are the tasks performed?**

For the user group that gets distracted or wants to multitask, the tasks are performed daily whenever the user is travelling by public transport.

For the other target user groups, the tasks are performed every time they have to travel to some new location that they are unfamiliar with and not know where to alight.

1. **What are the time constraints on the task?**

Information must be displayed to the user early enough before the bus reaches the destination bus stop so that the user has time to process the information or to prepare to alight.

1. **What happens when things go wrong?**

They end up having to alight at another incorrect stop which may or may not have the bus they need to transfer to. They will then have to cross the road and take yet another bus back to the correct destination, or walk. This results in time and money wasted.

# Requirement Analysis for solution

**Reminder/Prompt function**

There is a group of users that require a reminder function to alert them a few stop before their actual destination so that they can get ready to alight at the right stop. At the same time, this reminder function can also serve for the group of people that are distracted while travelling. These people could be sleeping, playing on their phone, enjoying their scenario and do not want to be constantly checking on their phone as to where they are currently are. The reminder function will be able to free up their attention time spent on monitoring their navigational app so that they can do other stuffs. The prompt function can also alert the user if he is straying off too far away from the suggested, calculated route.

**Visual aid**

People know how to get to their target destination via navigational apps but might not be very sure that they have successfully arrive at their destination if they are new to the destination. Visual aids such as updated photos of bus stops or prominent landmarks can help our users to confirm that they have correctly reach their desired destination.

**Community input**

There is a minority of people we interviewed that would rather rely on suggestions on other people rather than the suggested route supplied by the application. This is due to fact that the application may not be able to account to the user’s preference of travelling (i.e suggested route may be the shortest but requires some number of bus transfer compared to a longer bus route but does not involve any bus transfer, suggested routes goes through certain areas of traffic jam that the user might want to avoid completely) As such, the application should allow some kind of community input of suggestions to get to certain places as an alternative to the suggested route by the application. A voting, favourites, and commenting system should also be implemented to rate the most popular and preferred routes among users to ensure that the information is reliable and up to date as well.

**Up to date and reliable information**

This is a basic requirement for such a navigational application. The information needs to be reliable and updated so that the user can trust it. Reliability and updates can be further improved by the previous functionality mentioned - community input. On top of the community’s input, the administer of the navigational application need to also moderate and make sure that new information are added consistently to improve the database of the application.

**Ability to work offline mode**

The ability to save down maps and travelling routes and have the application go offline is crucial in the event our user travels to somewhere with bad wifi, 3G connection/reception. The GPS of the phone will still be working and as such, if the maps or travelling routes is already saved and recorded, the user is still able to the application should it go offline.

**Real time update**

While travelling, users may want to see where there are currently on their map with respect to their final destination. They need to feel a sense of assurance that the application/ mode of transportation is leading them correctly to their desired destination. If the user happens to be straying of their suggested route, the application should promptly update and re-calculate another route to the destination relative to his currently strayed-off location. The update should also be real time and instantaneous so that the user will not miss his destination while travelling.

# Team’s Contribution

# Appendix A

Interview Responses

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| **U2**  Gender: Female | Age: Early twenties | Job Title: Student | Location of interview: School | Conducted:Jia jie | Notes taken by: Oswell | Time to complete: 30 min  U2 reveals that the MRT is her main mode of transport. As she lives near the terminal MRT stops, she states that she seldom miss her stops. However, the few times that she did, she attributes them to oversleeping. When talking about visiting unfamiliar locations, she frequently alights at the wrong stop. This is as she is unable to read maps and thus does not have a reference to know when to alight. However, she does use some navigational apps like GoThere.sg , Street directory (mobile site) and Google Map, but the effectiveness is reduced by her inability to read maps. Some features that she thinks will be useful to her are integrated pictures of bus stops and surrounding areas, a reminder function to wake her up when she is nearing her stop, and improved capabilities of existing apps in calculating walking routes.  U2 was eager to provide us with information and provided insights on how to cater our project to a larger group of people. Data collected suggested that our initial idea for our product may not solve the problem for our target users. |

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| **U3**  Gender: Female | Age: Early twenties | Job Title: Student | Location of interview: School | Conducted: Oswell | Notes taken by: Kiang Kuang | Time to complete: 30 min  U3 revealed that she missed her stop only a few times before. Reasons stated was that she was unfamiliar with her destination and at that time, she had little access to navigational devices (lack of google maps and smartphones at that time). She also states that she was afraid to approach strangers to ask for directions. With regards to preparation of her route whenever she goes to unfamiliar places, she states that she always plan her routes in advance. She uses a combination of human input and navigational apps to plan her route. She prefers gathering human input first before double checking the information with navigational apps. She counts stops when on the bus to decide on which is the correct stop to alight at. The improvements she is looking out for are faster real time updates and being able to track the location of her friends.  U3 was vague when providing answers to some of our questions. It took some probing before we could get to the root of the situation. However, some good points were raised in the interview that could help our project. |

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| **U6**  Gender: Male | Age: Early twenties | Job Title: Student | Location of interview: His residence | Conducted: Kiang Kuang | Notes taken by: Jia jie | Time to complete: 30 min  U6 mentioned that his main mode of transport is through public transport. He mentions that he used to miss his bus stops quite frequently, but recently, it is much rarer for him to do so. He mentions that during his junior college days, he misses his bus stop almost once per week. he attributes it to his tiredness. However, he feels “okay” with missing his stop. He states that it is a chance for him to enjoy the scenery. With regards to traveling to new places, he always plan his route in advance using Google maps. He also uses GPS with google maps and counts stops when taking a bus to places he is unsure of. However, he states that he prefers physical maps over electronic ones as he tries not to be too reliant on technology. Improvements that he wish to see are an alarm that alerts him when he is near a stop or the phone is able to display the name of the bus stop which is coming up next.  U6 is quite informative in his replies to our contextual inquiry. He elaborates on his replies and require little prompting from us. However, he tend to digress from the focus of our interview and we had to guide him back. The results he gave were surprising as they contradict with the results we originally expected. |

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| **U7**  Gender: Male | Age: Early twenties | Job Title: Student | Location of interview: School | Conducted: Jia jie | Notes taken by: Oswell | Time to complete: 30 min  U7 is a frequent user of public transport and takes it quite often to commute to school. He misses his bus stops almost once every two weeks and he attributes it to him oversleeping. With regards to alighting at the wrong stop, he says sometimes. When prompted to give an example, he reveals an instance where he alighted at the wrong one due to two bus stops having the same name. He states that some navigational apps he use to plan and get around are GoThere.sg , Street directory (mobile site) and Google map. He uses them as he views them as a source of reliable and accurate information. An improvement that he will like to see is having pictures of the surroundings tagged to the bus stop.  U7 is mostly responsive to our contextual inquiry but he requires a little prompting before opening up. The data collected was somewhat surprising as we did not expect bus stops to have the same name. |

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| **U8**  Gender: Female | Age: Early twenties | Job Title: Student | Location of interview: School | Conducted: Oswell | Notes taken by: Samuel |  Time to complete: 30 min  U8 takes the public transport every day, usually a combination of both bus and train. She states that she misses her stop about once or twice a month, and mostly because she zones out and does not concentrate while taking public transport. Some applications she use to navigate and plan routes include Google map and GPS, but she states that once, she got off at the wrong stop due to the application misinterpreting and pointing her to the wrong destination. Some improvements that she seeked to see in existing applications are integrated bus waiting times and being able to see the available buses at each stop.  U8 is quite open in revealing information during the course of the contextual inquiry. However, not much new data was gathered. |

# Appendix B

Field Study Protocol

1. **Project** **Title**:

Interviews and Observations of Public Transport Commuters

2. **Investigators**:

1) Yong Jia Jie | a0004699@nus.edu.sg

2) Yam Gui Yao Samuel | littlegreen2002@gmail.com

3) Kuek Kiang Kuang | a0096677@nus.edu.sg

4) Chan Ao Wei, Oswell | a0096724@nus.edu.sg

3. **Purpose**:

The purpose of our research is to understand the difficulties faced by public transport commuters in arriving at their destination. This is to help us derive requirements for the design of novel interactive computational media that are intended to be useful to these commuters of public transport.

A brief description of our design concept is: An application for smartphones that will helps users of public transport to alight at their correct stops. The aim is to make our application easy to use and informative for the users.

4. **Process to be followed**:

We will brief the participants about the purpose of the study, explain the consent form to them, and ensure that they sign the consent form. We will then engage the participants in a half-hour long semi-structured interview. We will also with their permission make observations as follows:

1) Ask personal questions regarding their travel habits

2) Ask for a short demo of their ability in planning routes

3) Record the conversation for further analysis

5. **Participant selection:**

Participants will be chosen from a pool of likely commuters of public transport who use technology for navigation. They will be identified via their lack of personal vehicle and possession of technological devices capable of aiding navigation. They will be selected according to age, gender, and likeliness to incorporate technology in their navigating. In general, they will be characterized by young age, profession that have relation to technology, and high frequency of taking public transport.

6. **Relationships**:

There are no plans to make lasting relationships outside of the interview.

7. **Risk and benefit:**

There will be minimal risk to the participants, for example that they feel that they have wasted their time. The only benefit will be to contribute to the education of the investigators. Participants are free to withdraw before or at any time during the study without the need to give any explanation.

8. **Consent details**:

We will brief the participants about the purpose of the study, and explain the **attached consent form** to them, and ensure that they consent to participate and sign the consent form.

9. **Compensation**:

Participants will receive no compensation.

10. **Information sought:**

The information to be sought is described in the attached Appendix C: Contextual Inquiry Questionnaire.

11. **Confidentiality**:

Information will be kept confidential by the investigators. Names or other identifying or identified information will not be kept with the data. The only other use will be to include excerpts or copies in the assignment submitted, but names and other identifying or identified information will not be submitted.

# Appendix C

Contextual Inquiry Questionnaire

How often do you take public transport?

How often do miss your stop?

Could you give an example of when you miss your stop?

What caused you to miss the stop?

Did you prepare anything to help you to navigate?

How did you feel?

How often do you alight at the wrong stop?

Could you give an example of when you alight at your stop?

What caused you to alight the stop?

Did you prepare anything to help you to navigate?

How did you feel?

How often do you travel to new places?

Could you give an example of where/why were you travelling to?

How do you keep track of when/where to alight when you are travelling to new places?

What apps do your normally use to navigate to places you have not visited?

Do you currently use any navigational app(s)?

Why or why don’t you use that particular app(s)?

What features of that app do you think helped your experience in travelling?

What additional features would you like to see in the app you are currently using for navigation?

Can I have your contact details for further inquiry?

# Appendix D

Consent Form: Study of Problems with Navigation

I hereby consent to participate in a research study conducted by Yong Jia Jie, Kuek Kiang Kuang, Samuel Yam, Oswell Chan for an assignment in National University of Singapore Computer Science 3240, Interaction Design.

I agree to participate in this study the purpose of which is to gain more information on the problems faced when commuting using public transport.

I understand that

­    - The procedures to be used are verbal surveys and voice recording.

­    - I will receive no compensation for my participation.

­    - I am free to withdraw before or any time during the study without the need to give any explanation.

­    - All materials and results will be kept confidential, and, in particular, that my name and any identifying or identified information will not be associated with the data.

**Participant**

Name

Signature                                           Place and Date              \_\_\_\_\_\_\_

**Investigator(s)**

Name

Signature