SENG 310 - Human-Computer Interaction

Project Milestone 6

Team Aahhh

Hailey Baron
Clayton Dowdell
Dylan Dvorachek
Adebayo Ogunmuyiwa
Yiming Sun
Hans Lee

Table of Contents

1 | Problem **3**

2 | Existing Solutions **3**

3 | Proposed Solution **4**

4 | Personas **4**

Taylor McGill 4

Bob Lee 5

Brian Simon 5

5 | Scenarios and Use Cases **6**

Scenarios 6

Use Cases 6

File Upload 6

Playing Music 7

Playing Radio 7

Navigation 7

6 | Evolution of prototype **8**

7 | High Fidelity Prototype **13**

The Home Screen 13

Alert Windows 14

Main Navigation Screens 15

The Music Player 17

8 | Future Work **19**

9 | Lessons Learned **19**

Appendix **21**

1 | Problem

The problem that we chose to tackle in our design is mitigating distracted driving in on-board car computer systems without diminishing the capability of the system, specifically for the new Tesla system, which does not include any physical controls or physical dashboard meters. Many drivers rely on the physical buttons and dials to perform tasks while they're driving, such as change the temperature in the car, or switch the radio station. With the elimination of both these physical controls and the traditional placement of the speedometer (and also fuel gauge + odometer), the interaction design for the central computer is extremely important for the safety of its users as it will directly affect how distracted the user is while driving.

2 | Existing Solutions

Existing implementations of vehicle dashboard systems include two separate areas that provide control and information to the driver. These systems use physical controls for the user to interact with.The Tesla Model 3 uses a similar central control idea with their dashboard setup, however, it does not contain any form of a HUD display.

3 | Proposed Solution

Our proposed solution is *the Dashboard*: A combination of a new operating system for the vehicle's central computer, as well as a HUD for the car's speedometer and battery level on the vehicle's windscreen. The purpose of our design is to maximize both the usability, overall safety, and user experience for the driver by allowing them to spend the maximum amount of time driving with their eyes on the road. Another way to look at this goal is to minimize the time the user spends stopped at the side of the road, or with their eyes on the screen while driving. Our approach to this is simple- get the user from point A to point B in the system as quickly and simply as possible.

4 | Personas

Taylor McGill

Job title: Sales Manager, AT&T
Demographic: 28 years old, single, lives in California, BSC in economics
Goals and tasks: Taylor wants a futuristic, technologically advanced vehicle - unlike her current vehicle that she feels is outdated. Wants to be able to do as much as possible without needing to add more devices in her car.

Taylor represents our most advanced user: Those who want to take full advantage of their car's computer system and use all the features, while still maintaining a easy and fluid user experience.

Bob Lee

Job title: Business Owner - multiple coffee shops
Demographic: 40, father of two, married, lives in Coquitlam, MSC in Business
Goals and tasks: Bob would like to buy a new vehicle for his wife that would be used as transportation for his wife and kids. The vehicle should help him transport the kids to their soccer practice on time. Bob and his wife love to listen to talk radio while they drive.

Bob represents our more casual user, mainly looking to use the basic features of the system but have a more pleasant and comfortable experience than more outdated car systems.

Brian Simon

Job title: Zoo Keeper at the Dublin Zoo
Demographic: 36, married no kids, lives in Dublin
Goals and tasks: On behalf of the Dublin Zoo, Brian is looking for a company vehicle which can be used to pick up raw meat from various butchers for the lions.

Brian represents our users who will be taking full advantage of certain aspects of the system's features, specifically our system's powerful and easy-to-use navigation system. In our initial requirements gathering, we determined that the Navigation system in a car is the most difficult for users to interact with safely while driving, and also used quite often by average drivers.

5 | Scenarios and Use Cases

Scenarios

Taylor McGill:

File Upload and Playing Music: After buying a new car with Dashboard in place Taylor now uploads her files from her other devices to the Dashboard system. Taylor then plays her favourite songs without having to connect her old device.

Bob Lee:

Radio Play: Bob purchases a vehicle which uses the dashboard features. In the music app, Bob selects the radio option and then selects his favourite station.

Brian Simon:

Navigation: Brian purchases a vehicle which uses the dashboard features. He uses the built in navigation system to help him locate butcher shops across Dublin and no longer relies on using his phone, significantly decreasing distractions while driving.

Use Cases

File Upload

1. The user connects the media device to the vehicle through a wireless or wired connection.
2. The vehicle discovers the device and a notification for file management on the Central Control is given.
3. The user touches the notification icon.
4. The system displays a list of contacts (if there are any), music, videos and other files.
5. The user selects the files to be transfered.
6. The user touches the confirm button to start transfer.
7. The system displays a warning message: “Do not disconnect device!”
8. The system confirms once the files have been successfully transferred.

Playing Music

1. From the home screen the user selects the music icon.
2. The system displays quick-access playlists as well as music ordered by album with the options of selecting music by song title, artist or Radio.
3. The user selects the option to re-order music by artist.
4. The system displays a list of alphabetically sorted artists.
5. The user selects the desired artist.
6. The user selects “shuffle all”
7. No confirmation is needed as the music starts to play.

Playing Radio

1. From the home screen the user selects the music icon.
2. The system displays quick-access playlists as well as music ordered by album with the options of selecting music by song title, artist or Radio.
3. The user selects the Radio option.
4. No confirmation is needed as the radio starts to play through the car’s speakers, and the system displays the Radio screen.
5. The user presses the AM/FM toggle to switch the radio from FM to AM.
6. The user sees the desired station in the local listings, and presses it to switch the station.
7. No confirmation is needed as the radio station switches to the selected station.

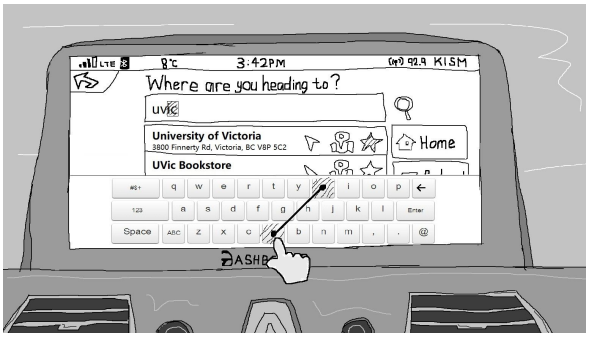
Navigation

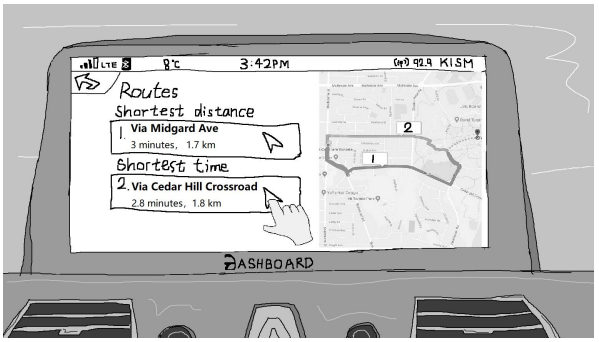
1. From the home screen the user selects the navigation icon.
2. The system displays a navigators search bar along with starred locations and a map.
3. The user then inputs the address into the navigators search bar.
4. The user taps on one result.
5. The system generates several routes for the user to take.
6. The user presses confirm to set the route.
7. The system displays next direction onto the hud for the user to follow.
8. System displays “arrived at destination” message when the user arrives at their destination

6 | Evolution of prototype

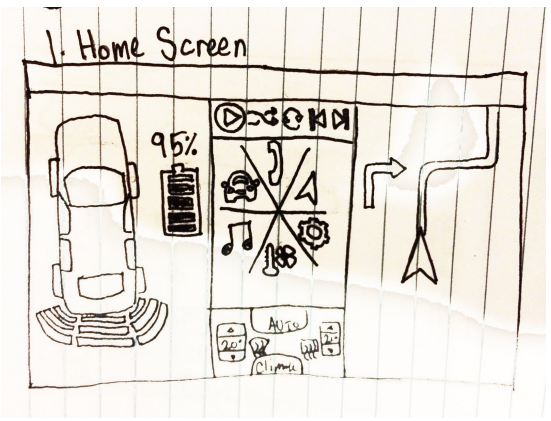
Below our initial prototype is shown.. It was very disorganized, inconsistent and messy to look at; the group seemed to have very different interpretation of the design. All of the different system options were not related to one another, there is no way to go from on screen to another, at least not in the prototype shown above. Moreover, the homescreen was very cluttered making it difficult for the user to quickly switch between the screens without the user being distracted from the road. Finally, this prototype did not include alert messages, the user would not have proper feedback if an error was made.

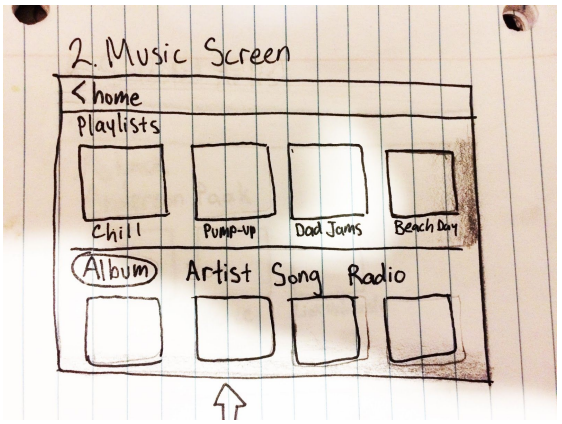
Navigation



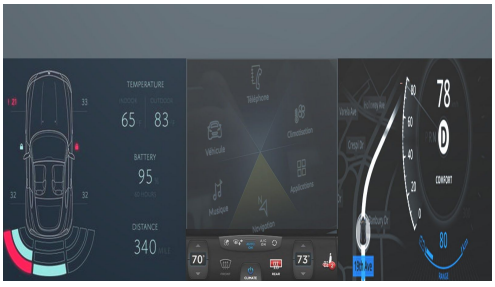


Playing Music

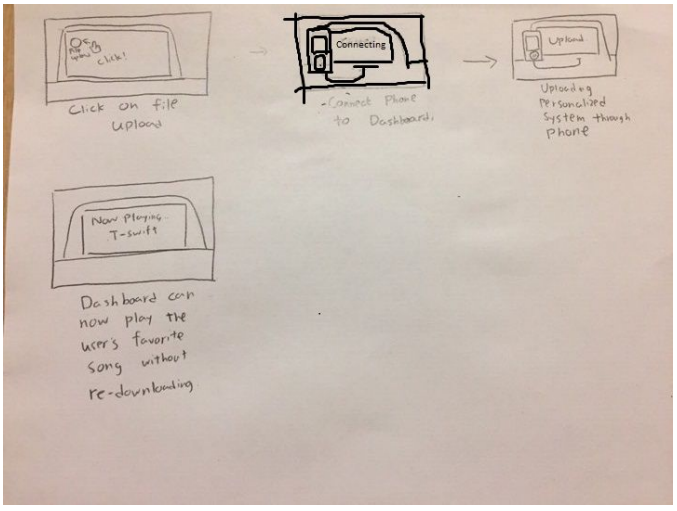




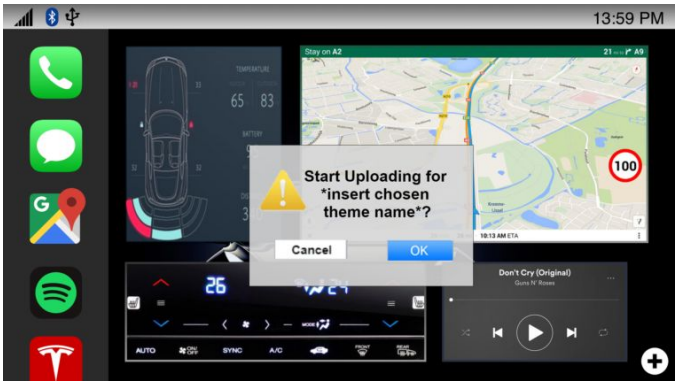
Home Screen

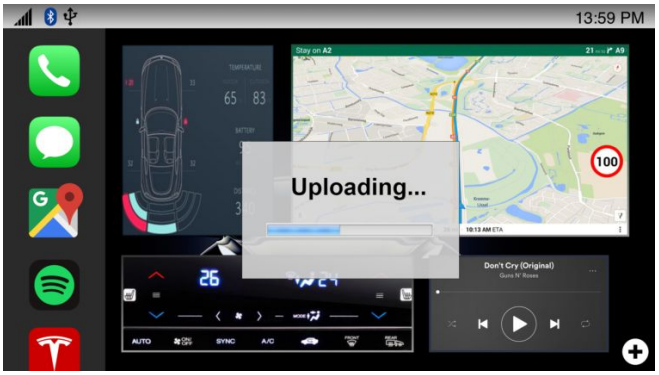


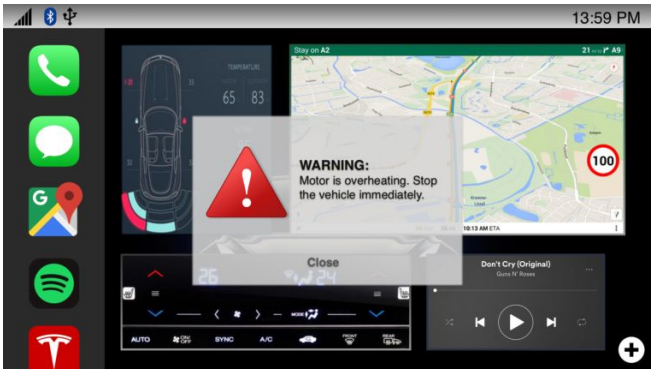
File Upload

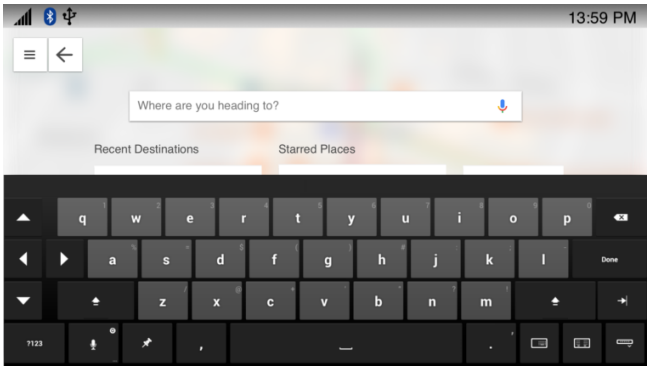


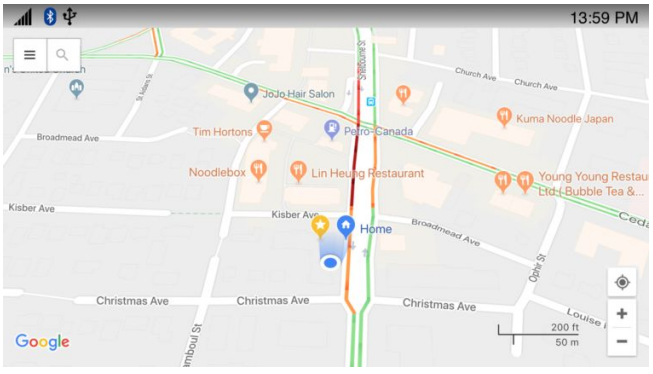
The images below are selected images to show the improvement of the prototype. The backgrounds for the different use cases are now consistent, we have now included a proper feedback system, and obvious navigation system. The prototype also has shown high level, organized interface, the user would not be easily confused by since every element selected is a common element that the target user would know from using other devices. We also included a user manual to clarify possible errors just in case the user gets confused.




13:59 PM
Uploading...
100
Don't Cry (Original)

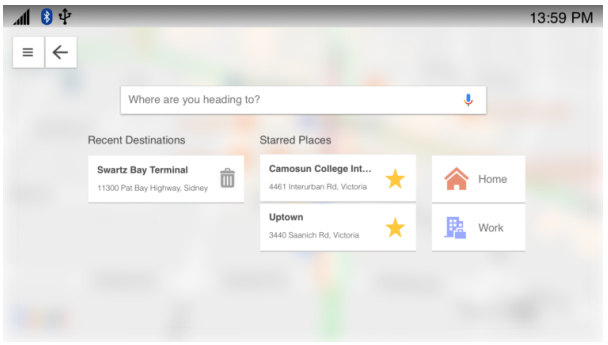

13:59 PM
WARNING:
Motor is overheating. Stop the vehicle immediately.
Close
100
Don't Cry (Original)

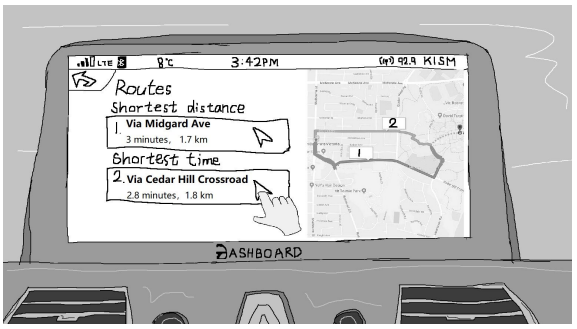

13:59 PM
Where are you heading to?
Recent Destinations
Starred Places

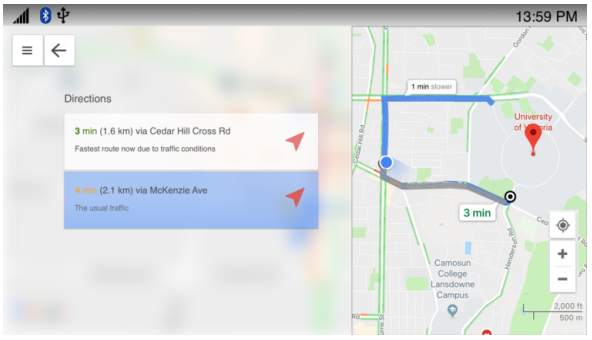

13:59 PM
JoJo Hair Salon
Tim Hortons
Petro-Canada
Kuma Noodle Japan
Broadmead Ave
Noodlebox
Lin Heung Restaurant
Kisber Ave
Home
Church Ave
Christmas Ave
Google

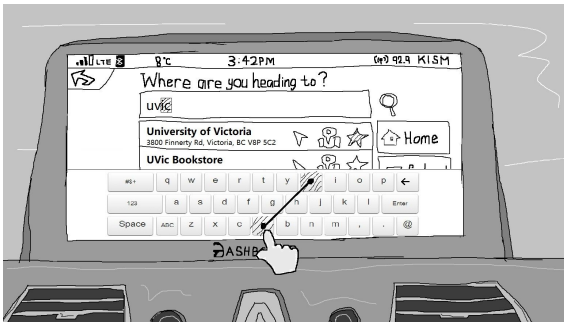
Use Cases

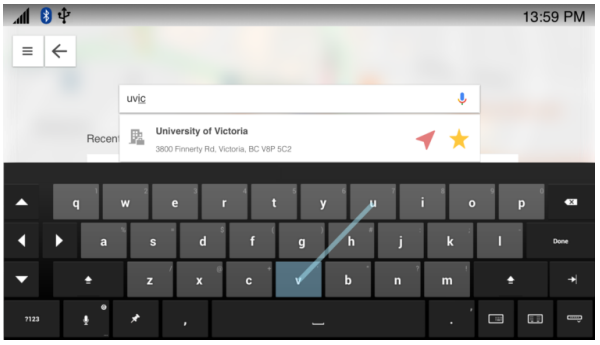
To further the understanding for the evolution of our prototype, we need to look into a specific example, in this case we will pick the navigation use case.











During one of the labs, our prototype got some constructed feedbacks about our presented aesthetic and mapping of items that we have never thought about before, it is at this point we decided to reevaluate our prototype. In our evaluation of the navigation use case for the low fidelity prototype , our findings were that varies options seems disorganized and different screens did not seem to connect with each other. Therefore in our high fidelity prototype we upgraded the organization of the prototype by using cards as options and also different buttons that leads to another screen. The general aesthetic also improved from the low fidelity to high fidelity prototype, it is now simple and easy to look at with clean and consistent fonts.

7 | High Fidelity Prototype

Our High-Fidelity Prototype can be found at https://invis.io/72GEYM834TN

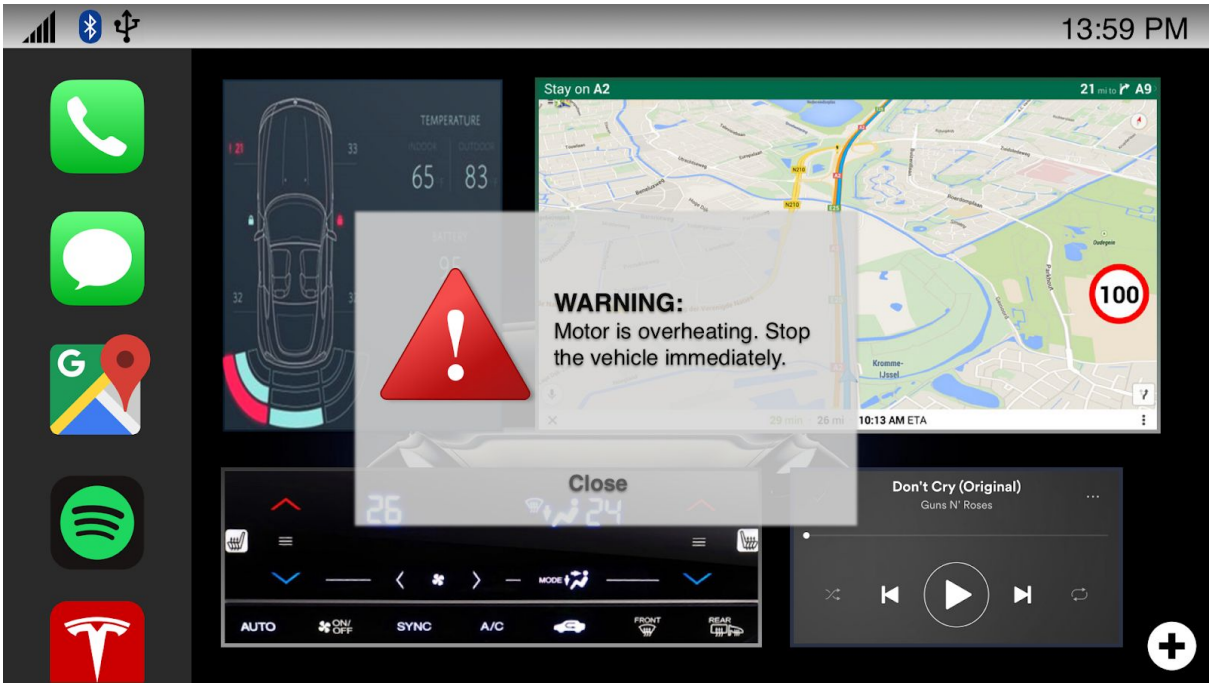
There are a few different aspects to this prototype. Because we are designing a multifunctional system, we included two main applications that we determined would be used most by users while driving: The Navigation System, and the Music Player. The prototype also includes samples of alerts, such as Low Battery and Emergency Alerts (obtained from external emergency alert systems), as well as a simple file upload system.

The Home Screen

The Home screen is designed to be customizable, featuring a series of app windows that the user can add to, remove, or rearrange. We determined that the best set of defaults would be the Car Status Window, the Navigation System, the Climate Control System, and the Media Player, since these are the most used features.

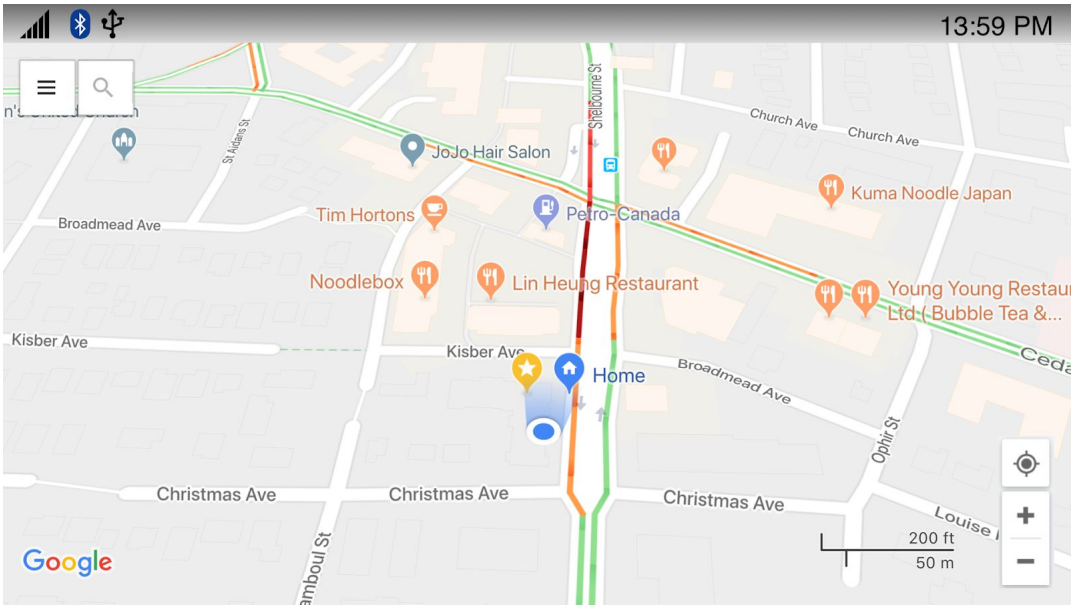
Alert Windows

When the user receives an alert from the system, it is displayed in large text in a box in the centre of the screen. The user must close the alert to continue to use the system. Alerts are to be accompanied by an audible alert sound, in order for the driver to receive the important information in a timely manner. Some alerts, such as the low battery warning, come with extra options for the user to select in order to give the user possible solutions for the issue.

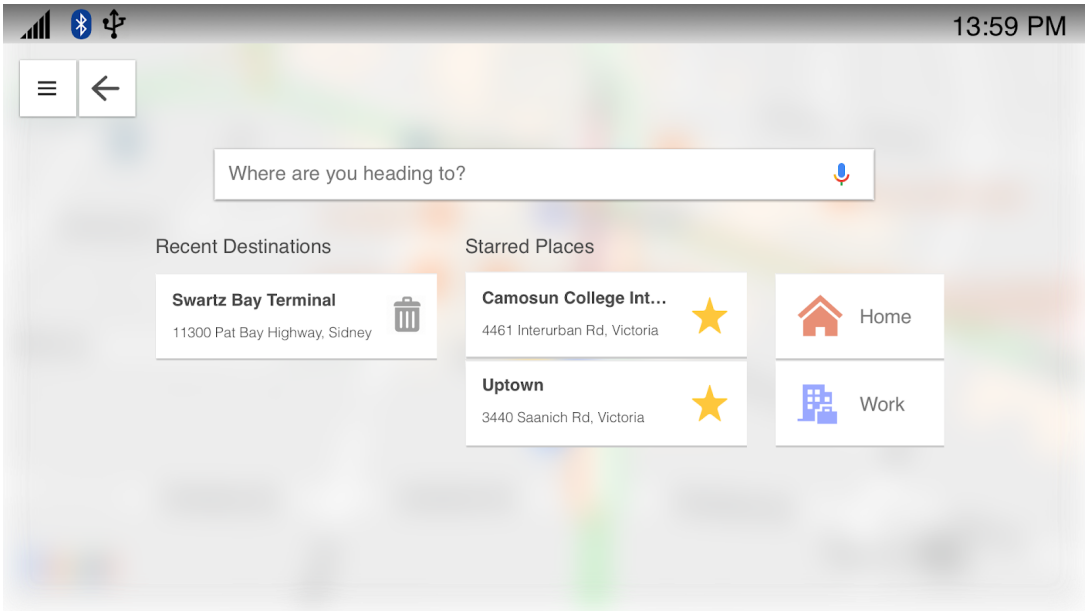


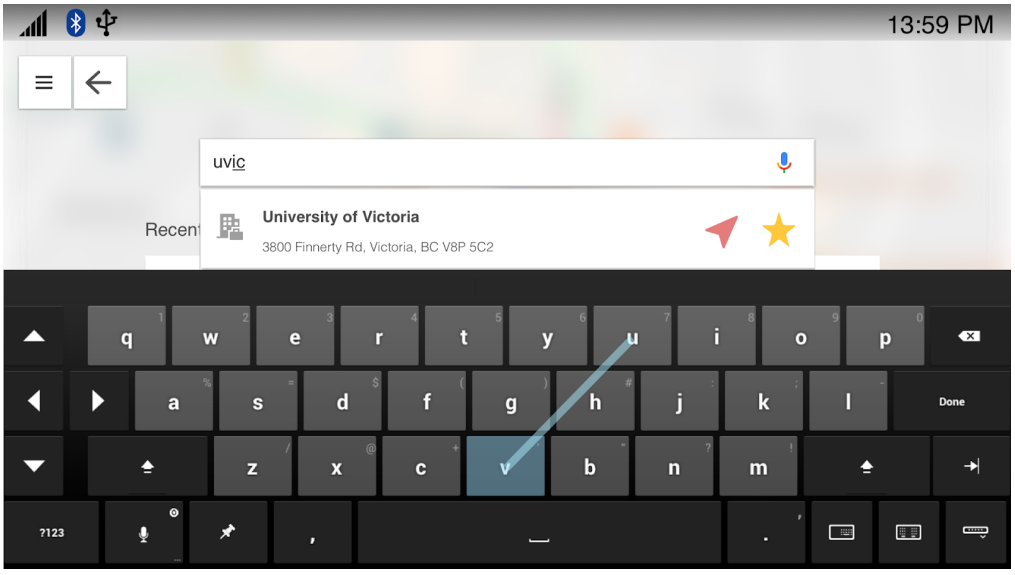
Main Navigation Screens

The navigation system is powered by Google Maps, but it has been redesigned depending on drivers' behaviours, aiming to be efficient and less distractive. The first screen is only a map with the vehicle's current location, since drivers often use maps without navigating. There are some buttons on this screen (from the left to right): a menu button, which is persistent across through every screen, for account management and preference settings; a search button for starting a navigation; recenter and zoom buttons for adjusting the map.

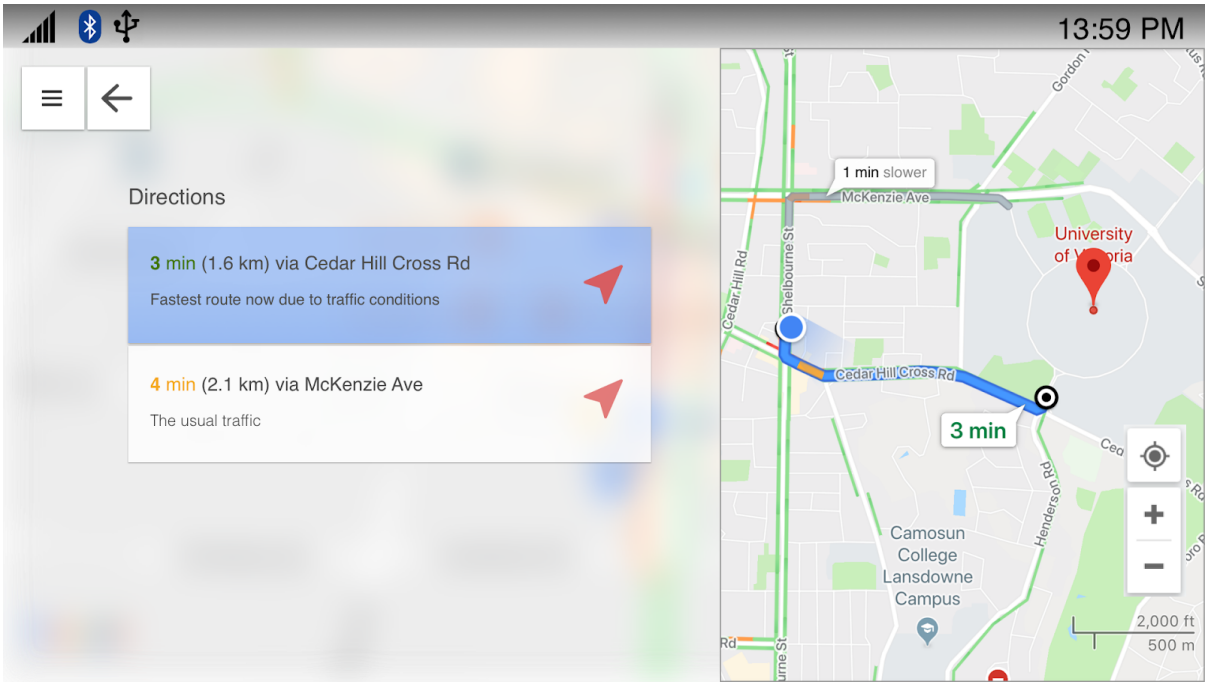


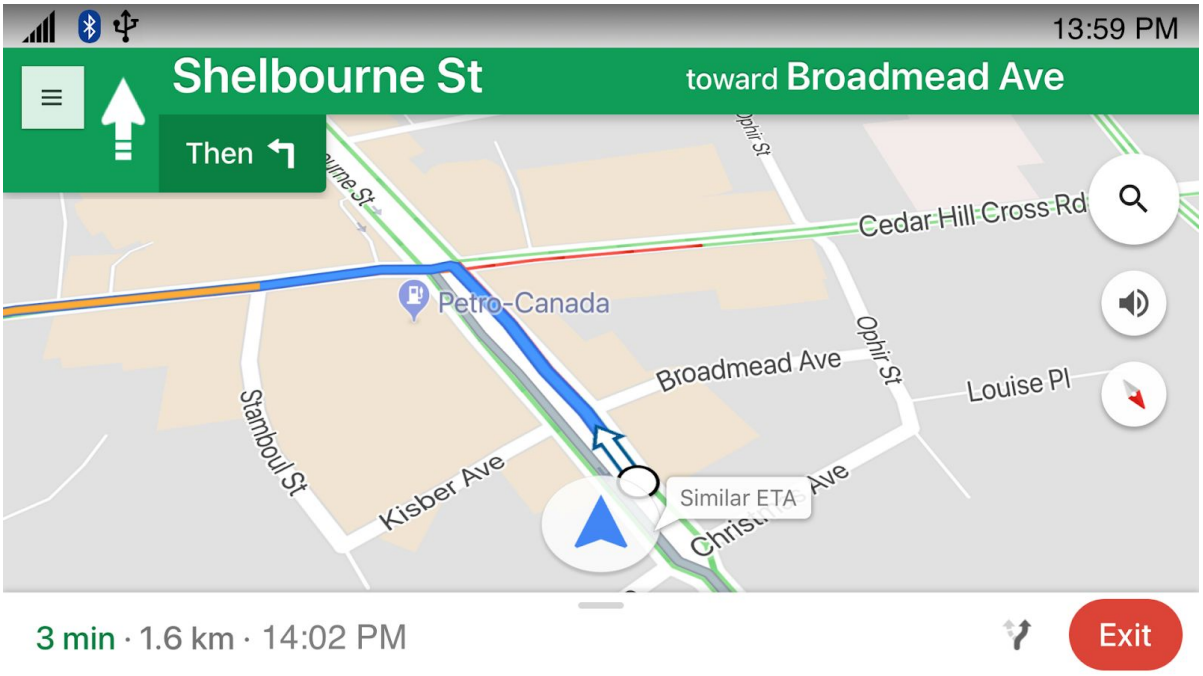
To possibly shorten the time cost to start a navigation, the searching screen has Recent Destinations, Starred Places, and Home & Work shortcuts cards, which are all editable. The search box has voice input and auto-completion features, also the on-screen keyboard supports swipe-input. Users can either tap on a searching result to select routes; or tap on the red arrow icon to use the suggested route, and skip the route selection.





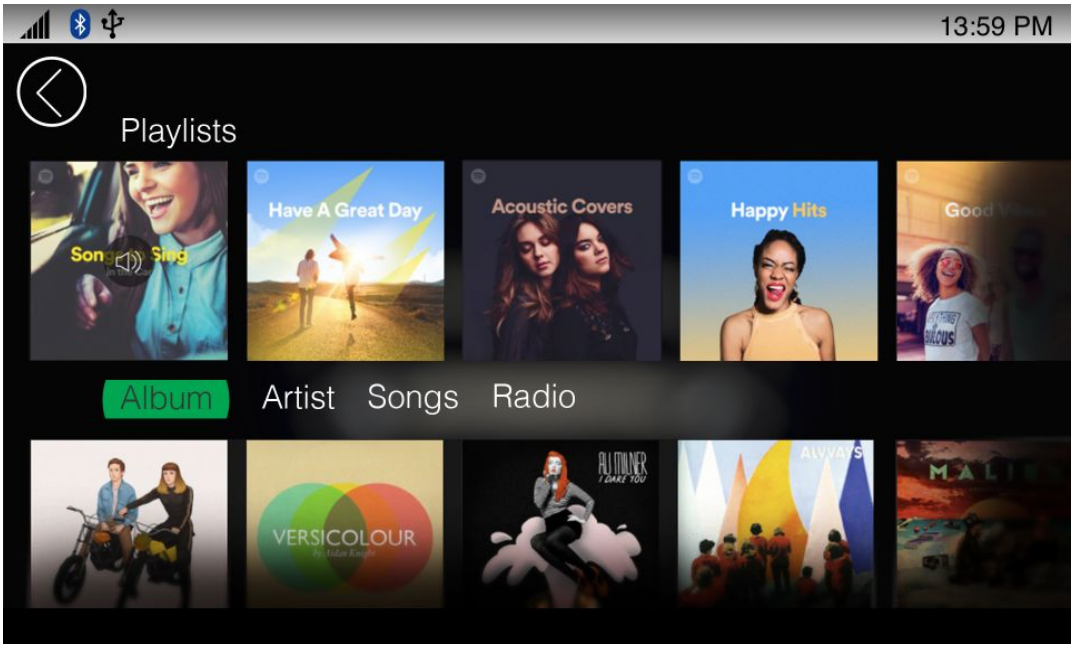
The system displays the best routes, and corresponding durations and distances. The selected route is highlighted blue on the map. The navigation starts as users tap on the arrow on a route. During the navigation, users can always reselect a route by tapping on the white bar on the bottom, restart a searching by tapping the search button on the right, or stop the navigation by tapping on Exit button.

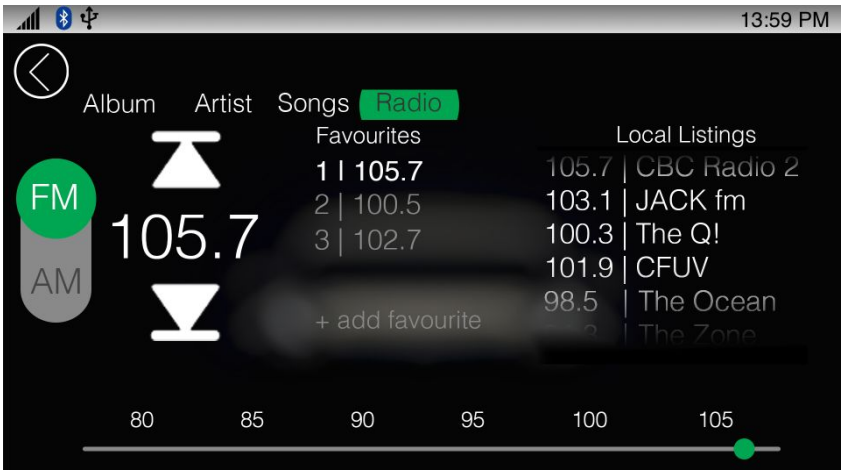


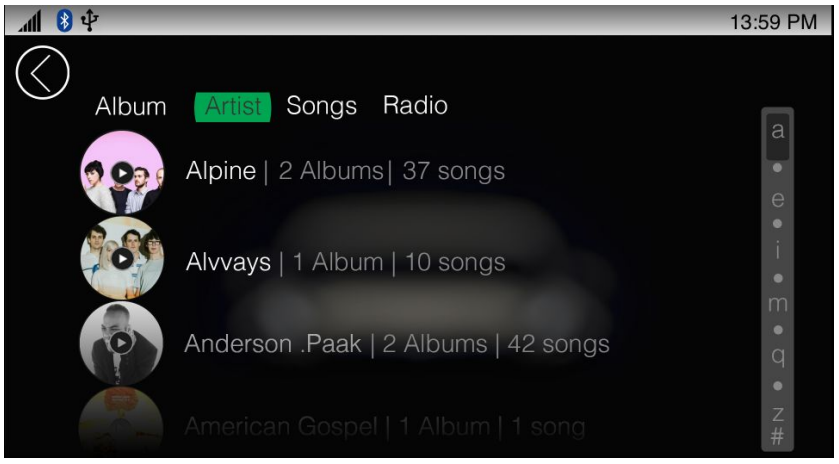


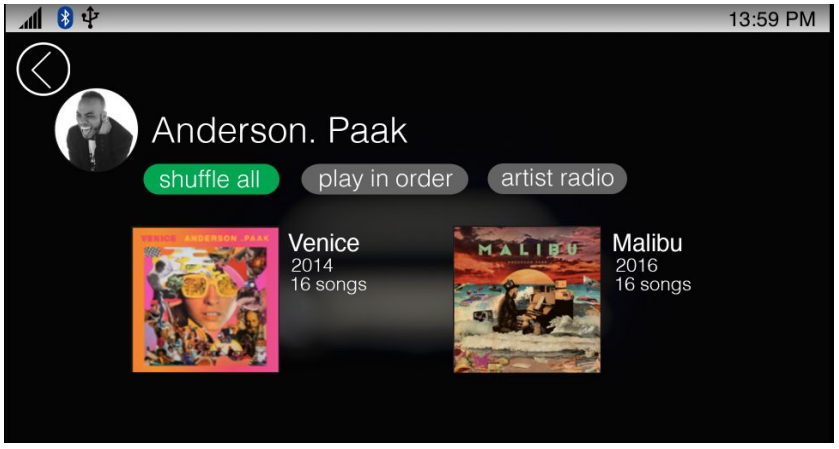
The Music Player

In the music player the user can either play music that they have uploaded from other devices or they can listen to their favourite radio stations.The user can make their own playlists or play songs belonging to a specific artist or by specific albums.




13:59 PM
Album
Artist
Songs
Radio
Favourites
1 | 105.7
2 | 100.5
3 | 102.7
+ add favourite
Local Listings
105.7 | CBC Radio 2
103.1 | JACK fm
100.3 | The Q!
101.9 | CFUV
98.5 | The Ocean
FM
AM
105.7
80
85
90
95
100
105


13:59 PM
Album
Artist
Songs
Radio
Alpine | 2 Albums | 37 songs
Alvvays | 1 Album | 10 songs
Anderson .Paak | 2 Albums | 42 songs
American Gospel | 1 Album | 1 song
a
e
i
m
q
z
#


13:59 PM
Anderson. Paak
shuffle all
play in order
artist radio
Venice
2014
16 songs
Malibu
2016
16 songs

8 | Future Work

Voice commands need to be implemented into later prototypes as it would help reduce distractions caused by the user looking at the control panel when they wish to perform actions with it. However, this is difficult to implement with invision.
Add a profile section for users to save their specific settings such as seat and steering wheel settings to make switching between drivers an easier and faster process. This feature would be especially useful to users with a family car that is driven by multiple people. It is also important that we refine the personas as currently they are easily interchangeable within the use cases.
Design the windshield HUD that pairs with the central control system. The HUD would contain the most important information for the driver, such as the vehicle's speed and battery levels.

9 | Lessons Learned

The importance of user feedback

One of our lessons learned was the importance of taking fellow classmate and teachers feedbacks and implement them into the prototype. Without constructive feedback, our prototype would more likely to still be disorganized. Moreover, some of our different use cases and their interface were also from the feedbacks of other. One example is the clarity of our music use case, the feedback we got was that it was difficult to see how to navigate through different music sessions. We did not have any concern about this error until we received the feedback. The conclude, feedbacks from others are one of the most important way to a successful design.

Consistency when collaborating

When working in a large group it is important to collaborate in way that does not negatively affect the consistency of the prototype. Team members need to work more closely with each other to ensure that all parts of the prototype fit together smoothly and appear consistent with each other. This is a problem our low-fidelity prototype suffered from.

Recognition over recall

As our main goal with our design was to reduce the users distraction it became incredibly important to keep the users cognitive load in mind. By reducing the user's cognitive load it allows the user to quickly navigate the prototype and reduces the amount of time the user would need to be staring at the screen while driving.

Making something new

As we were working on a prototype for a very new system there were not many references for us to work off of meaning we had to figure out what we believed would be most important objects to include in the system based on much older systems. This created an interesting challenge for creating a high tech system that is capable of performing high tech tasks without causing the user to become distracted by the system.

Appendix

User Manual

A link to the user manual for our high-fidelity prototype can be found below.
https://docs.google.com/document/d/1dRDQ_RgwLS2gZI7ELI9Ur1O1wS5ScHeLmFLPSTpgE8g/edit?usp=sharing

Survey Results

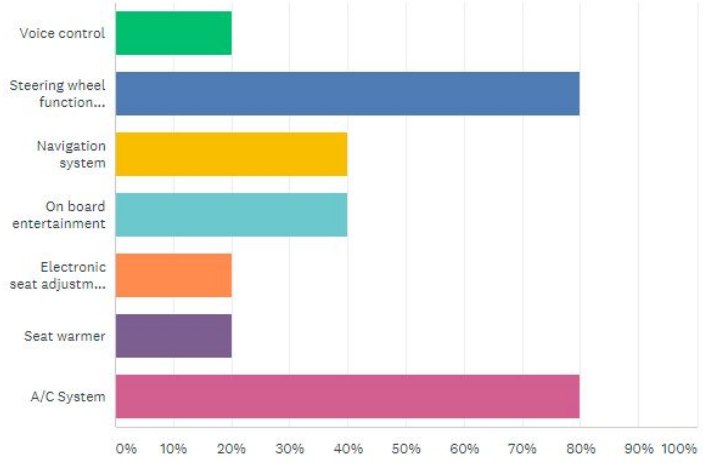
From our survey results we gathered the features each participant currently have in their respective vehicles. By analysing this data, we can determine that:

- 80 % of the current demographic use there A/C system and steering wheel functions. This implies that the demographic are drawn towards comfort and efficiency
- 20% of the participants have features like voice control, electronic seat adjustment, seat warmers. From this group, we can determine that 20% of the participants are familiar with futuristic technology like “voice control” and are more likely to prefer automated technology. This result can be generalized for the 40% populus that currently have.

Q4

What features does your car currently have? (check all that apply)

Answered: 5 Skipped: 1



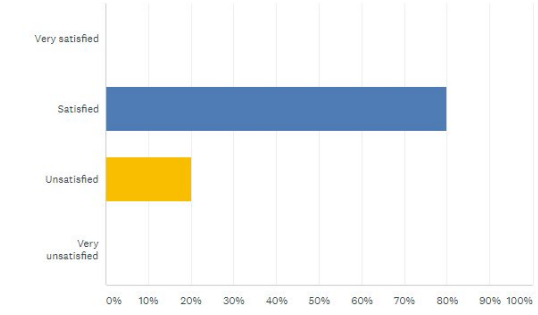
ANSWER CHOICES	RESPONSES	
Voice control	20.00%	1
Steering wheel function buttons (radio channel, volume control, etc.)	80.00%	4
Navigation system	40.00%	2
On board entertainment	40.00%	2
Electronic seat adjustment	20.00%	1
Seat warmer	20.00%	1
A/C System	80.00%	4
Total Respondents: 5		

We can see that people are sometimes distracted by their current dashboard system. This aligned with one of our goals to minimize the distraction caused by the dashboard to a minimum.

Q6

How satisfied are you with your current vehicle's interface?

Answered: 5 Skipped: 1

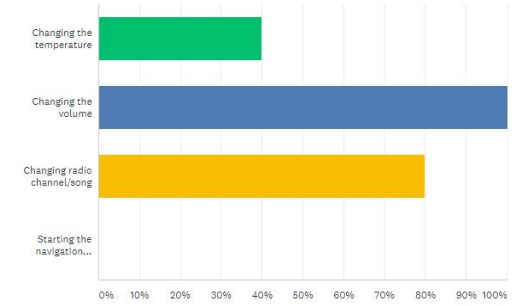


ANSWER CHOICES	RESPONSES	
Very satisfied	0.00%	0
Satisfied	80.00%	4
Unsatisfied	20.00%	1
Very unsatisfied	0.00%	0
TOTAL		5

Q10

What actions can you do without moving your eyes off the road? (Select all that apply.)

Answered: 5 Skipped: 1



ANSWER CHOICES	RESPONSES	
Changing the temperature	40.00%	2
Changing the volume	100.00%	5
Changing radio channel/song	80.00%	4
Starting the navigation system (looking up destinations)	0.00%	0
Total Respondents: 5		

It also appears that none of the individuals who answered the survey are able to set up navigation without taking their eyes off the road.