Google Self-Driving Car

Overview
Google Self-Driving Prototype
Google Self-Driving Lexus SUV

Overview

We observed the Google Self-Driving Car in Mountain View, California, USA for two days, documenting its driving dynamics and operating behaviors.

THE INTERSECTION
Middlefield and San Antonio

The Google Self-Driving Cars usually operate on this main intersection of Middlefield and San Antonio in Mountain View, CA. From are numerous cars zipping around from 8am to 5pm Monday to Friday.

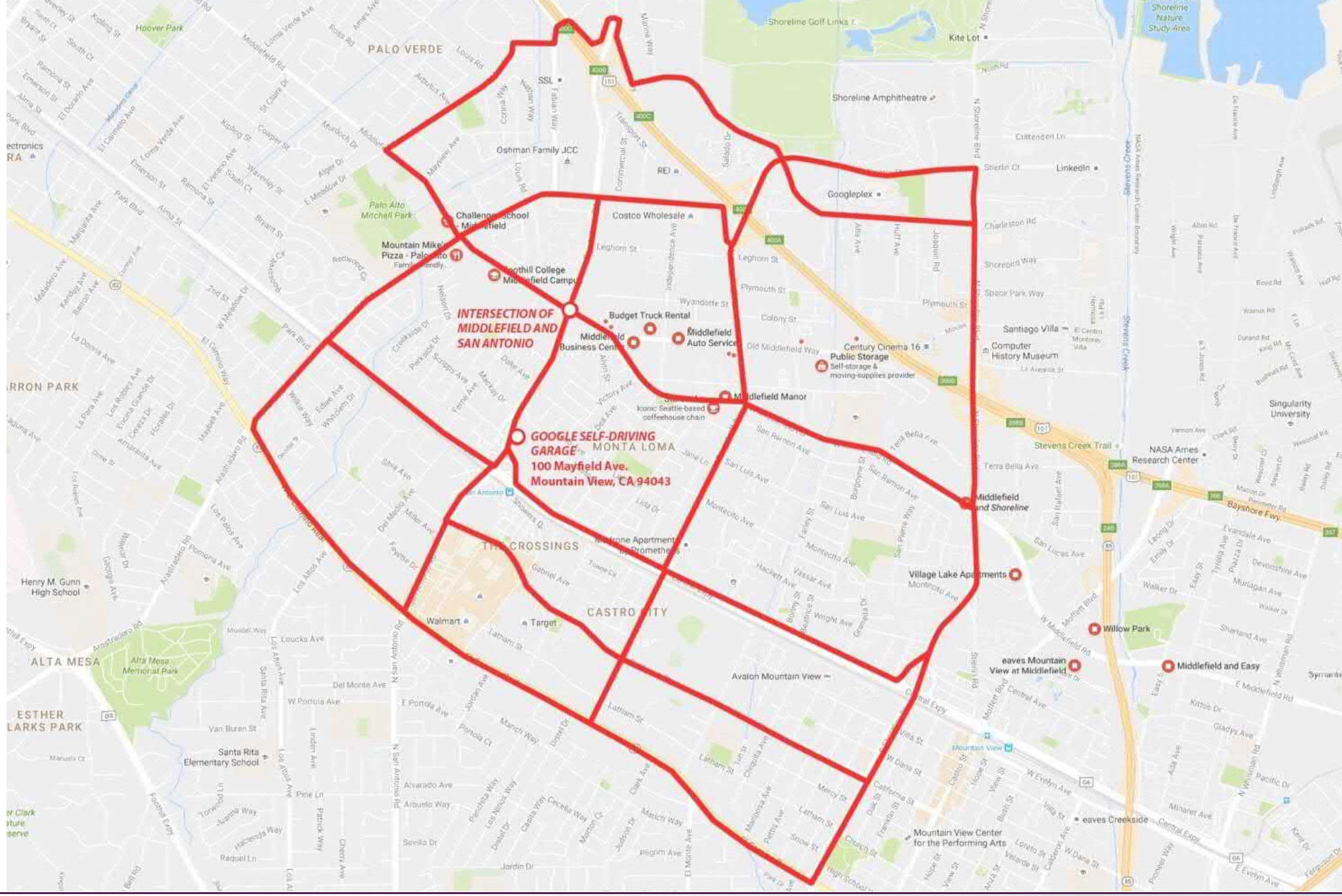
Driving Conditions

The weather condition in Mountain View is 87°F (30.5°C). It is dry, sunny and warm summer day. The concrete streets are in excellent condition and driving lanes are wide. There is not a whole lot of traffic, the busiest street is Middlefield, but traffic still flows.

(25 feet to the right of the intersection of Middlefield and San Antonio.)

The Google Self-Driving Car's Basic Route.

The Google Self-Driving Cars roam all over the Mountain View area, even in the smaller residential streets in between. It takes short trips, makes U-turns, while simultaneously documenting its miles via cameras mounted on the cars. There is no highway usage yet.



TWO MODELS: The Google Self-Driving Car

Google Self-Driving Prototype

-Electric Only
-Autonomous Only
-NO steering wheel
-Top Speed 25mph

Google Lexus SUV

-Hybrid Gas and Electric
-Manual and
Autonomous Mode
-Has steering wheel
-Top Speed 115mph

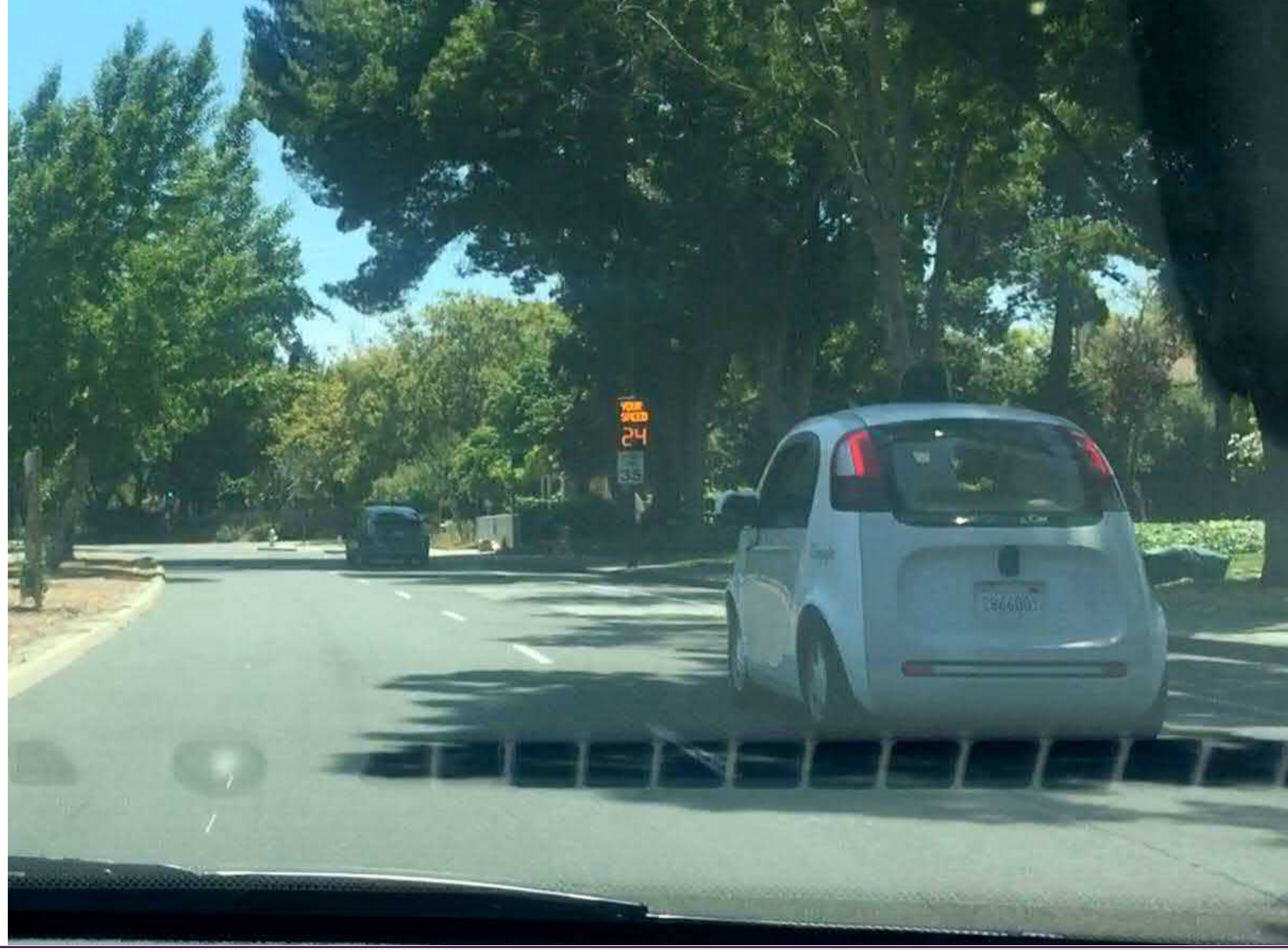
Google Self-Driving Prototype

No Steering Wheel

Positive:
- Acceptable for small town use
- Tall Upright Seating position
- Fully Autonomous

Negative:
- Very slow
- Electric drive is very quiet
- Small
- Two seater
- No Manual Mode
- Short range

Google Self-Driving Prototype's top speed is 25mph. Other cars pass it constantly. Potentially unsafe on a 35mph road.



Going 24mph on a 35mph zone

Google Self-Driving Prototype on a double left turn lane. It brakes before turning when there is a larger car also turning left. Requiring the cars behind it to also brake. Conservative driving but annoying to the cars behind it.

Turning left on E Charleston

It brakes for bicyclists on the right. It's not programmed to pass them. In fact it lurches behind the bicyclist at a low speed until the bike leaves the street.

The car brakes conservatively and proceeds with caution when ever there is a large vehicle to the right of it. And takes more time to do so than most human drivers.

Heading back to
the Google Station

When making a right turn it consistently moves to the right about 2 feet away from the curb.

Going North on Middlefield

The Prototype zipping by with a quiet electric car motor “whine.” There are potential safety concerns on a car this quiet.

Going North on Middlefield

Google Self-Driving Lexus SUV

No Hands on Steering Wheel

Positive:

- -Larger size feels safer
- -Both Manual (human operated) and Autonomous modes
- -Keeps within the lanes
- -Long range due to gasoline/ electric hybrid system

Negative:

- -No freeway testing
- -Required manual mode in parking lots and gas stations
- -Very slow/conservative with large or slower objects in front of it
- -Noticeably loud cooling fan sound coming from car

Filling up at the petrol station requires the car to be in manual mode. The “driver” must pump manually.

Shell Station on
Central Expressway

Loud cooling fan whine coming from the car. Sensors mounted on the outside of car is not made to be foul/rainy weather proof.

Cooling fans on all four corners of sensors

Car is very slow following a bicyclist. It does not pass or speed up. It also braked very abruptly while trying to be cautious.

Braking hard on Sierra Vista Ave.

Approaching speedbumps, the cars consistently brake before going over the bump in the same robotic manner on several occasions.

Speedbump right before Drew St. in a residential area.

Similar to the Google Prototype, the Lexus, when making a right turn, consistently moves to the right about 2 feet away from the curb. This happened consistently several times.

Making a right turn on W Middlefield

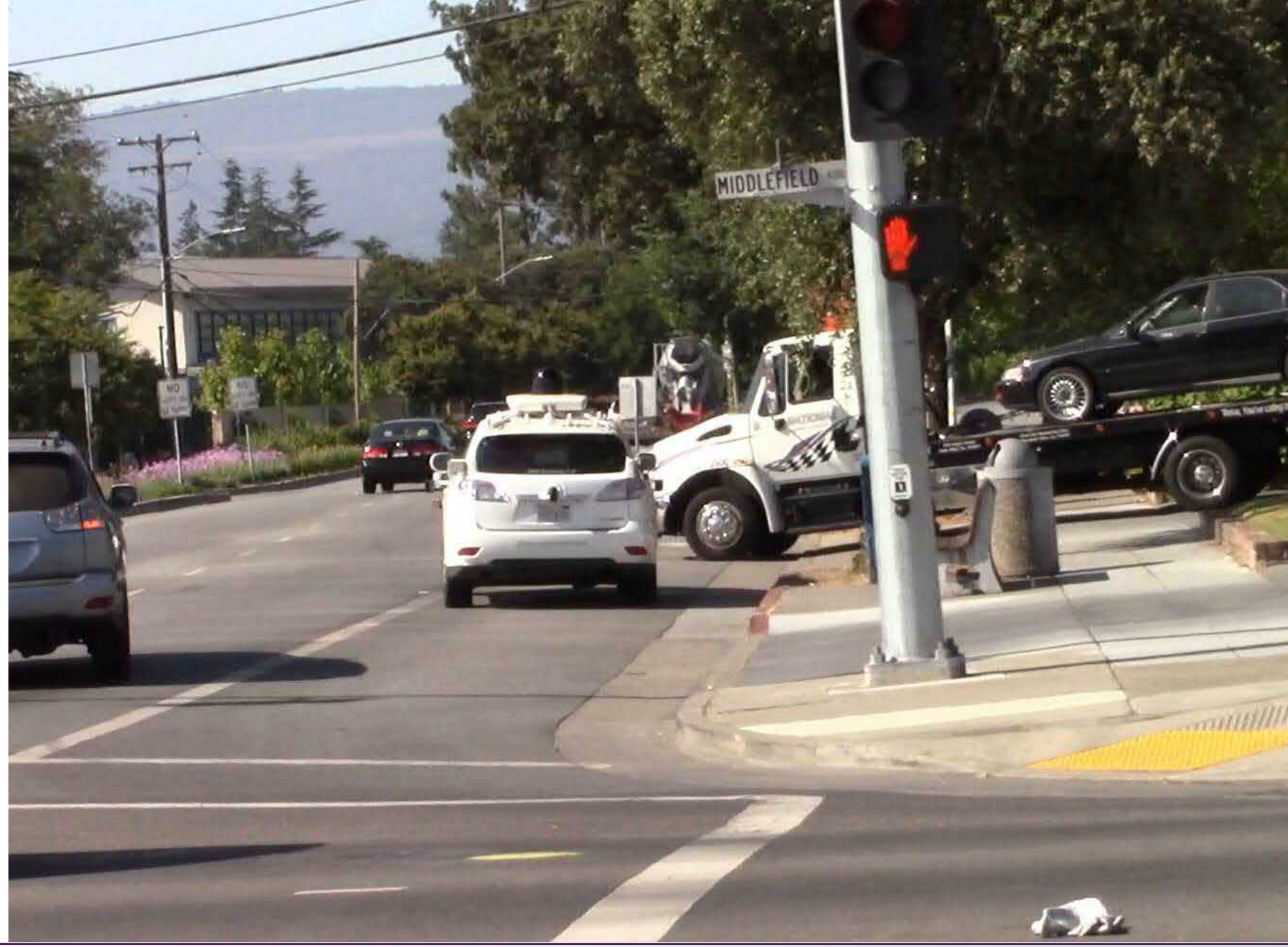
The Lexus is seen braking for larger objects parked at the right side, even when the larger cars are not moving. Frustrating to follow if you are too close to the abruptly braking Lexus. This happens several times.

When approaching a parked firetruck, the Lexus makes a full stop and waits two seconds before proceeding.

The Lexus makes a slight swerve to the right of the lane when a large SUV approaches from the other side of an intersection.

When people are present on the street the Lexus is overly cautious and brakes for them.

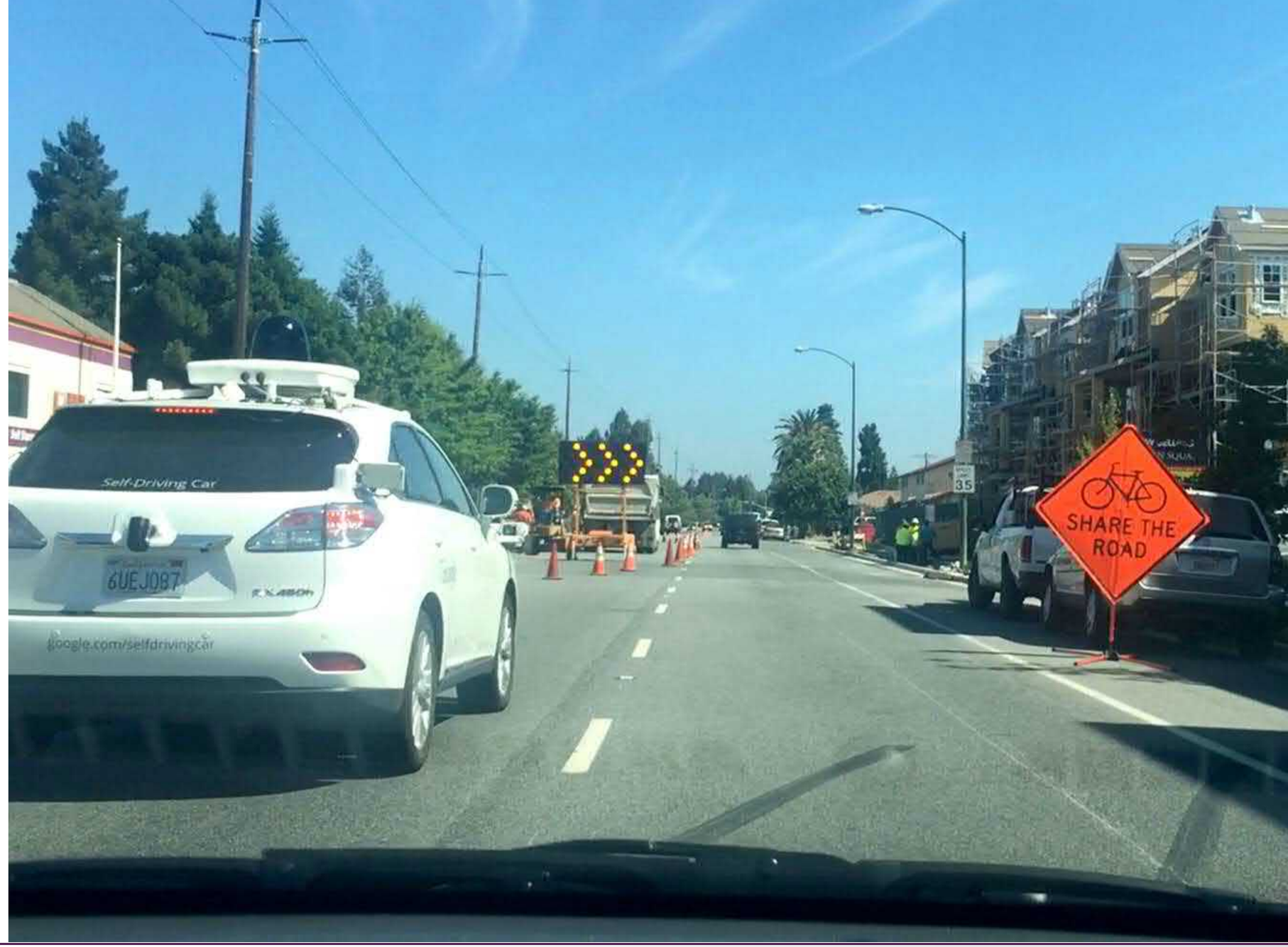
The Lexus, after making a right turn, stays a little too close to the right. When a truck pulls out of a petrol station, the Lexus is forced to stop and adjust while inconveniencing the SUV also making the same turn behind it.



Making a right turn on to San Antonio

Whenever there are yellow caution signs, the Lexus brakes, even when nothing is moving around. This happened repeatedly.

At a busy construction zone, the Lexus brakes and stays there for over five seconds, processing how to proceed.



When a large truck abruptly turns left in front of the Lexus, it brakes well in advance and confidently avoids any potential accident.

When a skateboarder is in the street to the left of the Lexus, it brakes cautiously and stays behind the skateboarder.

Going East on San Antonio

Interviews

Six interviews were conducted to understand how people involved in California car culture and transportation perceive self-driving vehicles.

-Bus Driver
-Uber Driver
-Electric Vehicle Owner
-Hot Rodder
-Track Performance Car Owner
-Retired Couple

BUS DRIVER

Jose Velazquez
58 years old
20 years experience as a bus driver

Takeaways
Likes the technology and feels that it will eventually be safe, but is concerned he will be out of a job.

The biggest challenge to bus drivers is to be on time for their stops. *How will an autonomous vehicle handle this issue?*

The bus driver helps with the handicapped, looks out for vandals and can smell cigarette smoke. *How will an autonomous vehicle handle this?*

The bus driver checks for air in the tires, leaks and any mechanical issues before and after the shift. *Will the autonomous vehicle have the same safeguards?*

Key Quotes from Bus Driver

What can you do as a driver that technology cannot replace?

“Vandalism, there’s got to be some sensors and eyes connected to the central computer where they can see people vandalize the (autonomous) bus.”

How do you feel about self-driving technology?

“I feel like it’s good because there’s no way of stopping technology. It’s good because we humans do get tired. Machines will not get tired”

What do you think is missing in this narrative for automated vehicles?

“Besides needing it in all different kinds of languages. There needs to be TV spots, radio spots, mailers sent to people so they can see what’s coming and how it’s going to be used”

UBER DRIVER

Emilie Johnson
31 years old
Fulltime Uber driver

Takeaways
Does not feel that autonomous cars will be good in crazy LA traffic and around human drivers.

She feels that automation will not know the shortcuts and alleys like she does.

Says the human connection of conversation and interaction is important as a driver.

She feels that as an Uber driver, her car must smell clean and look meticulous.

Key Quotes from Uber Driver

What can you do as a driver that technology cannot replace?

“Conversation. Having to see a face. Having an interaction with people. A lot of people say they were having a bad day, and they just want to vent”

If manufactures can include anything in the design of the self driving car what would you want them to include?

“A built in air freshener, seriously. ”

What could driverless vehicles manufacturers learn from you and your experience driving Uber?

“I think what they can learn for me is my knowledge knowing the streets. There’s a bunch of different ways where you can get yourself out of traffic. By using the back streets in the alley ways. Which is what I know. Like the ups and such, they don’t really show you that.”

ELECTRIC VEHICLE OWNER

Jack Payton
20 years old
1975 Porsche 914 Electric Conversion

Takeaways
Does not like autonomous cars as a concept, but feel that it will save lives.

Does not think we need to own autonomous cars.

Wants the autonomous car to take him somewhere he hasn't been.

Likes the technology, but wants to see something ridiculous, like an autonomous drift car.

Key Quotes from EV Owner

What do you want to see existing in the world when it comes to autonomous cars?

“Showing me something interesting like having a scenic route button and take you to new places. Because... If I can’t drive the car, I want it to take me places I wouldn’t have gone myself.”

“I personally kind of see them as the taxi cabs of the future. There is no real reason for you to own an autonomous vehicle.”

“I think the interest (in modifying cars) will eventually sort of die away, because people won’t have grown up in a culture where you have your own car and you make it your own car and service.”

“I wanna see something a little bit more ridiculous in a fun kind of way. If I’m involved in an autonomous car experience, I want to enjoy the experience. Not necessarily mean reckless driving, I know BMW has built a self drifting car, which is ridiculous.”

HOT RODDER

Fred Shrader
62 years old
1930 Ford Hot Rodder and Pilot

Takeaways
Feels nervous in an autonomous car now but wants it to be the only cars on the road in the future, once the technology is perfected. (no human driven cars).

Would give up hot rodding if he feels that his kids are safe while using driverless car technology.

Key Quotes from Hot Rodder

Is there anything from the hot rod or from the interior that you think could carry over?

“Well, I like gauges, dials, lights and switches and things like that being a pilot and being a racing and car enthusiast. I think you could put some of that stuff in an autonomous car. We need that kind of stuff to attract attention.”

“The period that scares me the most is that period of time that we’re going to have go through where we have mixtures of vehicles on the road and that’s because I don’t think that the driver operated vehicles are going to be able to react is predictably and as fast as and safely as an autonomous vehicle would once it is perfected.”

“Would there someday be a autonomous hot rod? Probably… why not it would be easy enough to re-equip an antique car with in certain cases with autonomous technology but people like me are nuts. We love to drive, we love to do things…”

TRACK PERFORMANCE CAR OWNER

Bryan Hon
36 year old chiropractor
2006 Lotus Elise with turbo, 320hp, 2000lbs, heavily modified

Takeaways
Would not trust his life to an autonomous car.

Driverless cars should have their own tunnel away from human driven cars.

He thinks autonomous cars marks an end to his love of driving and car enthusiast culture.

Key Quotes from Track Performance Car Owner

What impact do you think this technology may have on cars or the driving culture in Los Angeles?

“Oh, in Los Angeles… I think the traffic would get even worse. Those things are miserably slow. I feel like that it will be a waste of amazing winding mountain roads and like the PCH (Pacific Coast Highway) would be a complete waste. I mean, these autonomous cars should have a underground tunnel they could go through, they shouldn't be out in the wild.”

Do you think you could ever learn to like this? Because in the past people liked carbureted cars and then they came to like fuel injection, now they are starting to like turbos and hybrids.

“See, all those technologies enhance the driving experience. Make the cars perform better. An autonomous car, there is no performance. Getting from point A to point B as slow as possible, that's not performance, that's just boring.”

“Soulless, there is no soul driving autonomous cars. Takes the fun out of driving.”

If they could include anything in the car design what would you want them to include?

“A self-destruct button”

RETIRED COUPLE

Frank Vontikis
81 years old retired

Sara Hon
74 years old retired

Takeaways
Not ready for the technology yet.

Wants to retain control even though they acknowledge the tech is safer than their driving.

Wants ingress and egress easier with this new technology.

Wants the driverless car to accurately pick them up at the right spot.

Wants the autonomous car to do what an ambulance can do at the touch of a button.

Key Quotes from Retired Couple

Would you want to own one?

“Yes, if I am alive by the time they come out. I would own one if I know that they are 99.9 percent safe for me to be inside” - *Frank*

As a human driver, what percentage do you think you are at in terms of safety?

“Right now, I think that I am at 89-90 percent (safe)”
- *Frank*

“These car companies should hire a lot of seniors to test the cars. Many seniors may not know how to use the cars at all. Some people just don’t want to learn. I have a lot of friends that don’t even want to own a cell phone. Some of my friends don’t even know how to text on a phone”
- *Sara*

If car manufacturers can include anything to their design, what would you want them to include?

“A very important button, for people that may have a stroke. I push a button, and the car takes me to the hospital right away”
- *Sara*

Are there any features a self-driving car should have?

“One thing that I want to emphasize is for the disabled. When I get into my SUV, I take a longer time to get in my seat. It’s very slow and a little painful, but if there’s something close to the door, a button to make the seat come closer to the door...” - *Sara*