

Project 4 Process Book

# Cara

## **Team 9 - In-car Interaction with Driverless Car**

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## List of Users and Goals

Users	Goals
Passengers	<ul style="list-style-type: none"><li>- Ensure it's the correct vehicle</li><li>- Add an intermediate destination</li><li>- Get to a specific destination</li><li>- Control temperature inside car/windows</li><li>- Control loudness of speakers/radio station</li><li>- Ask about price</li><li>- Ask about or automatically adjust seats</li><li>- Get local information</li></ul>
Engineers	<ul style="list-style-type: none"><li>- Decide default settings</li><li>- Estimate cost, reliability, and safety</li><li>- Building prototypes of components to carry out tests on</li><li>- Organizing and carrying out testings</li><li>- Generate specifications for parts</li></ul>

## Competitive Analysis

The integration of CUIs with cars is a very new area and there aren't that many CUI's in this sector, and almost none when it comes to autonomous cars. Currently they are trying to focus on speech recognition as well as virtual assistance.

Hyundai is planning on using 'Kakao I' which will be integrated in select cars from Hyundai and Kia. The new technology allows users to control the navigation screen with the sole means of a voice. The driver can find the screens that he is looking for simply by telling the machine the name of a store, an address, or a nearby diner. All he has to do is to activate the function by pushing the button on the wheel and say the name of a destination. It will also feature support for speech and image recognition, text-to-speech, natural language processing, image recognition and chatbots so people can have access to things from the comfort of their car.

A company called Nuance has released a feature for Chrysler and BMW cars with built-in microphones and the company's AI-powered Automotive Assistant software called Dragon Drive that displayed information on the vehicle's in-dash display. The system allows easy, voice-control access to maps and directions but also allows has a Contextual Reasoning Framework which allows the driver to do things such as find parking in a city and the driver can say his/her preferences.

Iris is an automated voice made specifically to soothe the driver who might be sitting in an autonomous vehicle. Passengers who sat in a car with Iris felt four times more comfortable than passengers who sat in a car without a CUI with a human voice and name. However, the system does not play any role other than applying psychological methods to make the driver safe and comfortable.

Comparison Matrix

	Siri	Cortana	Google Now/Google Automation	Alexa	Kakao	Nuance	Iris
Conversational	x	x		x		x	
Helps Productivity	x	x	x	x	x		
Phone Accessible	x	x					
Home Use/IOT				x			
Information Retrieval			x	x		x	
Used In Cars	x				x	x	x
Used in Autonomous Cars							x
Soothes Driver							x
Augments Driver Experience						x	
Hands-Off Driving (eg answering calls w voice)	x				x	x	

# Ecosystem Collection

## Actors

Who will use this?

Passengers, engineers

Who will influence this?

People who ride in the cars, engineers who design the driverless car system, stakeholders who own the driverless cars

Who will support this?

Stakeholders who have invested in this product and want to introduce it to the market, engineers who want to create a better passenger experience

What are the relationships between the actors?

Stakeholders define overall product goals, engineers design and implement goals, and passengers offer valuable user feedback

What assumptions are you making about the characteristics, attitudes, and expectations of the actors?

Passengers want to offer valuable user feedback

## Props

What products are associated with this?

The CUI (conversational user interface) is the main product. It is conveying requested information to the passenger and carries out passenger requests. There may be an additional screen for the passenger to see information. However, if the CUI is clear enough, this is not required.

## Activities

What processes are associated with this?

Passengers realize there is CUI available, and then ask CUI for information and request changes to the environment

What actions are associated with this?

Passengers speak to CUI, CUI interpret and respond to passenger requests

What tasks are associated with this?

Passenger makes a request, CUI responds to request accordingly

What culture is associated with this?

Passengers must be comfortable speaking to a CUI as opposed to a real person

What greater meaning is associated with this?

Humans are slowly being replaced by artificial intelligence and machine learning

## Place/Context

Where does this take place physically?

These interactions occur in a car, between a user and a CUI (digital)

In what social context does this take place?

These interactions take place while a passenger is trying to travel from one location to another location

## Trends/Patterns

Are there any trends affecting this?

Artificial intelligence, natural language processing, and language process. Sophisticated algorithms in Machine learning that interpret human behaviors. The change from human-to-human interaction to human-machine interaction for interface design.

Are there any design patterns affecting this?

The CUI cannot be seen, so there is minimal (if any) displayable information. It is preferable that the CUI sounds as much like a real person as possible.

## Desired Outcomes

What is the desired outcome for the stakeholders?

Passengers are successful when using driverless cars to get from one place to another. They also want the driverless cars and CUIs to perform well on the market.

What is the desired outcome for the service?

Passengers have a good experience in the driverless cars and would like to have this experience again, whether it be for novelty or convenience. The CUI and system should be updated according to user feedback.

What does success look like?

The CUI and driverless car system is efficient and easy-to-use. It also provides more support for artificial intelligence and how it can be used to improve everyday life.

## Scenarios

### Changning

#### Short commute

- James is leaving from his house at 9am and wants to get to his office for work.
- The CUI has saved James' previous travel information and knows that James usually takes the car to work at 9am every weekday.
- When James opens the door and enters the car, the CUI asks, "Good morning James! Do you want to go to your office, located at 123 Main St.?"
- James replies, "Yes, take me there."
- Sometimes, James has a day off from work, so instead, James will answer, "No, I have the day off from work."
- The CUI will then ask, "Where would you like to go?"

#### Long distance travel

- Kelly wants to get to her parents' house for the weekend.
- Kelly lives in Pittsburgh and her parents live in New York. The CUI knows Kelly's parents' address from her previous trips.
- Halfway through the drive, the CUI asks Kelly, "There is a rest stop coming up in 2 miles. Do you want to stop there?"
- Kelly can answer, "Yes, I need to use the restroom."
- Or Kelly can answer, "No, keep driving, I'm in a hurry to see my parents."

### Rosie

#### Control temperature inside car

- Linda lives in a region where the temperature changes drastically from day to night.
- Linda needs to adjust the temperature in the car frequently. Controlling the temperature and focusing on the road condition are difficult to manage at the same time. She often feels anxious when she is driving.
- Our CUI removes the stress and anxiety to multitask when Linda is driving the car. When Linda feels too hot or too cold, she can ask the CUI to increase or decrease the temperature to some degrees. The CUI will adjust the temperature based on Linda's request, and follow with a confirmation "Hi, Linda, the temperature in the car has been successfully changed to 68 degrees."

#### Get local information

- Mike is a busy salesman man who is traveling frequently with his car.
- He is constantly traveling to new towns and cities for his business. To get local information such as gas prices and local weather conditions, he has to spend a lot of time doing research online prior to the trip. He often feels annoyed about the inconvenience of this process.
- Our CUI will save Mike's time and take away the hassle of searching for information himself before he travels every time. With our CUI, Mike is able to get local information

such as nearby gas stations or rest stops at any time when he's driving. All Mike has to do is to ask the CUI about the nearest gas station or stop, and the CUI will perform the search for Mike and respond with the information he needs immediately: "Hi Mike, the nearest gas station is about 5 miles away." In this way, Mike can travel with ease and have more time focusing on his business.

### **Tiffany**

#### Change destination

- Massie has many last-minute plans, and wants to be able to change her destination after the car ride has already started.
- She is worried that the CUI will misunderstand her new destination and bring her to a completely different location.
- When Massie asks the CUI to change the destination to a new address, the CUI will confirm the new location with her and ask her if she is sure she wants to cancel the old address. The CUI will also state how long this new trip will take.

#### Change soundtrack

- Janet is a fan of many musicians, but gets tired of specific songs frequently.
- She wants to easily be able to change the current song or soundtrack being played.
- Janet asks the CUI to change the song. The CUI selects a song that Janet has not listened to recently but has finished from beginning to end multiple times in the past. The CUI then asks Janet if she would like to listen to this particular song, and selects a different song if this choice is rejected.

### **Sumedha**

#### Ask car to switch highway lanes to get to destination quicker

- Susie realizes that, even though the car is programmed to take the highway that has no tolls, there is a tollway that will get her to work quicker since she has an important meeting.
- She asks her CUI "Can you take the XYZ Tollway to get to work instead of the ABC highway?"
- The CUI says "Confirming that you want to take XYZ Tollway to get to work. Your estimated time of arrival is 12 minutes. Confirm?"
- Susie replies with "confirm" and reaches her destination on time.

#### Find nearby parking at her destination

- When Mike reaches Downtown Pittsburgh, he is unsure of all the parking options (Garage, Street Parking, Parking lot, free lots).
- The CUI tells Mike "These are your parking options...." and lists out the parking options with their prices.
- Mike decides he wants to park in the garage because it's raining that day and says "Park in the Garage"
- The car then goes inside the garage and parks itself.

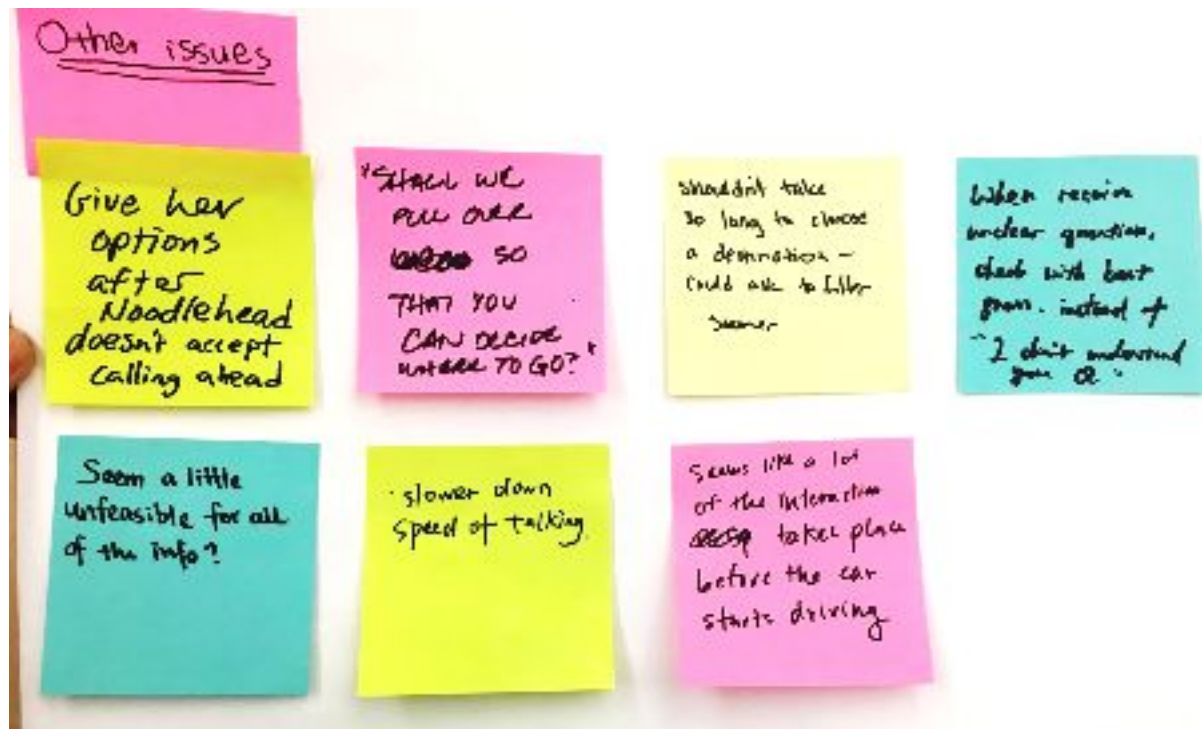
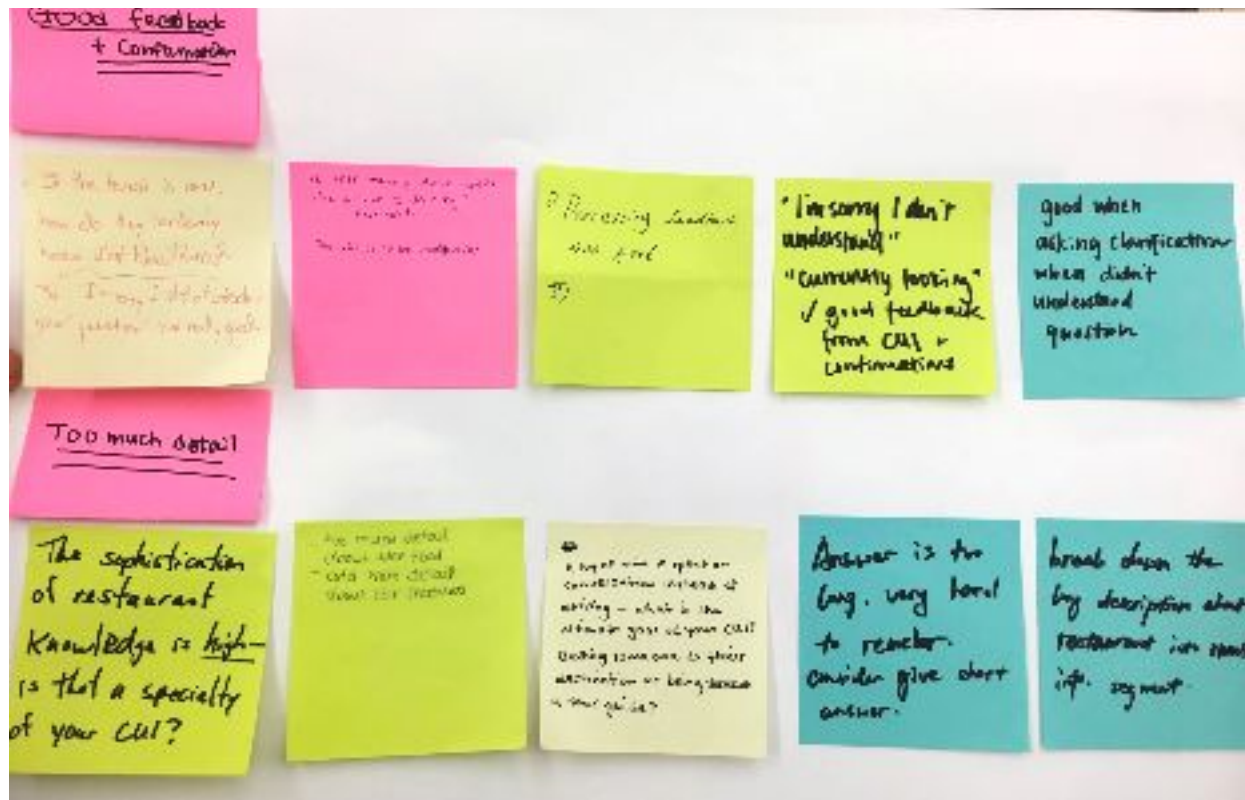


## Prototyping Session

<https://youtu.be/50RM-ArIWrg>



## Feedback from Testing



## List of CUI-Supported Activities

- Get to destination
- Add a stop on the route
- Change destination
- Ability to calculate estimate arrival time based on local traffic
- Ability to switch lanes when asked by the passenger
- Ability to remember recurring drives
- Ability to find nearby parking
- Ability to find and notify of nearby gas stations/rest stops
- Ability to control music and radio in the car
- Ability to adjust windows and seats
- Ability to control temperature of car
- Ability to make/accept calls and text

## Revised Scenario

### Goals of scenario:

- Get to destination
- Ability to calculate estimated arrival time based on local traffic
- Ability to find and notify of nearby gas stations/rest stops
- Ability to make/accept calls and text
- Ability to switch lanes when asked by the passenger

Cara - CUI

Linda - user

### Ability to remember recurring drives, change destination, calculate estimated time

- Linda is leaving from her house at 9am on Thursday, November 26. She opens her car door and says, "Hi Cara!"
- Cara has saved Linda's previous travel information and knows that Linda usually takes the car to work at 9am every weekday.
- Cara asks: "Good morning Linda! Would you like me to take you to work?"
- Linda responds: "No, I'm going to my parents' house today. Please set the destination to 200 Oakwood St., Washington DC."
- Cara replies: "Changing destination to 200 Oakwood St. Washington, DC. Is this correct?"
- Linda responds: "Yes, that's correct."
- Cara says, "Your estimated arrival time is 2:05pm."

### Find nearby gas station, add a stop

- It's 12:30pm now. Linda has been in the car for 3 hours and she wants to grab a snack, so she asks, "Hey Cara, I'm getting a bit hungry, is there a gas station nearby?"
- Cara notifies Linda: "Checking for nearby gas stations...The closest gas station is Exxon Mobile, 6 miles away. Would you like to make a stop there?"
- Linda replies, "Yes, let's stop there."
- "Adding Exxon Mobile 5131 Garden Road to your stops. Your estimated arrival time is 12:47 PM."

### Accept calls, switch lanes

- After stopping at Exxon Mobile, Linda is back on the road. The car is traveling in the slow lane right now.
- Cara notifies Linda: "Incoming call from Mom. Would you like to answer?"
- Linda says, "Yes."
- Mom: "Hey Linda!"
- Linda: "Hi Mom!"
- Mom: "I just wanted to let you know that guests are arriving at 2pm. Try to get here as soon as you can!"

- Linda: "Ok, I'll try my best. See you soon!"
- Cara states : "Call from Mom ended."
- Linda asks: "Hey Cara, can you switch to the fast lane?"
- Cara replies: "I don't understand what you mean by 'fast lane'"
- Linda clarifies: "Can you please switch to the left lane?"
- Cara responds: "Switching to the left lane."

Arrive at destination

- Cara states: "You have arrived at 200 Oakwood St., Washington DC. Can I further assist you?"
- Linda responds: "Nope. Bye Cara!"

## Conversational Model

**INTENT 1—Alerting the system that the destination needs to be changed**

**CONTEXT:** Linda gets in her car at 9AM on Thursday morning.

User	Conversation	CUI status	Characteristics of CUI
Utterance	Linda says, "Hi Cara"	Pre-Attentive	Friendly, helpful
Utterance	"Hi, Linda, are we going to 5000 Forbes Avenue today for work?"	Attentive	
Utterance	"No Cara, I'm going to my Mom's place for Thanksgiving. Please change the destination to my parents' house."	Intent	Polite, efficient
Utterance	"Changing destination to 200 Oakwood St. Washington, DC. Is this correct?"	Response	
Utterance	"Yes, that's correct!"	Attentive	Helpful, useful
Utterance	"Driving to 'Parents House'. You should reach your destination at 2:05PM. There is mild traffic on your route "	Response	

**INTENT 2—Asking the system to find the nearest gas station or rest stop****CONTEXT:** Linda is getting slightly hungry and decides she decides that she needs a snack

User	Conversation	CUI Status	Characteristics of CUI
Utterance	"Hey Cara,"	Pre-Attentive	Friendly, listening
	"Yes, Linda."	Attentive	
Utterance	"I'm getting a bit hungry, is there a gas station nearby?"	Intent	Accurate, professional
	"Checking for nearby gas stations... The closest gas station is Exxon Mobile, 6 miles away. Would you like to make a stop here?"	Response	
Utterance	"Yes."	Attentive	Accurate, helpful
	"Adding Exxon Mobile 5131 Garden Road to your stops. Your estimated arrival time is 12:47 PM."	Response	

# Visual Script Rough Draft

## Cara - Concept Video

Cara is a hands-free CUI to help passengers in personal, self-driving cars.

TIME	SCRIPT	VISUALS	NOTES
0:00	"Cara, your self-driving car assistant."	Black slide with "Cara" on the screen as an intro - "Your self-driving car assistant."	Fade into scene Music starts and continues throughout video
0:03		Pictures pan from house view Camera follows Linda to car -> Linda opens car door  Clock shows 9am, blinking at the top right corner.	Cut to next
0:09	Linda: "Hi, Cara!"	Show Linda sitting in the back	
0:10	Narrator: "Cara has the ability to remember recurring drives, change the destination, and calculate estimated time of arrival."	Blurred screen, text with Cara's features	Stop footage, blur out, show visuals while narrator is talking
0:17	Cara: "Good morning Linda! Would you like me to take you to work?"  Linda: "No, it's Thanksgiving. Can you take me to my parents' house today?"  Cara: "I'm sorry, I don't know where 'my parents' house' is. Can you please give me an address?"  Linda: "It's 200 Oakwood St. Washington, DC."  Cara: "Destination set to 200 Oakwood St. Washington, DC. Is	Side view of Linda talking	



	<p>this correct?"</p> <p>Linda: "Yes, that's correct."</p> <p>Cara: "Your estimated arrival time is 2:05pm."</p>		
0:44	<p>Cara: "Would you like me to store this address as 'my parents' house'?"</p> <p>Linda: "Yes."</p> <p>Cara: "Address stored."</p>	Car driving away	Fade into next
0:50	<p>Narrator: "Cara can also search for nearby gas stations, and make a stop along the way."</p>	<p>Blurred screen, text with Cara's features</p> <p>Clock shows 12:30 pm on the top right corner.</p>	<p>Blur out from footage</p> <p>Show visuals of feature</p>
0:53	<p>Linda: "Hey Cara, I'm getting a bit hungry, is there a gas station nearby?"</p>		
0:56	<p>Cara: "Checking for nearby gas station(beeping). The closest gas station is Exxon Mobile, 6 miles away. Would you like to make a stop there?"</p>		<p>Beeping sounds to indicate Cara is still attentive</p>
1:06	<p>Linda: "Yes, let's stop there."</p> <p>Cara: "Now stopping at Exxon Mobile, 5131 Garden Road. Your estimated arrival time is 12:47 PM."</p>	Different side view of Linda	Fade into next scene
1:15		<p>Back view of Linda coming back to car with snacks. Linda gets into seat.</p>	
1:19	<p>Narrator: "Cara can accept incoming calls."</p>	<p>Blurred screen, text with Cara's features</p>	<p>Stop footage, blur out, show visuals while narrator is talking</p>

1:21	<p>Cara: "Incoming call from Mom. Would you like to answer?"</p> <p>Linda: "Yes."</p> <p>Mom: "Hey Linda!"</p> <p>Linda: "Hi Mom!"</p> <p>Mom: "Are you almost here?"</p> <p>Linda: "I'm 30 minutes away. I'll see you soon!"</p> <p>Cara: "Call from Mom ended."</p>	Front view	Cut to next
1:33		Car pulls into parents' house driveway. View of full house with car pulling into driveway.	Cut to next
1:38	<p>Cara: "You have arrived at 200 Oakwood St., Washington DC. Can I further assist you?"</p> <p>Linda: "Nope. Thanks Cara, bye!"</p>	Linda gets her things while Cara talks. As Linda opens the car door, she responds. Camera is outside of the car.	
		Camera backs up as Linda walks to parents' house.	Fade out
1:45	<p>Narrator: "Cara is a hands-free friendly assistant for passengers in personal, self-driving cars. We've designed her to make car rides as easy and efficient as possible. Now we just need your help to bring Cara to cars nationwide."</p>	Team talks	
	<p>"Cara, your self-driving car assistant."</p>	Black slide with "Cara" on the screen as an intro - "Your self-driving car assistant."	

# Visual Script Final Draft

## Cara - Concept Video

Cara is a hands-free CUI to help passengers in personal, self-driving cars.

TIME	SCRIPT	VISUALS	NOTES
0:00	"Cara, your self-driving car assistant."	Slide with "Cara" on the screen as an intro - "Your self-driving car assistant."	Fade into scene Music starts and continues throughout video
0:03		Picture of Linda to car, Linda opening car door	Clock shows 9am, blinking at the top right corner.
0:09	Linda: "Hi, Cara!"	Show Linda sitting in the back	
0:10	Narrator: "Cara has the ability to remember recurring drives, change the destination, and calculate estimated time of arrival."	On Screen: -road to building -pinpoint -clock	Stop footage, blur out, show visuals while narrator is talking
0:17	<p>Cara: "Good morning Linda! Would you like me to take you to work?"</p> <p>Linda: "No, it's Thanksgiving. Can you take me to my parents' house today?"</p> <p>Cara: "I'm sorry, I don't know where 'my parents' house' is. Can you please give me an address?"</p> <p>Linda: "It's 200 Oakwood St. Washington, DC."</p> <p>Cara: "Destination set to 200 Oakwood St. Washington, DC. Is this correct?"</p> <p>Linda: "Yes, that's correct."</p>	Multiple side views of Linda talking	<p>Split screen: one side is Linda talking; other side is stock Thanksgiving photo</p> <p>Split screen: one side is Linda talking; other side is pic of Washington DC</p>

	Cara: "Your estimated arrival time is 2:05pm."		Clock that shows 2:05pm appears over Washington DC pic
0:44	Cara: "Would you like me to store this address as 'my parents' house'?"  Linda: "Yes."  Cara: "Address stored."	Car backing up and driving away from starting house	Engine starting noises
0:50	Narrator: "Cara can also search for nearby gas stations, and make a stop along the way."	On Screen: -Gas station -Multiple pinpoints along road	
0:53	Linda: "Hey Cara, I'm getting a bit hungry, is there a gas station nearby? "	Side view of Linda talking - on the road, hand on stomach looking hungry (Outside Sumedha's Apt)	Clock shows 12:30 pm on the top right corner.
0:56	Cara: "Checking for nearby gas station(beeping). The closest gas station is GetGo, 6 miles away. Would you like to make a stop there?"		Beeping sounds to indicate Cara is still attentive  Split screen: Picture of gas station
1:06	Linda: "Yes, let's stop there."  Cara: "Now stopping at GetGo, 5131 Garden Road. Your estimated arrival time is 12:47 PM."	Different side view of Linda	Overlay 12:47 PM over picture of gas station
1:15		Back view of Linda coming back to car with snacks. Linda gets into seat.(GetGo**)	
1:19	Narrator: "Cara can accept incoming calls."	On Screen: -Phone	Stop footage, blur out, show visuals while narrator is talking

1:21	<p>Cara: "Incoming call from Dad. Would you like to answer?"</p> <p>Linda: "Yes."</p> <p>Dad: "Hey Linda!"</p> <p>Linda: "Hi Dad!"</p> <p>Dad: "Are you almost here?"</p> <p>Linda: "I'm 30 minutes away. I'll see you soon!"</p> <p>Cara: "Call from Dad ended."</p>	<p>Multiple front views of Linda talking</p> <p>Multiple views of Mom on phone (Sumedha's Apt)</p>	<p>Pictures of Mom slide in, become split screen</p> <p>Pics of Mom slide out</p>
1:33		Car pulls into parents' house driveway. View of full house with car in driveway.	Engine stopping noises
1:38	<p>Cara: "You have arrived at 200 Oakwood St., Washington DC. Is there anything else I can help you with?"</p> <p>Linda: "Nope. Thanks Cara, bye!"</p>	<p>Linda gets her things.</p> <p>Linda opens car door but still inside.</p> <p>Linda steps out.</p> <p>Linda closes car door.</p>	
		<p>From the same camera position:</p> <p>Multiple views of Linda walking up to house.</p> <p>Ring doorbell.</p> <p>Dad opens door welcoming with smile.</p> <p>Linda and dad hug.</p> <p>Also closer side view of Linda and Dad hugging</p>	Fade out
1:45	<p>Narrator: "Cara is a hands-free friendly assistant for passengers in personal, self-driving cars. We've designed her to make car rides as easy and efficient as possible. Now we just need your help to bring Cara to cars nationwide."</p>	<p>Stick figure in car smiling and talking → map of US, same figure pops up all over map.</p> <p>Cara's features → ending screen</p>	

	<p>"Cara, your self-driving car assistant."</p>	<p>Final slide with "Cara" on the screen as an intro - "Your self-driving car assistant."</p>	
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## Additional Process Work

### *Brainstorming for the concept video:*

- Title screen: "Cara"
- Pan from house view → follow Linda to car, open car door → cut screen to clock @ 9am on Thursday, November 26.
- Linda opens her car door, gets into her seat, and says "Hi Cara!"
- Narrator: "Cara has the ability to remember recurring drives, change the destination, and calculate estimated time of arrival."
- Side view of Linda talking.
- Cara: "Good morning Linda! Would you like me to take you to work?"
- Linda: "No, I'm going to my parents' house today. Please set the destination to 200 Oakwood St., Washington DC."
- Panning out of car to eventually see car driving away.
- Cara: "Changing destination to 200 Oakwood St. Washington, DC. Is this correct?"
- Linda: "Yes, that's correct."
- Cara: "Your estimated arrival time is 2:05pm."
- 
- Linda looks down at phone screen → clock says it's 12:30 PM
- Linda: "Hey Cara, I'm getting a bit hungry, is there a gas station nearby?"
- Narrator: "Cara can also search for nearby gas stations, and make a stop along the way."
- Cara: "Checking for nearby gas stations...The closest gas station is Exxon Mobile, 6 miles away. Would you like to make a stop there?"
- Linda: "Yes, let's stop there."
- Cara: "Adding Exxon Mobile 5131 Garden Road to your stops. Your estimated arrival time is 12:47 PM."
- 
- Linda comes back to car with snacks and gets into seat.
- Narrator: "Cara can accept incoming calls and switch lanes at the request of the passenger."
- Cara: "Incoming call from Mom. Would you like to answer?"
- Linda: "Yes."
- Mom: "Hey Linda!"
- Linda: "Hi Mom!"
- Mom: "I just wanted to let you know that guests are arriving at 2pm. Try to get here as soon as you can!"
- Linda: "Ok, I'll try my best. See you soon!"