
Glide

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Glide

Problem

Motorcycle travel is practical because of its low economic and environmental impact, it is enjoyable because of its thrilling physicality, but it is dangerous due to limited safety measures. I merge the world of augmented reality with the world of motorcycling. I create Glide.

Solution

An augmented reality interface appears 5 ft in front of the rider. The interface presents information that helps the rider make safe riding choices as well as build healthy riding habits.

Audience

Glide is for motorcyclists who want to be safe on the road, but don't want to sacrifice a sporty riding style. The user commutes in and out of an urban environment several times each week.

Success Criteria

Glide is meant to be delightful and practical. The solution should be judged on the cohesion of its visual language, but with due consideration of functionality. Form follows function. The breadth of thinking behind the interface is just as important as the interface itself. I ask you, "Is this system actually useful? Would a rider benefit from it?"

Glide is a motorcycle safety system. Sensors and scanners are integrated into the rider's motorcycle. These sensors send information to the rider's helmet. The helmet visualizes the information on a digital, semi-transparent plane that appears 5 ft. in front of the motorcycle.

In this process book, I explain how I came to the design decisions that I came to.

Final Solution

The interface is there when the rider needs it and not when he doesn't. The interface is invisible 90% of the time, because it isn't needed. There are never more than two modules on the screen at a single time.

Each module has its own place (i.e the modules never overlap). Unique placement increases legibility, because the user can identify a module simply by its positioning.

The features on the left of the screen are all controlled by voice. The features on the right of the screen are controlled by pupil detection and interaction with the motorcycle.

Glide never asks the rider to synthesize a load of information that is greater than "moderate" (note: primary research findings on pp.40). This ensures Glide does not reduce driving performance.


Tesla
Cole
Roy
Swift
Riddle
Call Lucy?
Beethoven-Symphony IV
47


47


Plum
Street
700-799
Tesla
Coin
Roy
Swift
Riddle


Call Lucy?
BUS STOP


Call Lucy?
Lucy Calling...
Lucy


Beethoven-Symphony IV


Rock Pop


Dubstep


Tupac


Beethoven


Folk


Party


Work

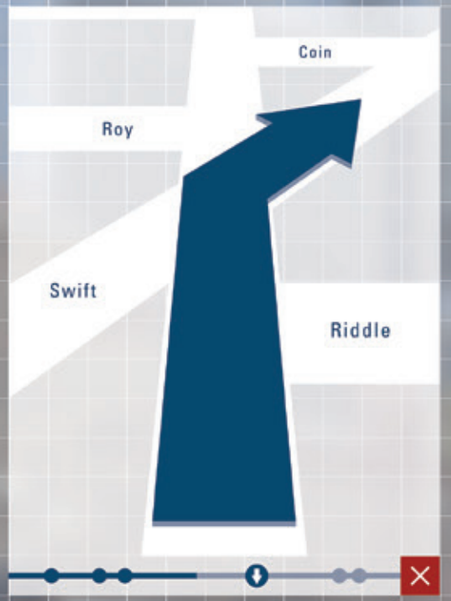

Dr.Connor

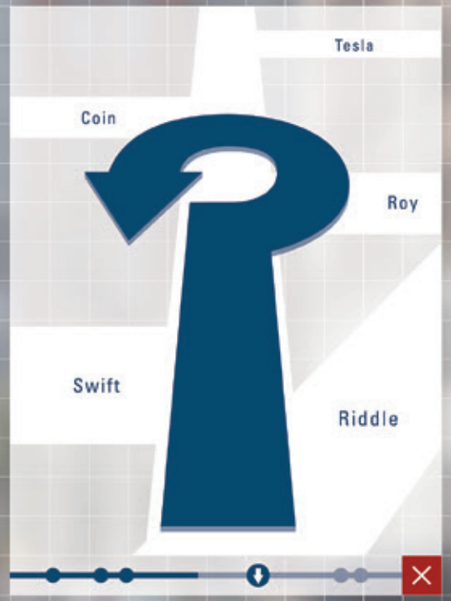

Lucy


Starbucks


Joey


Gym


Coin
Roy
Swift
Riddle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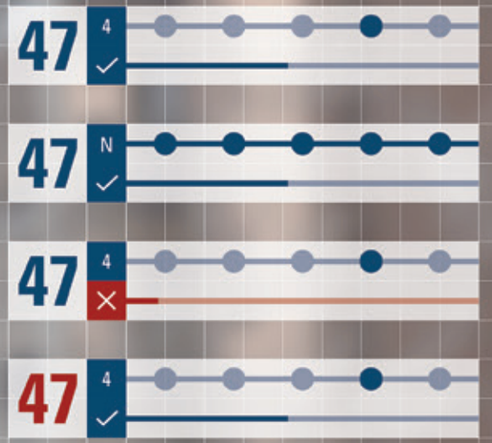
Coin
Roy
Swift
Riddle

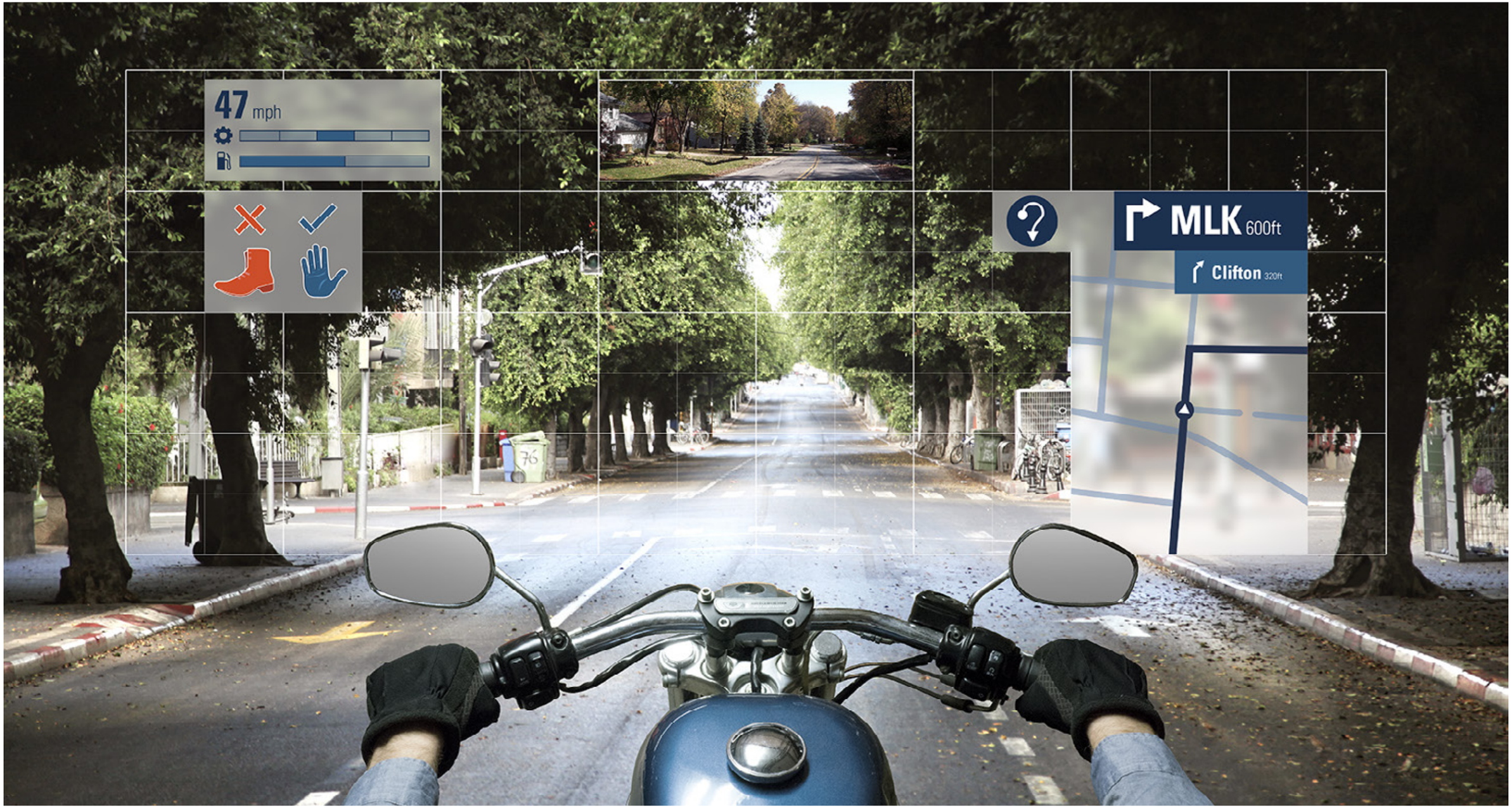

47
47
N
47
47

Interface Evolution

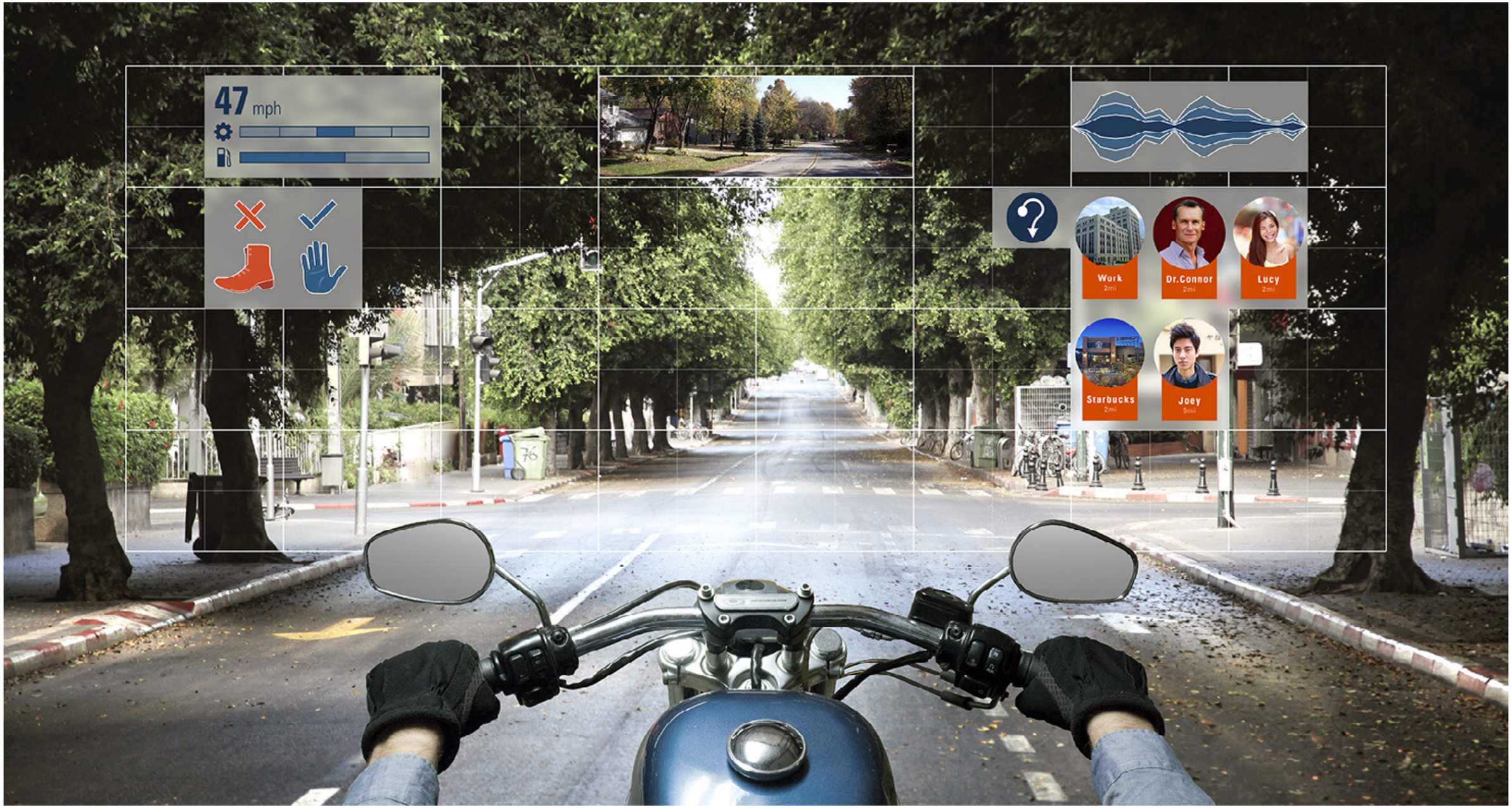
It was difficult to determine a proper aspect ratio for human sight, which is the aspect ratio that Glide should comfortably fit within. Through primary research (pp.34-44), I determined that the average human has a view range that is approximately 5:3. This is slightly more narrow than 16:9. I avoided this part of the project until I had a stronger grasp of what my interface was actually comprised of. My early interfaces were too large and too square. Then they were too wide and too small. After much exploration, I discovered a comfortable medium. I graphically present the images at an aspect ratio of 17:9, but functionally the interface fits comfortably within the user's 5:3 view range.


47 mph
MLK 600ft
Clifton 320ft

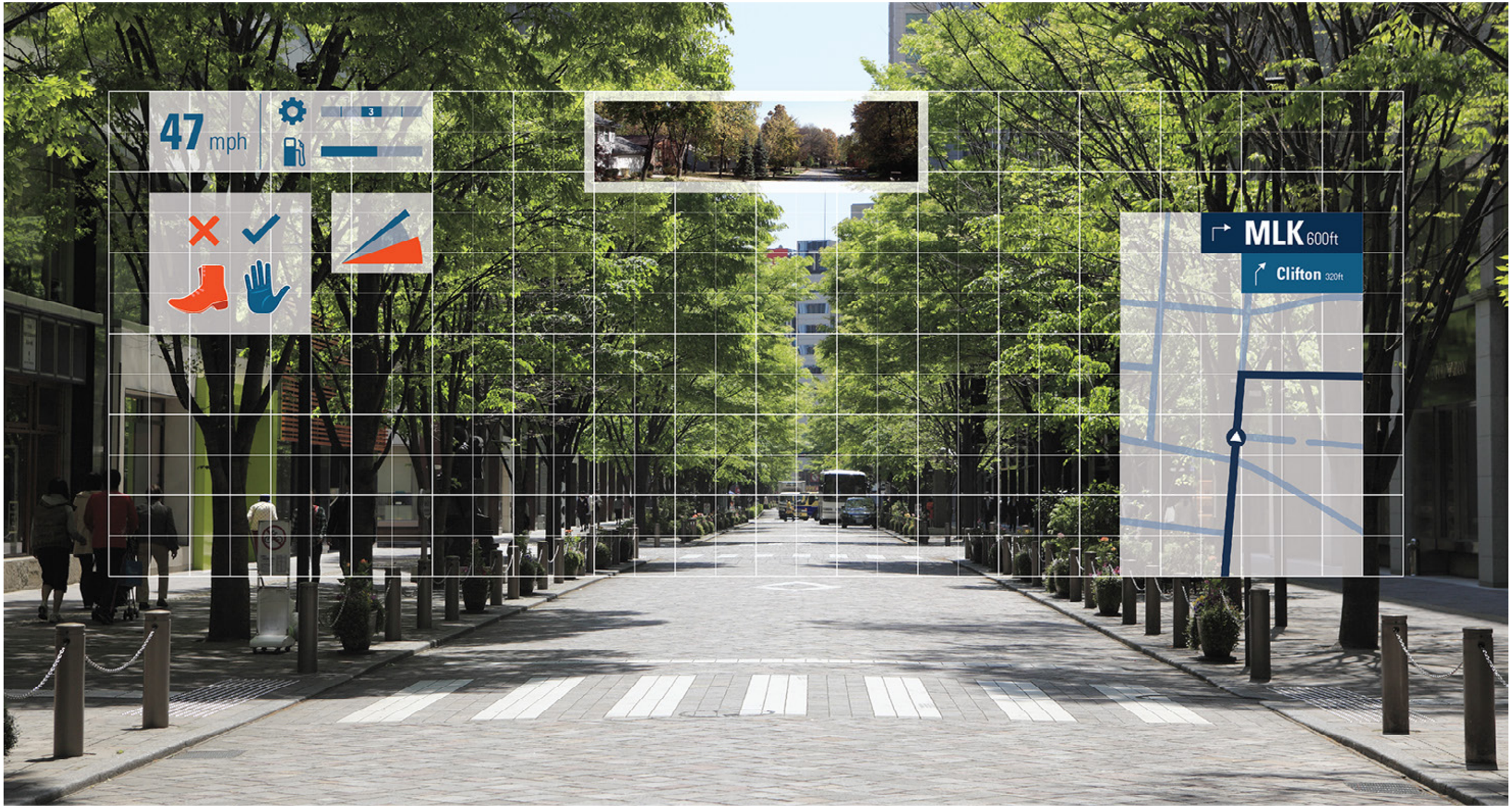

47 mph
Work
2mi
Dr.Connor
2mi
Lucy
2mi
Starbucks
2mi
Joey
5mi

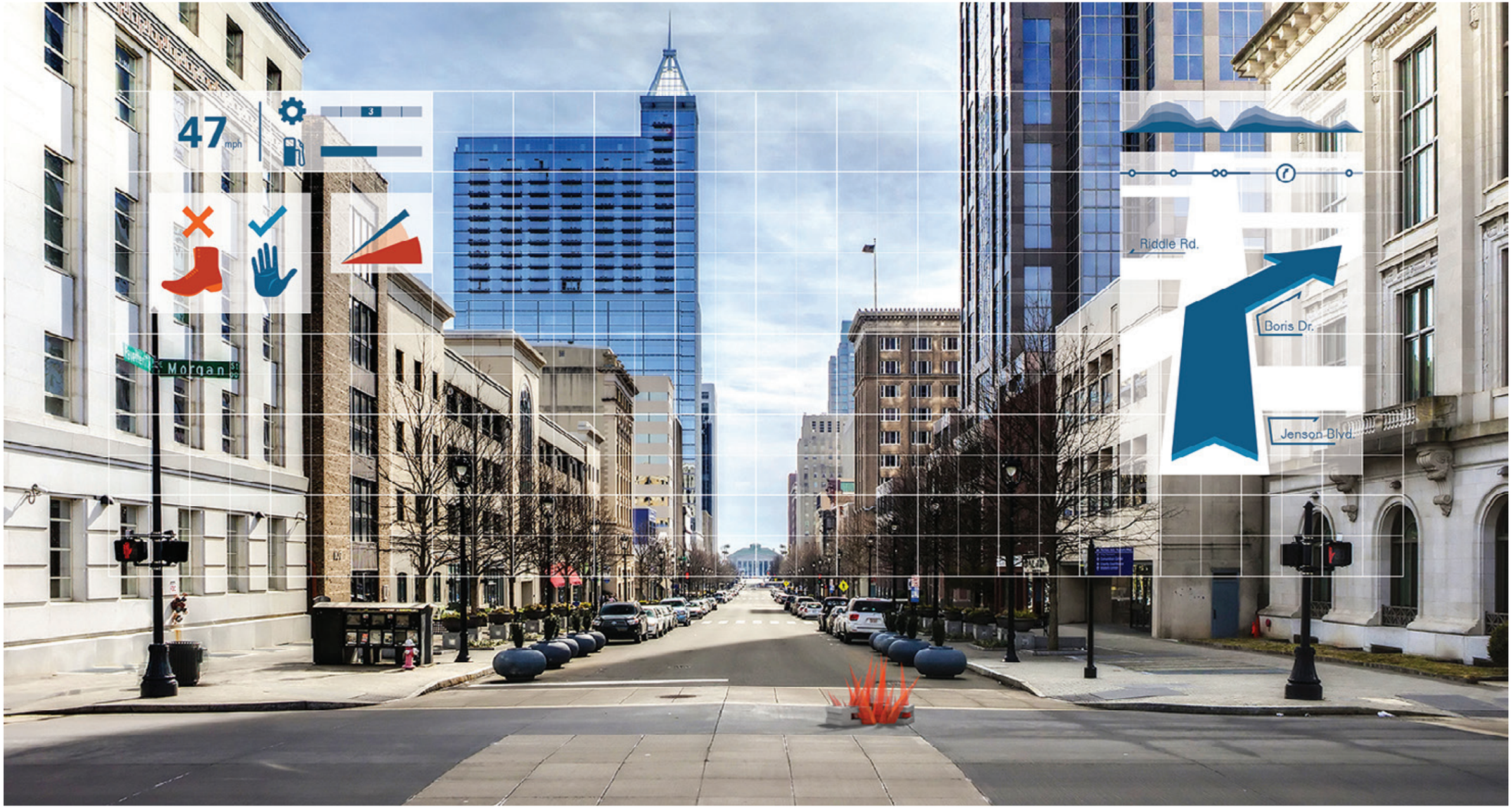

47 mph
MLK 600ft
Clifton 320ft

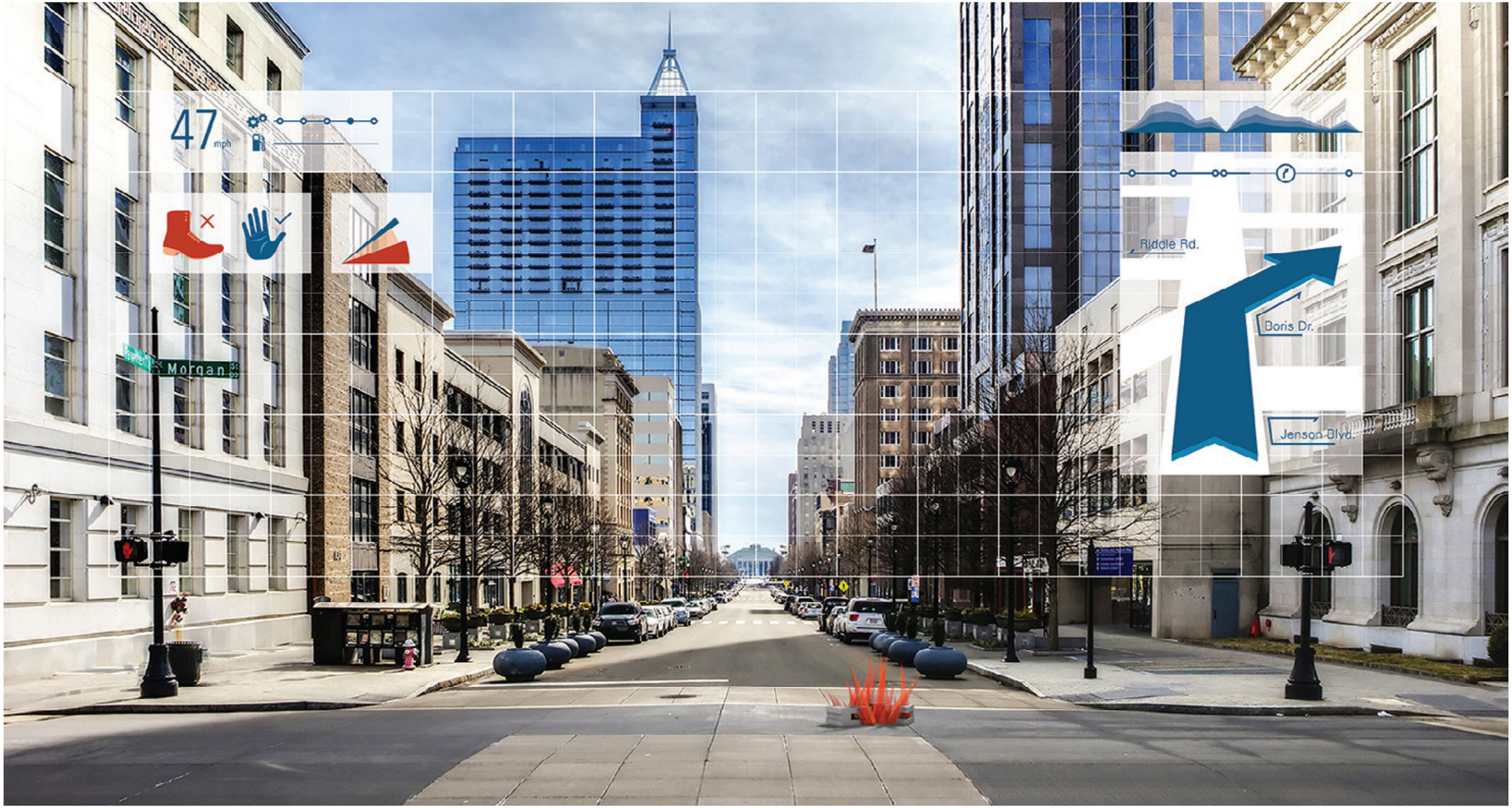

47 mph
WHERE TO...
*Add destinations using the Glide companion app for iOS or Android device
Sandy's 10mi
Dad's 22mi
Starbucks 2mi
CLOSE


47 mph
Work
2mi
Dr.Connor
2mi
Lucy
2mi
Starbucks
2mi
Joey
5mi


47 mph
3
Morgan
Work
2mi
Dr.Connor
7mi
Lucy
7mi
Starbucks
2mi
Joey
5mi
Work
2mi


47 mph
3
MLK 600ft
Clifton 320ft


47 mph
3
Morgan
Riddle Rd.
Boris Dr.
Jenson Blvd.


47 mph
Morgan
Riddle Rd.
Boris Dr.
Jenson Blvd.


47 mph
Riddle Rd.
Boris Dr.
Jenson Blvd.


47 mph
Beethoven - Symphony IV
Close
Plum Street
ONLY
ONLY
Call Lucy?
Yes No
Samuel Pl.
Riddle Rd.
Boris Dr.
Jenson Blvd.


47
Call Lucy?
Beethoven - Symphony IV


47

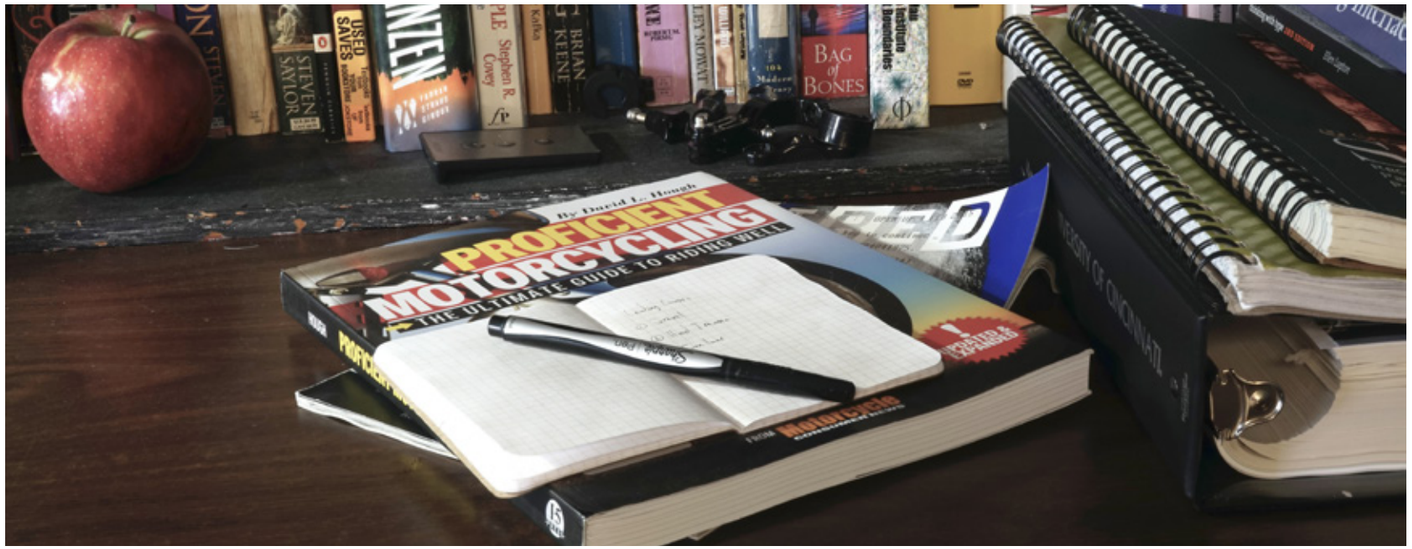

47
Lucy
Beethoven - Symphony IV
Swift
Riddle


47
Call Lucy?
Beethoven - Symphony IV
Tesla
Coin
Roy
Swift
Riddle


Tesla
Coin
Roy
Swift
Riddle
Call Lucy?
Beethoven - Symphony IV
47

Secondary Research

During Summer Semester 2014, I conducted research into the world of augmented reality as well as the world of motorcycle safety. The engineering behind Glide is not innovative. All of the engineering has already been done by different product teams at different companies. Glide is innovative because it is a new and creative application of existing technology. By researching and benchmarking the current state of technology, I was able to set design parameters for myself. I was also researching motorcycle safety and leading causes of accidents. This research made the production side of my capstone much easier. I simply applied current technology to the leading causes of accidents. The functionality of Glide is, in a sense, “combating” the leading causes of motorcycle accidents. Glide builds healthy riding habits in a user so that he is less likely to encounter danger and more capable of handling it when he does.



RIDE APART - Top Causes of Motorcycle Crashes

“A Car Turns Left In Front Of You.”
“You Hit Gravel In A Blind Corner.”
“You Entered-A Corner Too Fast.”
“A Car Changes Lanes Into You.”
“A Car Hits You From Behind.”
“Your Riding Buddies Are Idiots.”
“You Locked The Front Brake.”
“A Car Opened Its Door.”
https://rideapart.com/articles/10-common-motorcycle-accidents-and-how-to-avoid-them

WIRED - Thales

“Projected directly on to the pilot’s helmet visor, the 3D Synthetic Vision System imaging (SVS) will give the crew a virtual representation of the world around the helicopter even in adverse weather, brownout or whiteout conditions, where pilots are no longer able to discern the ground from the air due to dust, sand storms or snow. Detected obstacles can also be displayed in augmented reality, should the helicopter be equipped with an Obstacle Warning System (OWS). This new function has already been evaluated in flight.”
http://www.wired.com/2011/06/augmented-reality-thales-topowl-helmet/

POPULAR MECHANICS - Skully

“Weller sees his helmet merging with vehicle-to-vehicle (V2V) technologies so that cars could become more aware of bikes.”
“‘What you’ll see in the future is a digital force field around the rider,’ he says. ‘Our hope for the future is that this helmet will become the instigator or the catalyst to really revolutionize the industry.’”
http://www.popularmechanics.com/cars/motorcycles/news/coming-this-fall-the-augmented-reality-motorcycle-helmet-16836594?click=pm_latest

CREATIVE APPLICATIONS - Project Tango

"The phone will know exactly where it is, what direction it's looking in, and in all likelihood, what it's looking at. Compare this to the iPhone 5G's M7 motion processor which can just about figure out whether you're running, walking, or in a car."

http://www.creativeapplications.net/android/project-tango-machine-vision-eyes-and-spatially-aware-brains/

BUSINESS WEEK - Driving Car

"When Google made its Nexus line of phones, it was mainly trying to create concept phones that demonstrated Android's full potential. When it got serious about making phones it went out and bought a phone maker: Motorola. I seriously doubt Google is going to go out and buy a struggling automaker."

http://www.businessweek.com/articles/2013-08-26/whats-putting-the-brakes-on-googles-self-driving-car

GOOGLE - Project Tango

"Project Tango is an attempt to create a mobile device unlike any other, a mobile device that shares our sense of space and movement, that understands and perceives the world the same way we do."

https://www.google.com/atap/projecttango/

DAILY TECH - F35

"The idea for the F-35's high-tech and futuristic looking helmet was to be able to display all the data the pilot needed on the helmet's visor so the pilot could remain focused on the environment."

http://www.dailytech.com/F35+Augmented+Reality+Helmet+May+Finally+Reach+Pilots+Thanks+to+Fixes/article24644.htm

CNET - Skully Test

"Closing the prototype helmet's tinted visor did the trick, and suddenly in the right corner of my field of vision I could see a small display of the world behind me, projected what appeared to be 15 to 20 feet ahead of me."

http://www.cnet.com/news/high-tech-skully-helmet-a-google-glass-thats-born-to-be-wild/

WIRED - AR Forecasting

"For example, at a NASCAR race, fans who can't see the entire track could point their phones at a distant turn and get photos and videos gathered by others who are closer to the action."

"The app uses the phone's GPS, digital compass, and motion sensors to detect where I'm pointing."

http://www.wired.com/2013/11/augmented-reality-real-world/

WIRED - AR Forecasting

"AR is already gaining traction among consumers — look no further than IKEA's interactive catalog, Heinz's AR recipe booklet or Amazon's recent integration of the Flow ARtechnology into its primary shopping app."

"An NYU study found that people retain close to 80 percent of information they consume through images versus just 10 percent of what they read."

"While more immediate iterations might be limited to apps and voice commands, I believe it is inevitable that object-recognition technology will evolve to become an automatic overlay on a wearable device."

"Samsung received a patent earlier this year for a camera-based augmented reality keyboard that is projected onto the fingers of the user."

"Augmented reality has already proven itself to be a multi-million dollar industry — with 60 million users and around half a billion dollars in global revenues in 2013 according to Research and Markets. It's expected to exceed $1 billion annually by 2015, according to the Juniper report."

http://www.wired.com/2014/06/well-soon-be-researching-3-d-objects-just-by-looking-at-them/

LOCKHEAD MARTIN - F-35

"The F-35's Helmet Mounted Display Systems provide pilots with unprecedented situational awareness. All the information pilots need to complete their missions — airspeed, heading, altitude, targeting information and warnings — is projected on the helmet's visor, rather than on a traditional Heads-up Display. This approach greatly reduces the pilot's workload and increases responsiveness. Additionally, the F-35's Distributed Aperture System (DAS) streams real-time imagery from six infrared cameras mounted around the aircraft to the helmet, allowing pilots to 'look through' the airframe. The helmet also provides pilots night vision through the use of an integrated camera."

https://www.f35.com/about/capabilities/helmet

MOTORCYCLE SAFETY FOUNDATION - Statistics

"91% (of accidents) occurred on non-interstate roadways, and half of those were at intersections."

"The most common mode of two-vehicle crash was when the front of the motorcycle struck the side of the PV [MSF's note: likely a left-turning driver]: 501 out of 1,792 = 28%"

"Only 4% of motorcyclists were responsible for right-of-way violations, compared to 35% of PV drivers; an additional 9% of PV drivers failed to stay in the proper lane, 7.1% were under the influence of alcohol or other drugs, 5% of them were inattentive (talking, eating, etc.) and 4.7% were making an improper turn."

"27% of motorcyclists had been speeding, compared to 4% of PV drivers."

"Alcohol involvement among motorcyclists was 2.5 times the alcohol involvement of PV drivers: 24% of motorcyclists had a BAC of 0.01 or higher; 16% had a BAC of 0.08 or higher."

"24% of motorcyclists had an invalid license, compared to 8% of PV drivers."

Email with MSF Representative Ken Glaser

Accident Causes

The rider hits gravel in a blind corner

The rider enters a corner too fast

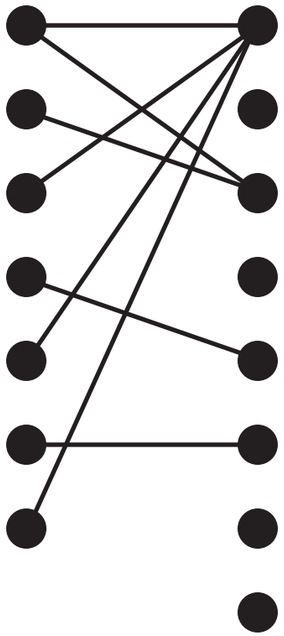
A car cuts the rider off

A car hits the rider from behind

The rider's friends use improper riding form

The rider locks the front brake

A parked car opens its door into the rider's lane



Glide Functionality

Alerts user of detected obstacles

Provides directions

Suggests speed adjustment for upcoming turns

Visualizes gauges (speed, gear, fuel)

Increases rider's visibility (rear video camera)

Encourages rider to use breaks equally

Plays music

Sends and receives calls

Primary Research

I conducted two user tests. The first test was conducted to determine how much information a rider can synthesize before they begin to display delayed reaction times. The second test was conducted to determine the proper scale of my interface. I knew that I wanted the interface to appear a few feet in front of the user, so that his gaze and the focus of his eyes remained “out” in his surroundings. I did not know proper UI dimensions or font sizes.

Test One - Cognitive Load

I had 20 users operate a driving simulator. I asked them to operate the simulator for 5 minutes, so as to become comfortable with its controls. I then timed them for two laps around a set course. I then turned on a data overlay and asked them to drive two more laps while answering questions from a data overlay. I compared the times from the first two laps with the times from the second two laps.

One third of the users were given a “heavy” data overlay, One third of the users were given a “moderate” data overlay, and one third of the users were given a “light” data overlay.

The data overlay challenged the operator to think lingually, mathematically, and visually. I made the data overlay a blend of these three forms of thought in hopes of getting a general gauge of how processing information affects driving performance. I was not hoping to understand how reading, doing math equations, or looking at images affects driving, but thinking in general.

This test determines how much information a rider can synthesize before driving performance decreases.

Conclusions

The operators that were given a heavy data overlay displayed delayed reaction times (pp.39). The users that were given a moderate data overlay displayed reaction times roughly equivalent to their control times (pp.40) The users that were given a light data overlay displayed increased reaction times (pp.41). The increased reaction times can be attributed to the adrenaline rush that helps athletes. Prominent psychologist, Gerry Mathews, found similar results in similar driving experiments. He concluded that a small amount of stress increases driving performance. Users ignore or look past secondary information when primary information is critical or time sensitive. Of the 20 total wrong answers from the experiment, only 2 were actually answered incorrectly. The other 18 were simply ignored.

Test Sample One
Bennett answers the questions of the “heavy” data overlay.

Test Sample Two
Bennett operates a driving simulator.

Visual
The user says what is highlighted.

Lingual
The user names the author.

"You may be poor," said **Jonathan Franzen**, "but the one thing nobody can take away from you is the freedom to fuck up your life whatever way you want to."

"By the time a man gets to be presidential material," said **Gore Vidal**, "he's been bought ten times over."

Mathematical
The user solves for X.

$8 * X = 4$

$4 + X = 11$

$X - 8 = 3$

$X * 3 = 15$

Light
A single stream of data that updates every 20 seconds.

Moderate
Two streams of data that update every 20 seconds.

Heavy
Three streams of data that update every 20 seconds.

Results One

Times, wrong answers, and crashes from the heavy data overlay.

HEAVY MEDIUM LIGHT

/ = wrong answer ✸ = Crash

	Before	After	Difference
User 1	2:00 ✸	/ 1:42	+00:18
User 2	1:38 ✸	/ 2:12 ✸ ✸	-00:34
User 3	1:35	// 1:45	-00:10
User 4	4:08	////////// 4:17	-00:09
User 5	1:40 ✸	1:38 ✸	+00:02

Results Two

Times, wrong answers, and crashes from the moderate data overlay.

HEAVY | **MEDIUM** | LIGHT

/ = wrong answer ✸ = Crash

	Before	After	Difference
User 6	1:47 ✸✸	// 1:44 ✸	-00:03
User 7	2:30 ✸✸✸✸	2:18 ✸	+00:12
User 8	1:36 ✸✸✸	/ 1:45 ✸✸	-00:09
User 9	1:50	1:51	-00:01
User 10	1:33	1:43 ✸✸	-00:10

Results Three

Times, wrong answers, and crashes from the light data overlay.

HEAVY MEDIUM **LIGHT**

/ = wrong answer ✸ = Crash

	Before	After	Difference
User 11	1:42 ✸✸✸	1:38 ✸✸	+00:04
User 12	2:13 ✸✸✸✸	2:11 ✸✸✸✸	+00:02
User 13	1:30 ✸	/ 1:37 ✸	-00:07
User 14	1:34 ✸	/ 1:32 ✸✸	+00:02
User 15	1:53 ✸✸	1:39 ✸	+00:14

Test 2 - Font Sizes / UI Dimensions

The actual scale was one of the most difficult parts of this project because it is so unusual. It is important that the graphics appear several feet in front of the user so that, when reading them, the focus of his eyes does not shift too close to him. Focusing on something very close to a person makes everything farther than a couple meters away indistinguishable. This lack of focus is dangerous. It temporarily removes the rider from his environment. Glide must appear at a distance far enough away that the user does not completely lose focus of the environment around him. I determined that this distance is 5 feet by conducting the tests outlined in this section.

It is also imperative that the interface not obstruct the user's view anymore than it has to. By conducting the tests outlined in this section, I determined that if the interface were 6.5' wide and 2.5' tall, it would comfortably fit in the periphery of the user's view. It would be far enough from his line of sight that it would not hurt his driving if he wanted to ignore it. It would be close enough to his line of sight that if he wanted to read it, he wouldn't have to look too far from the road to do so.

Actual Size UI Test 1
The modules are too small in this test. The rider has a hard time reading them.

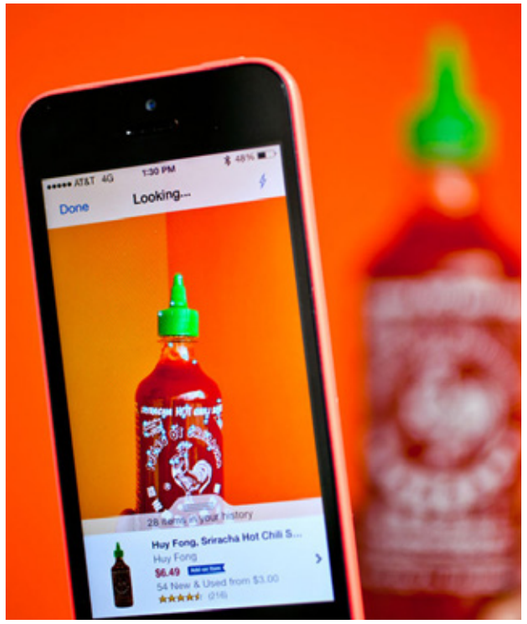
Actual Size UI Test 2
The modules are too large in this test. They obstruct too much of the rider's vision.

Actual Size UI Test 3
The module sizes and layout are very close to the final state in this test.

Numerous Actual Size UI Prints
Numerous actual size test prints were needed to determine ideal UI.

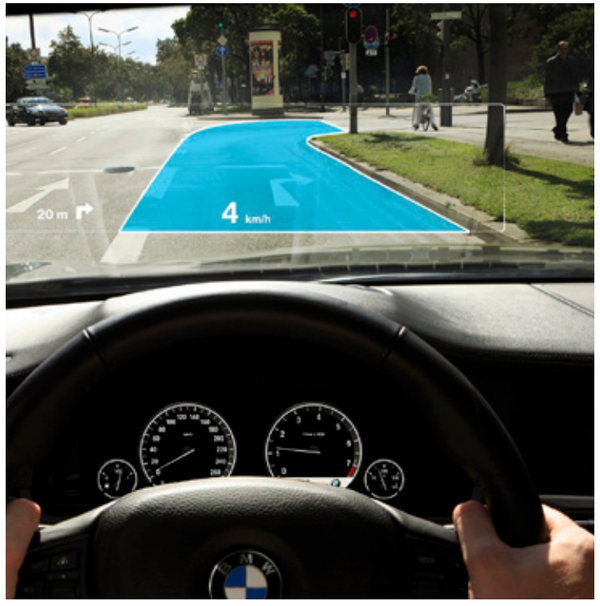
Visual Research

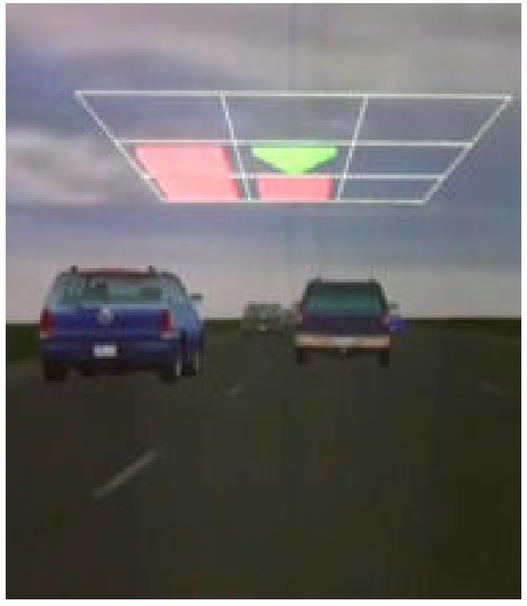
During the “research intensive” Summer Semester 2014, as well as during the “production intensive” Spring Semester 2015, I scoured the web for visualizations of how augmented reality could help the driving experience. Some of the visualizations I found were simple and practical, some were beautiful and conceptual. Early on, I determined two buzz words for the aesthetic of Glide: “Mechanical Precision” and “Future Science.” I compiled images that matched the style that I intended for Glide.

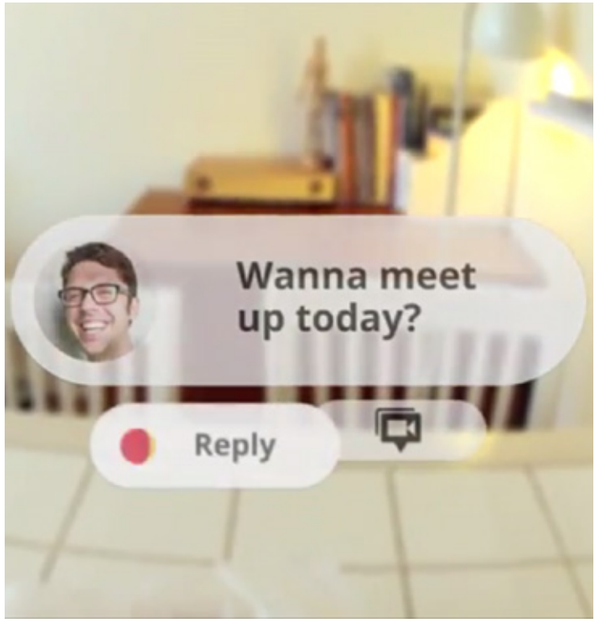

AT&T 4G
1:30 PM
Done
Looking...
28 items in your history
Huy Fong, Sriracha Hot Chili S...
Huy Fong
$6.49
54 New & Used from $3.00


PASTORAL CARE


23 km
120
120 km/h

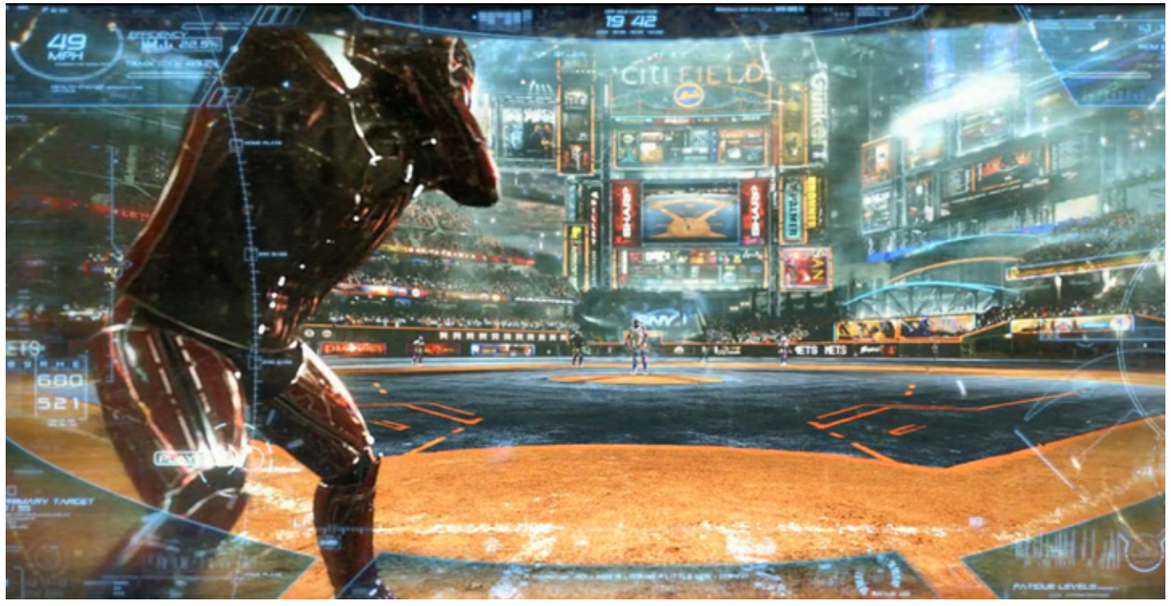

20 m
4 km/h



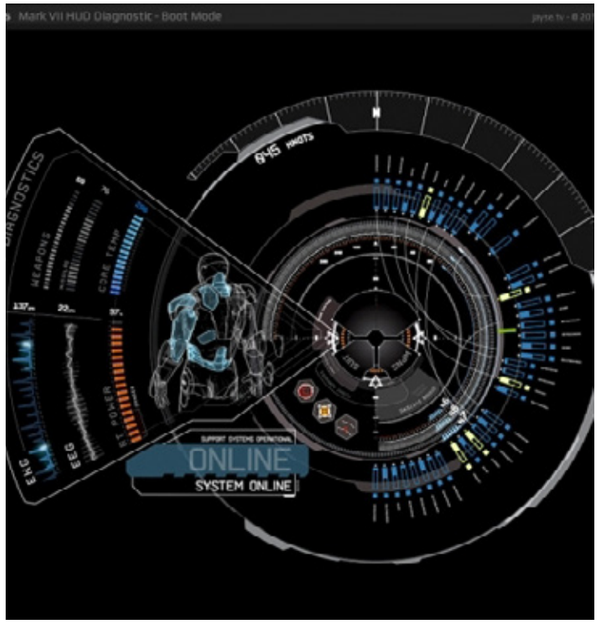

Wanna meet
up today?
Reply


HUD Diagnostic/Flight Mode - Back View


Corona Del Mar
911 call @ 1311
701-553-4458
Robbery
one suspect armed
5XAW126

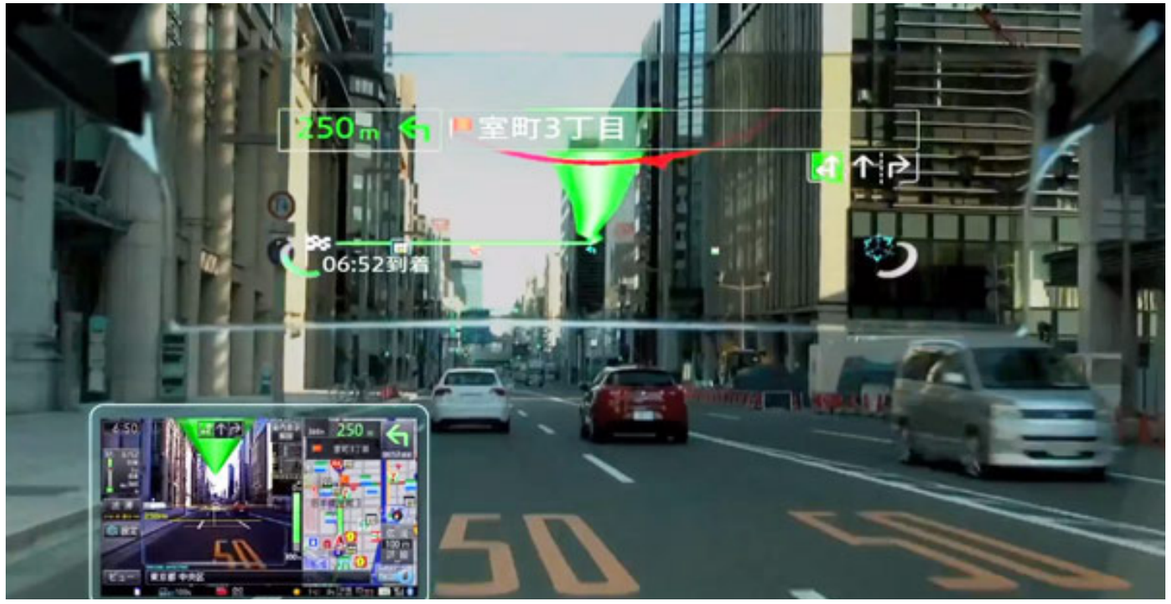

49
MPH
19 42
CITI FIELD
680
521

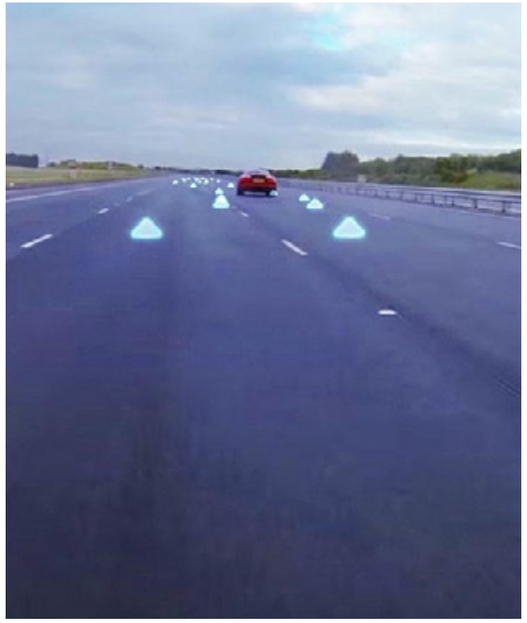

IKEA


Mark VII HUD Diagnostic - Boot Mode
DIAGNOSTICS
WEAPONS
CORE TEMP
ENG
EEG
SYSTEM ONLINE


FOLLOW ME


2.4 km
大黒JCT
10:40到着
65m


250 m
室町3丁目
06:52到着

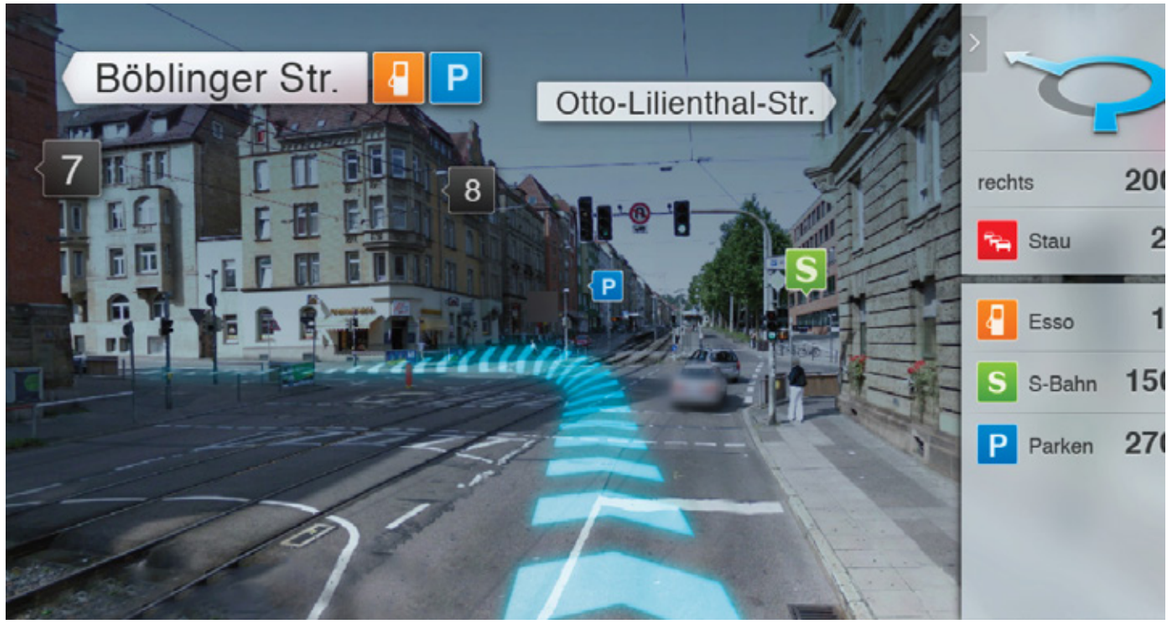



00:38.54
S. Gordon
3rd
00:01:05
108
MPH
5

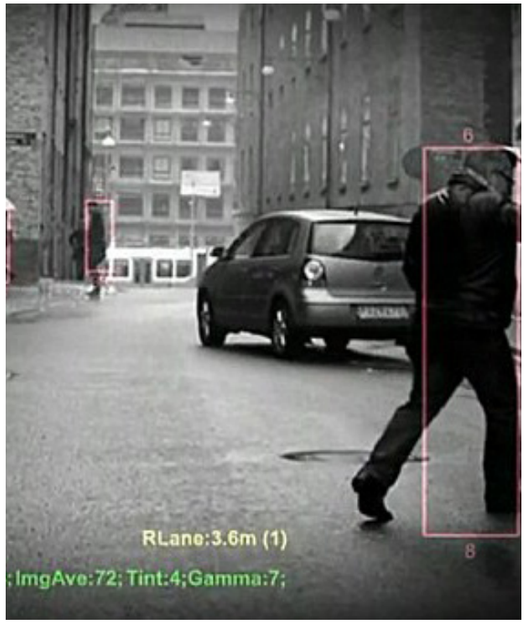

ANGLE
0:25°
ON
OUT
CAR
CHARACTER
12:52.09
AVENTADOR
19"
SPORT
Lamborghini


SPEED UP!
21
GO
STRAIGHT
SPEED
LIMIT
30


OFF
IN
CAR
CHARACTER
12:56.56
AVENTADOR


Böblinger Str.
P
Otto-Lilienthal-Str.
7
8
S
P
rechts
Stau
Esso
S-Bahn
Parken

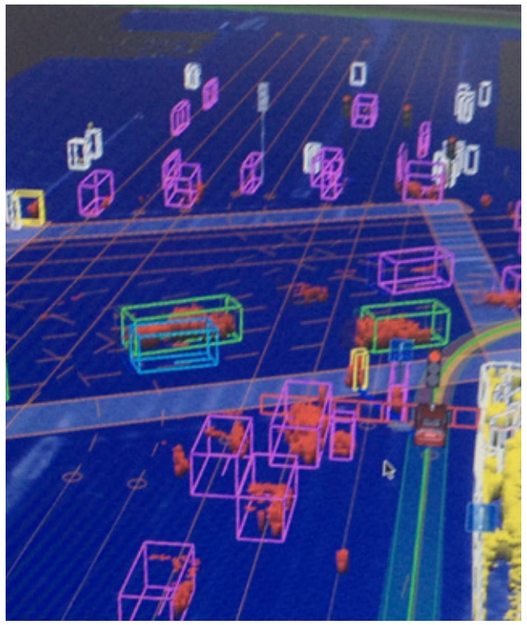

150 m
東京ゲートブリッジ
75m
20:27 到着

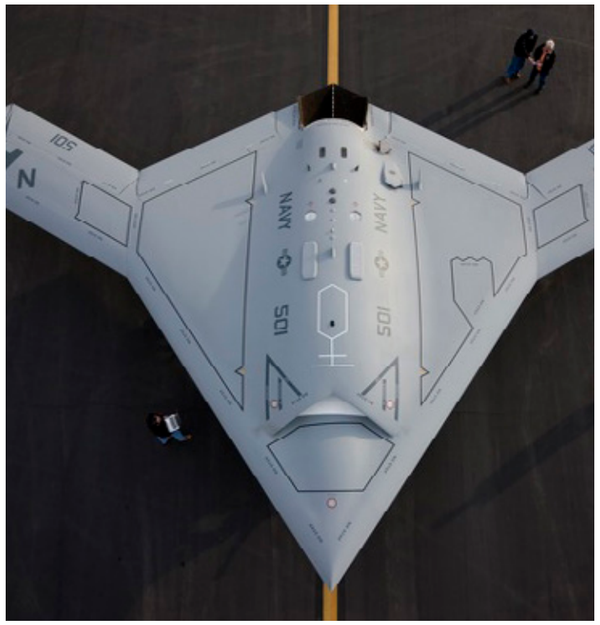

RLane:3.6m (1)
ImgAve:72; Tint:4;Gamma:7;

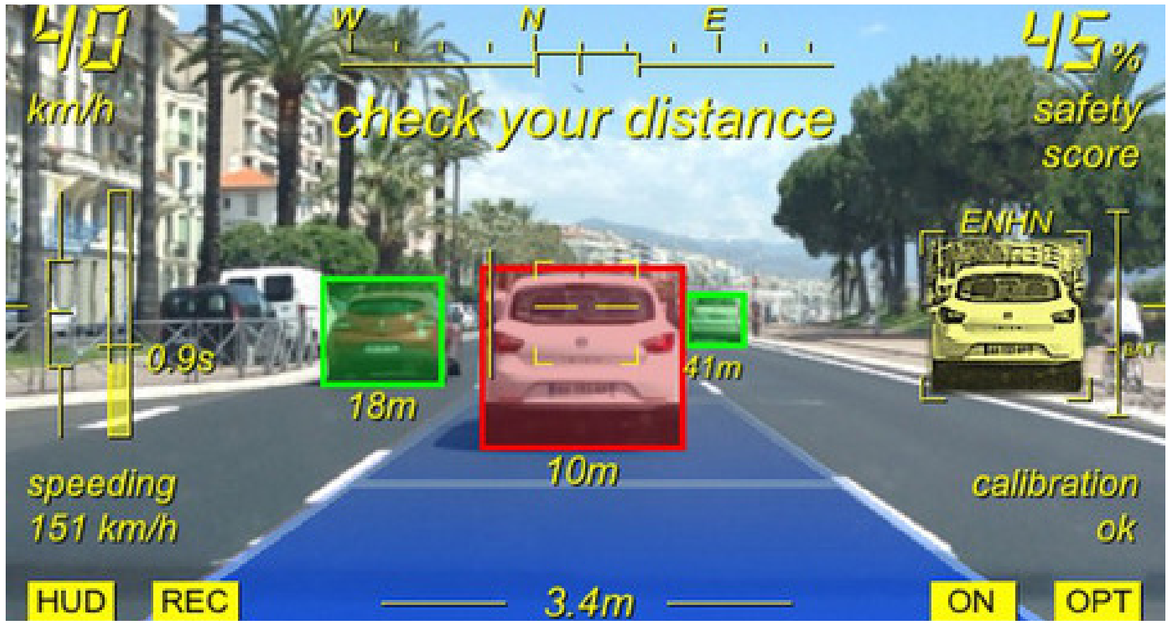

TRANSPARENT BONNET
VIRTUAL PROTOTYPE IN TESTING


Geiereck (1805 m)
Stadelhorn (2286 m)
Großer Weißschartenkopf
Sonntagsh
GPS Accuracy: 228 m - Line of Sight:


DRIVE ASSIST
ACTIVE
5.2 M
3.26 M



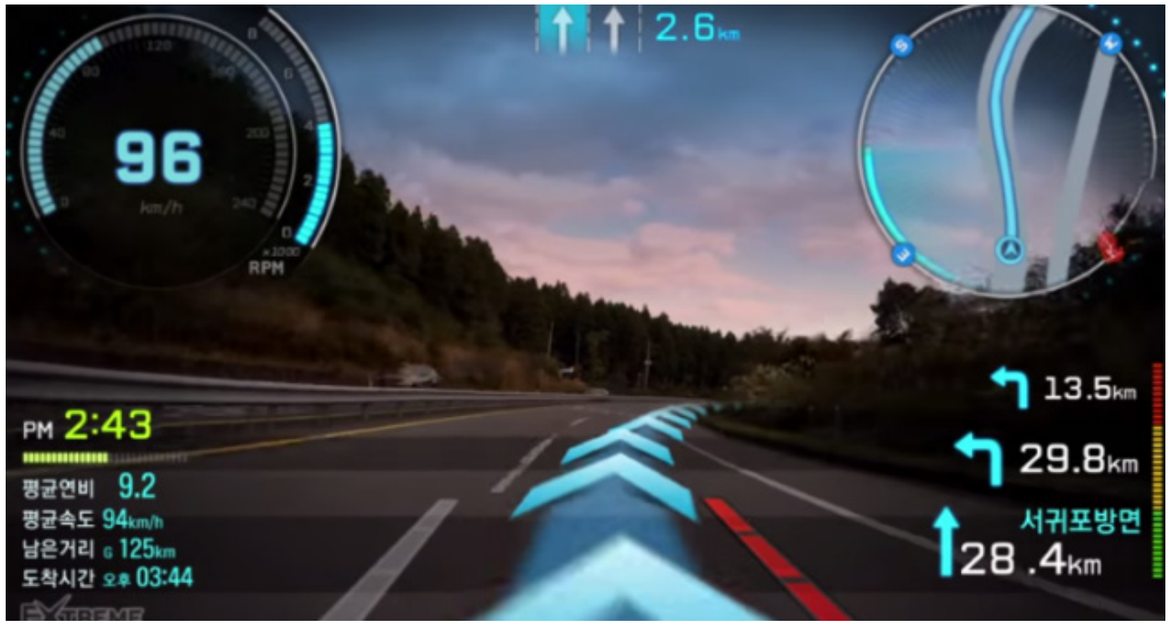



40
km/h
W
N
E
45%
safety
score
check your distance
ENHN
0.9s
18m
10m
41m
speeding
151 km/h
calibration
ok
HUD
REC
3.4m
ON
OPT


SKULLY

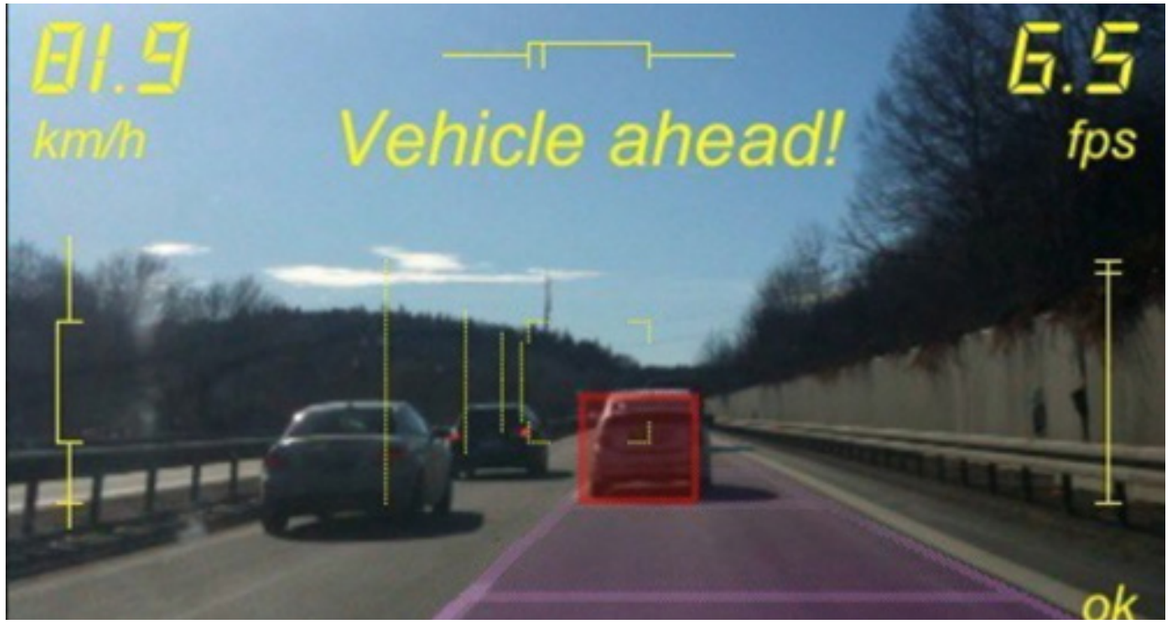

virtual road signs
text and graphics
(as in typical HUDs)
Best Western
DEER CROSSING
virtual building signs
TYPICAL HUD-BASED SYSTEM

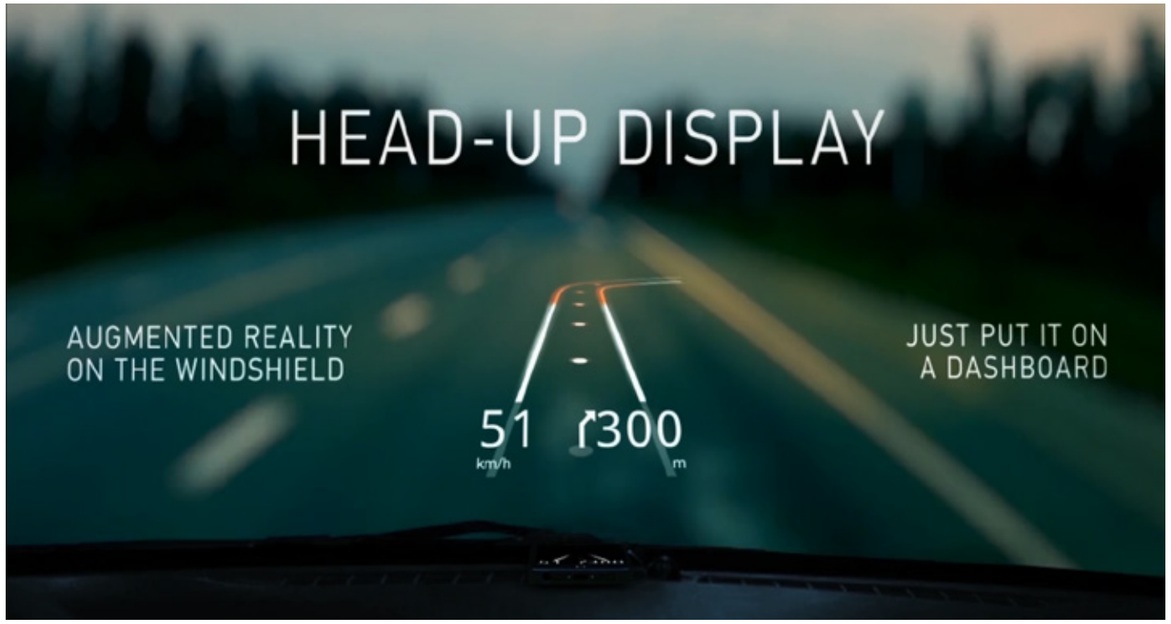

漢口路五段 直走
1.2km
41%
PATH
32
km/h
1.5km
1.5公里 17:05 00:01

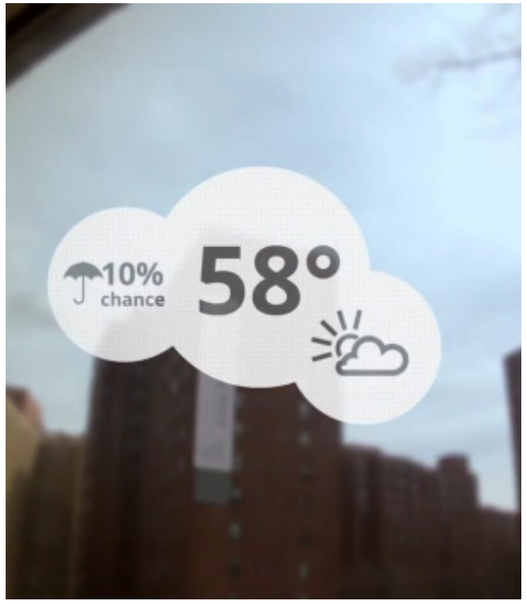

96
km/h
RPM
2.6km
PM 2:43
평균연비 9.2
평균속도 94km/h
남은거리 125km
도착시간 오후 03:44
13.5km
29.8km
서귀포방면
28 .4km


RIGHT HERE
LEFT HERE

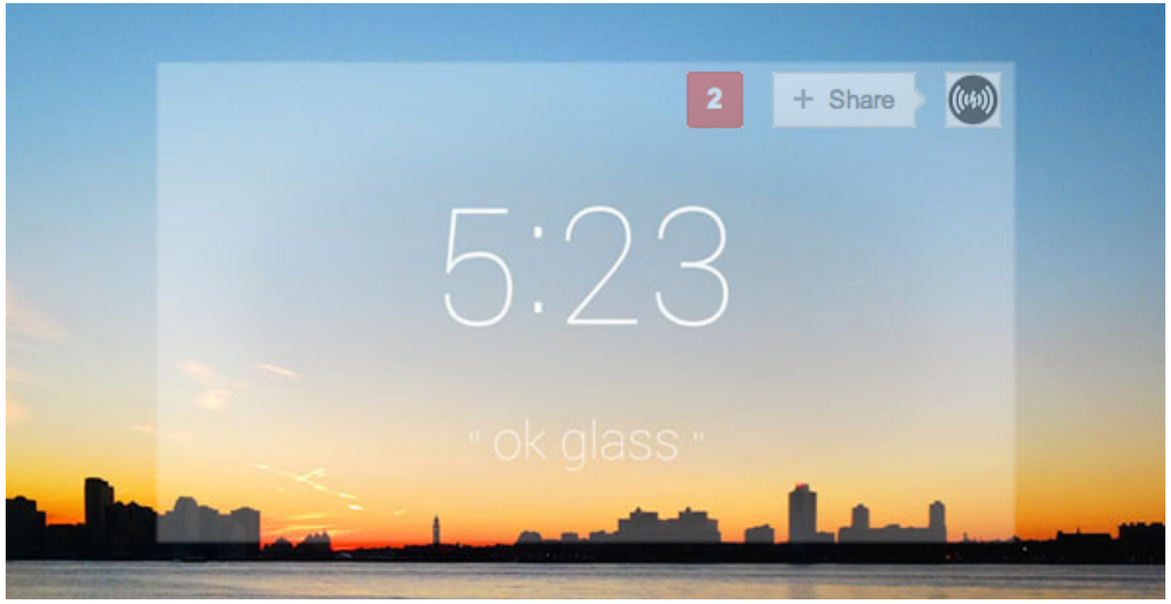

Hitachi 2400 Smart Windshield
Recommend Upgrading to OS 2.7
Look at Target and Blink Rapidly to Install
Han, Jennifer // Age 23
Expired Registration, DUI Conviction 2012
STARBUCKS COFFEE


81.9
km/h
Vehicle ahead!
6.5
fps
ok


HEAD-UP DISPLAY
AUGMENTED REALITY
ON THE WINDSHIELD
JUST PUT IT ON
A DASHBOARD
51
km/h
300
m


10%
chance
58°


12:30 PM
Lunch
JFK
SFO
Virgin Airlines
Flight 23
10:31 AM
On Time


2
+ Share
5:23
" ok glass "


20 SECONDS
1920x1080

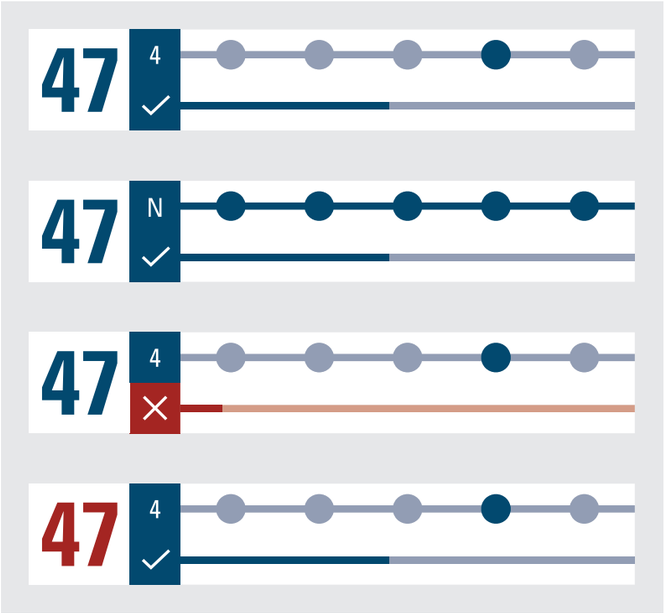

14.02.2013
LIVE DATA TRANSFER
ROSEMARY CHURCH
CNN
021.
#08

Gauges

Monitoring current gear, fuel level and speed is a breeze with Glide, because the user needs this information frequently.

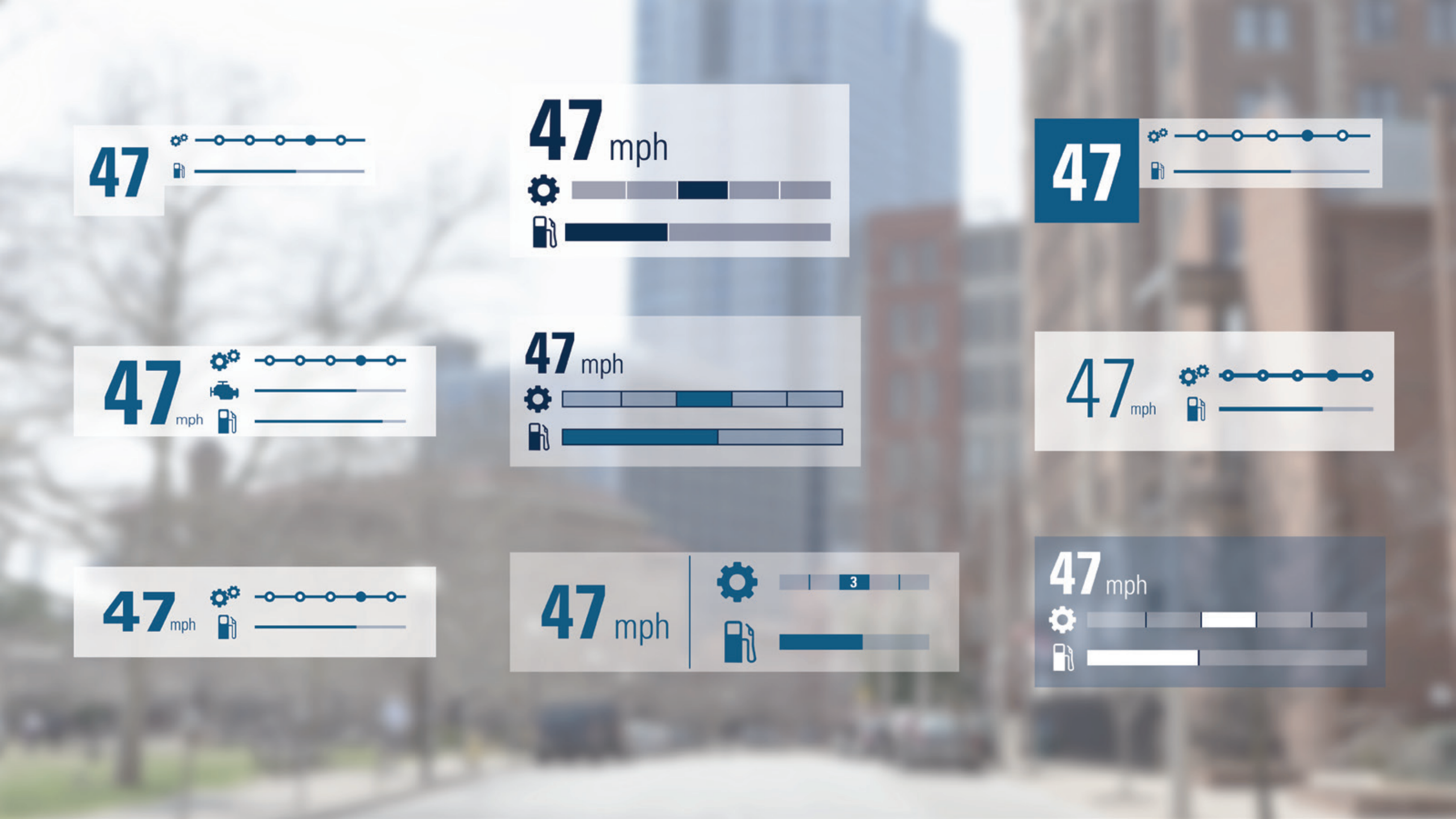
The user does not have to remove his eyes from the roadway to read this information as much as he would if he were reading from mechanical gauges attached to the handlebars of his motorcycle. Because the holographic interface appears 5 ft. in front of the motorcycle, the focus of the user's eyes does not shift so drastically that his environment becomes indistinguishable. When a rider looks down at his odometer or other mechanical gauges, his eyes refocus to a close distance, making the rider's environment indistinguishable.

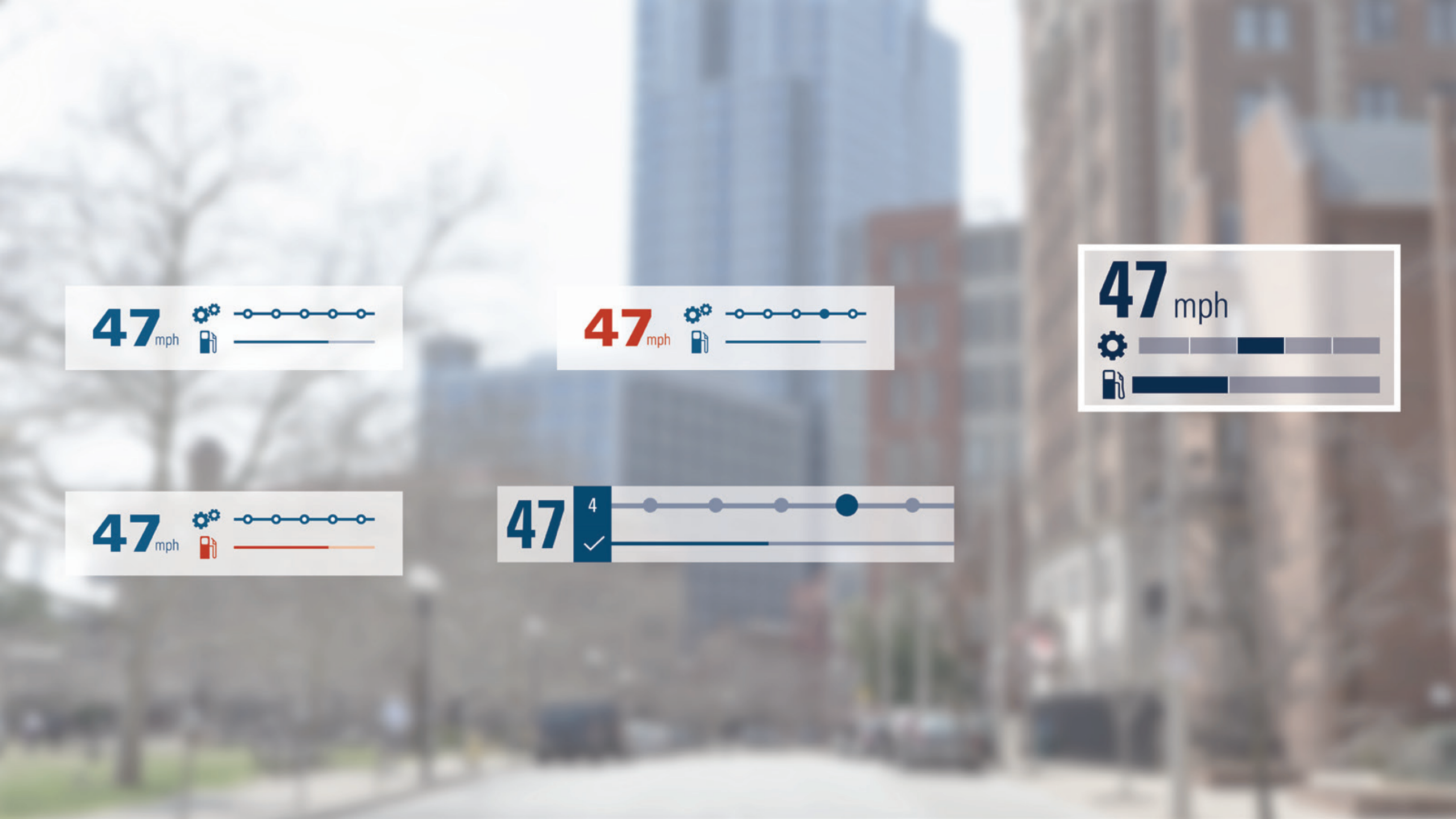
Because gear, fuel, and speed information is displayed digitally as a part of Glide, the user can remove the bulky mechanical gauges from his handlebars, which means the user has a clearer view of the road and his environment.



INTERACTION

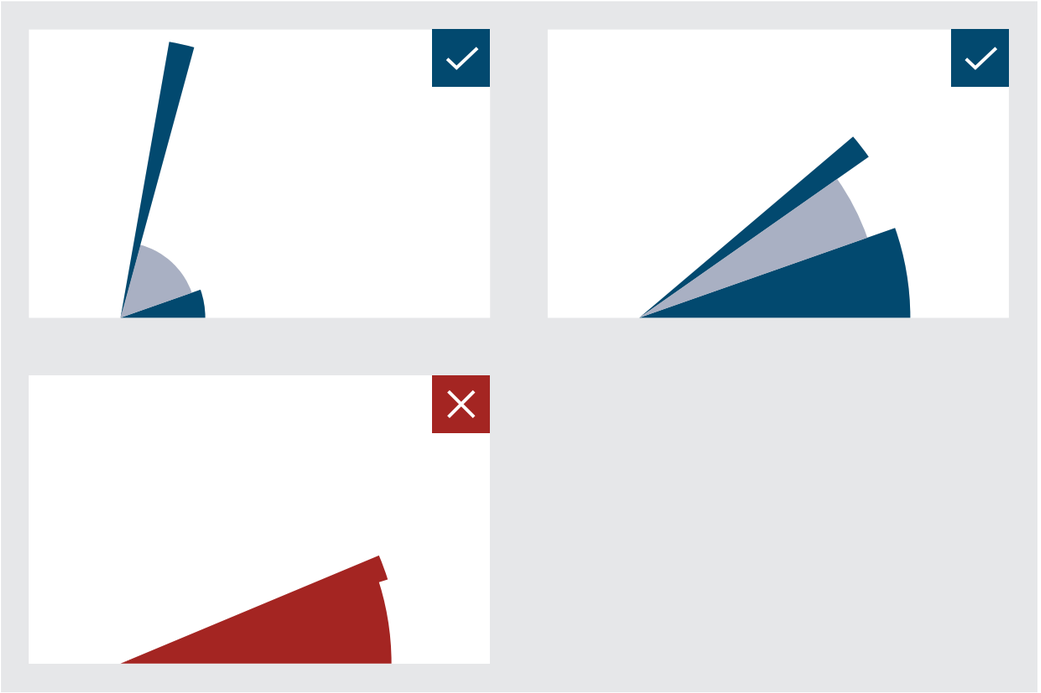
When the user moves his pupils to the right, he reveals gear, fuel and speed information.


47
47 mph
47
47 mph
47 mph
47 mph
47 mph
3
47 mph


47 mph
47 mph
47 mph
47
4
47 mph

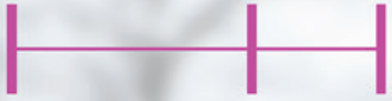
Lean Indicator

Glide teaches healthy riding habits. Many riders are “shallow leaners.” A shallow leaner is a person who never leans harder than 20°. This makes them more vulnerable to a slew of major causes of motorcycle accidents, especially gravel in the periphery of a corner. The rider who is comfortable leaning hard is more nimble, more capable of avoiding danger. Glide visualizes how much further the rider can lean when the rider begins leaning. This feature only becomes active if Glide determines that the rider is a shallow leaner. Riders can safely lean up to 55°.

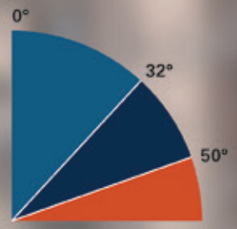


INTERACTION

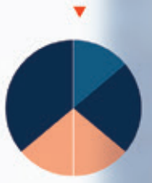
When a shallow leaner takes a turn, the lean indicator appears.




14°
DANGER

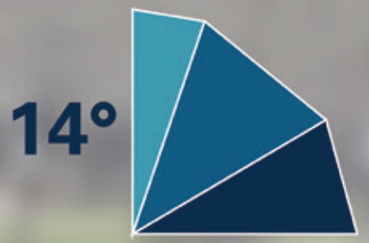

0°
32°
50°

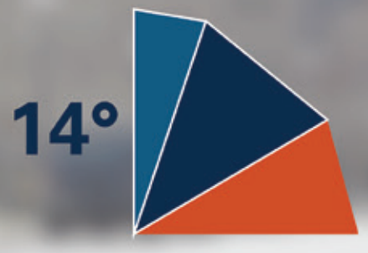

0°
32°
60°




14°


32°


14°


14°

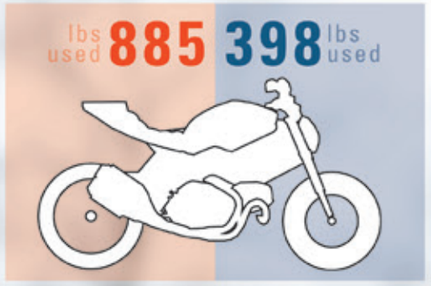
Brake Indicator

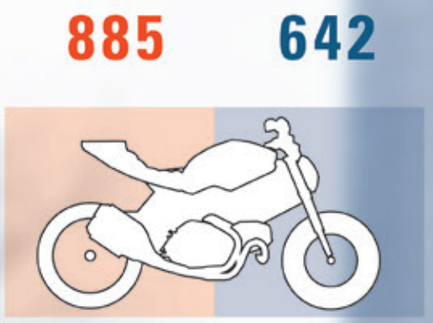
Glide teaches healthy riding habits. Many riders neglect the sensitive front brake (hand activated). They prefer to use the duller back brake (boot activated). Riders that neglect the front brake are more likely to slam on it during a hazard situation. This causes them to flip over the handle bars or lose control of the bike.

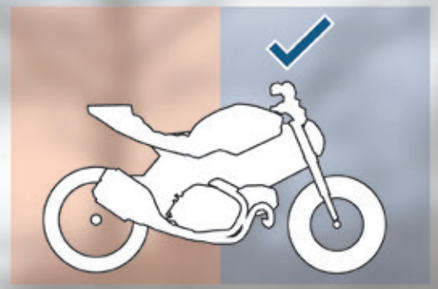
If Glide determines that the rider is neglecting one of his brakes, Glide begins encouraging equal brake usage by displaying the brake indicator. Glide helps the rider build the good habit of using his brakes equally. The overused brake is displayed in red, while the underused brake is displayed in blue. The front brake is activated by the rider's hand, which is why it is represented with the hand icon. The back brake is activated by the rider's boot, which is why it is represented with the boot icon.

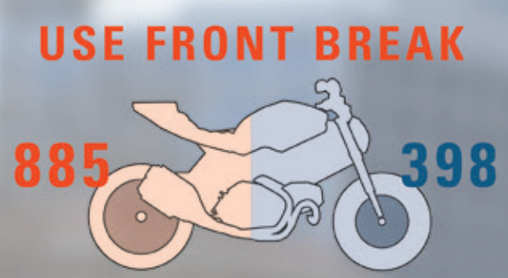
INTERACTION

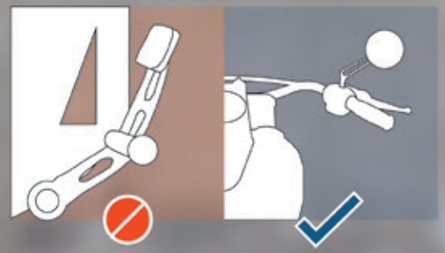
If Glide determines that the user does not use his brakes equally, the brake indicator appears when the rider activates his overused brake.

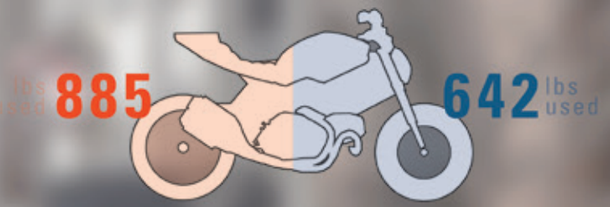

lbs used
885
398
lbs used


885
642

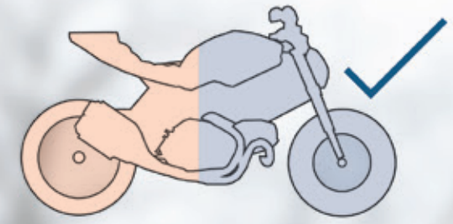


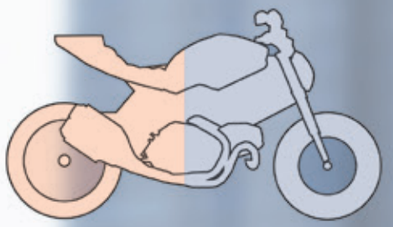

USE FRONT BREAK
885
398

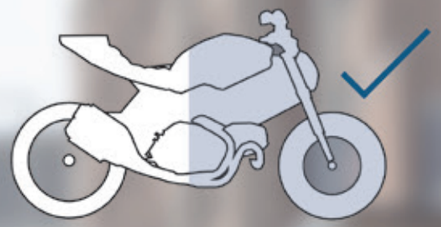


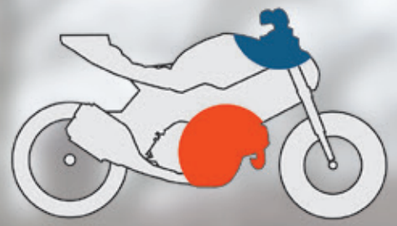

lbs used
885
642
lbs used

lbs used **885** | **642** lbs used

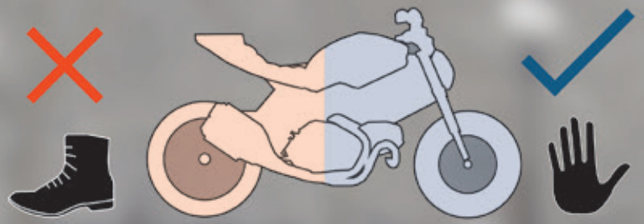








USE FRONT BREAK



Visibility

Three major causes of motorcycle accidents could be prevented by increased visibility. These causes of accidents are:
1. The rider hits an obstruction in the road (gravel, animal, etc).
2. A car cuts the rider off.
3. The rider merges into a lane that is occupied by an unseen car.

I chose to increase the rider's visibility in three unique ways:
1. The user can see a video of what's behind them by moving their pupils to the right.
2. Augmented reality red, holographic spikes highlight obstructions in the road.
3. A red bar on either side of the rear view camera illuminates if there is a car in the user's respective blind spot.

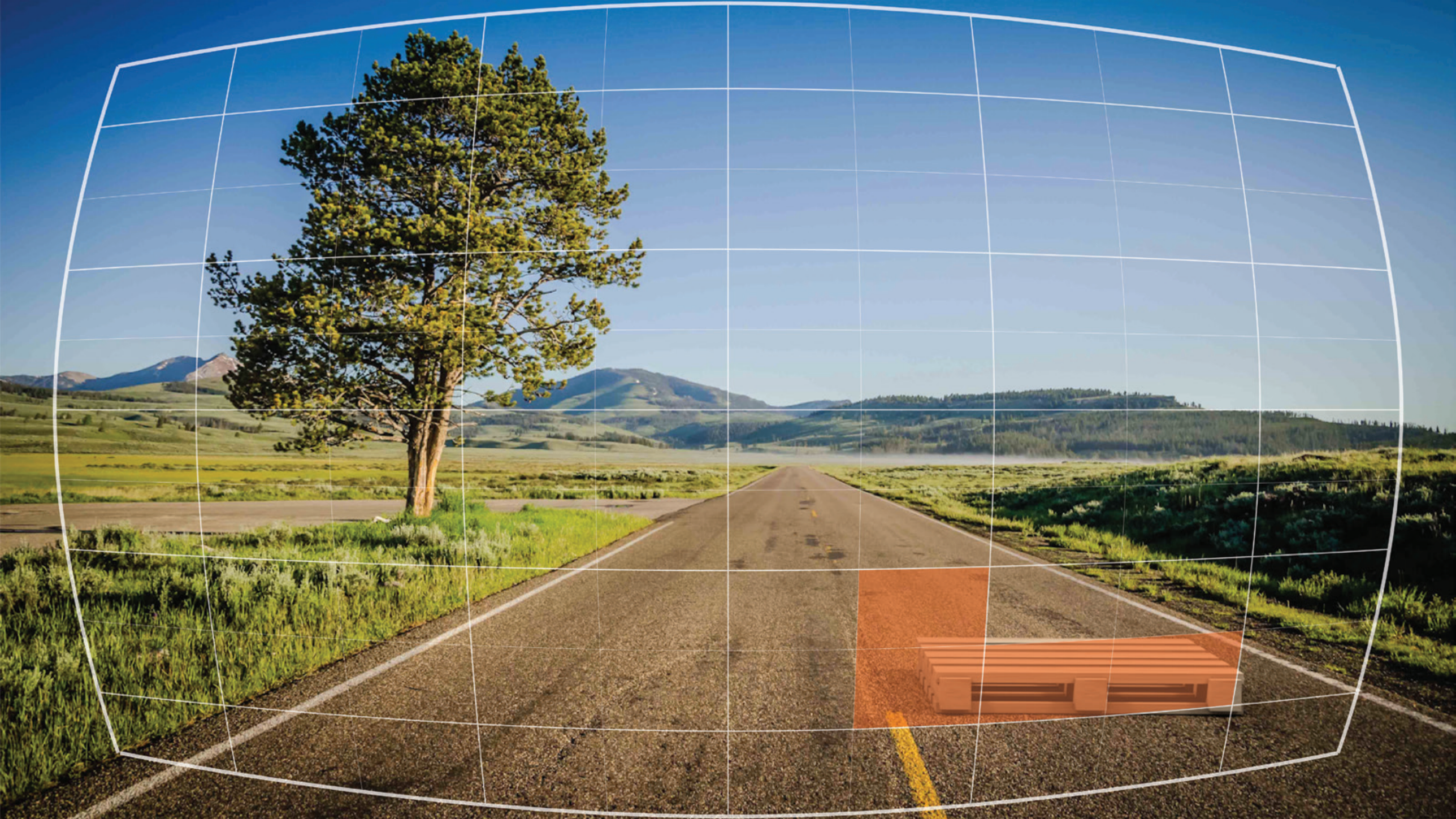
The placement of the rear video stream is strategic. Most of us have experience driving cars. In a car, if one needs to see what's behind him, he moves his pupils to the right to look into a rear view mirror. Glide mimics this convention.

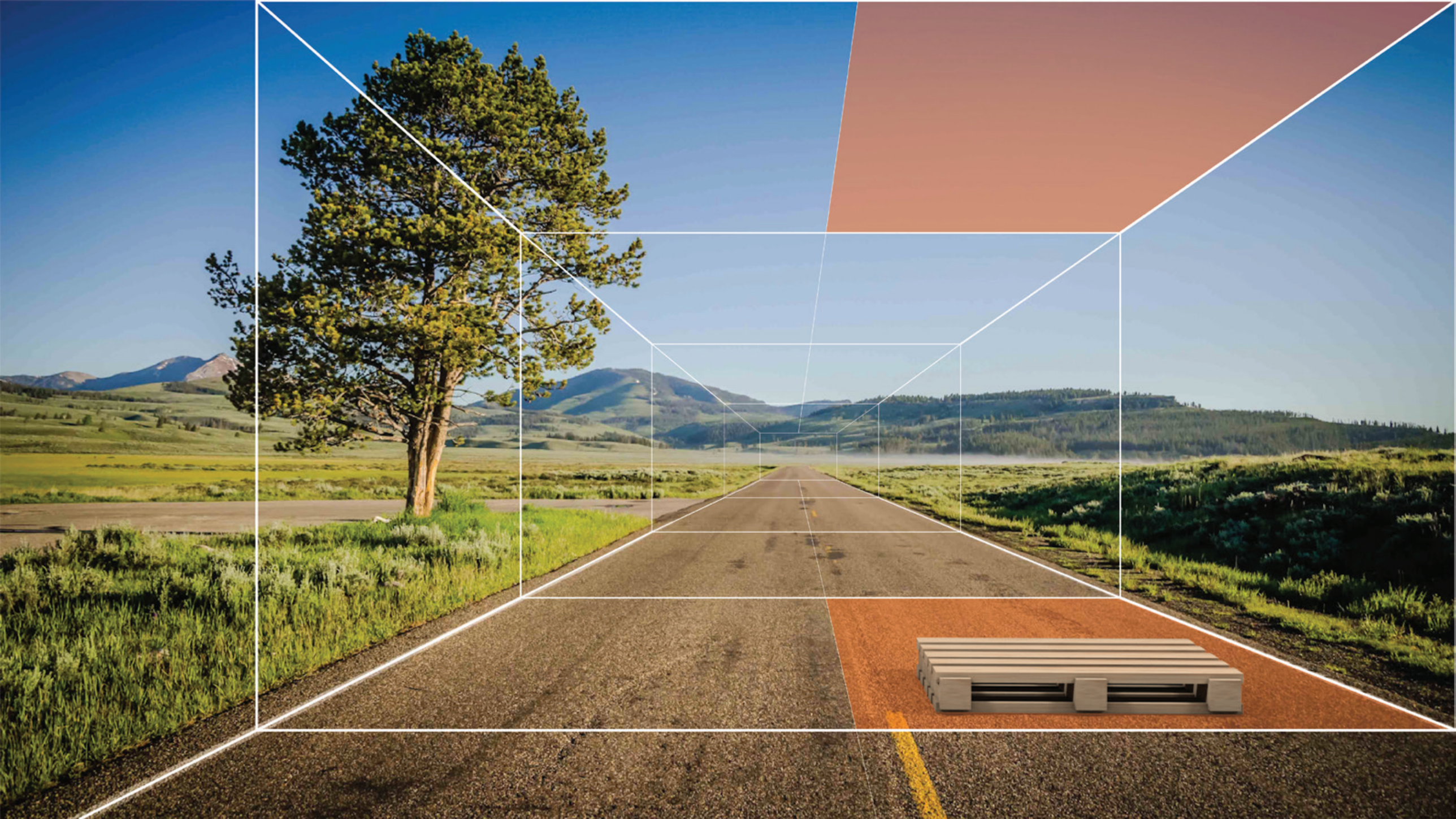
INTERACTION

The user does not activate the obstacle detection. The 3D Scanner on the bike is always on. Whenever it determines part of a scan is a threat to the user, Glide highlights the threat with red holographic spikes. This information is "ambient."

When the user moves his pupils to the right, he reveals a video stream of what's behind him.

The blind spot indicators that warn the user of cars in his blind spots are not controlled by the user. A blind spot indicator appears when a car moves into the user's respective blind spot.

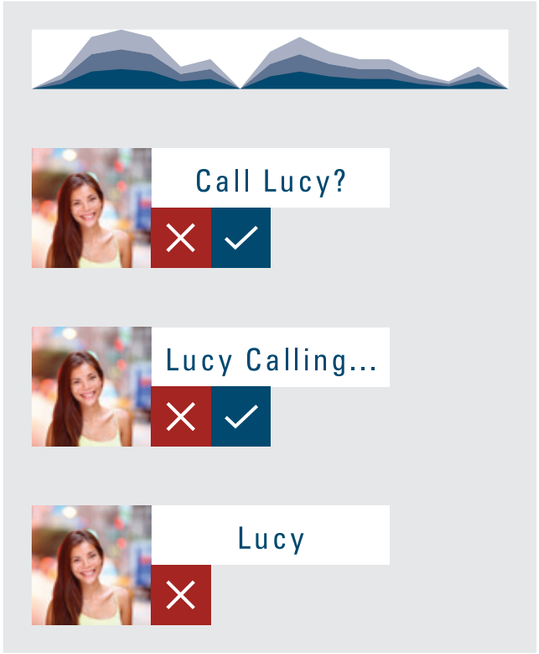




Phone

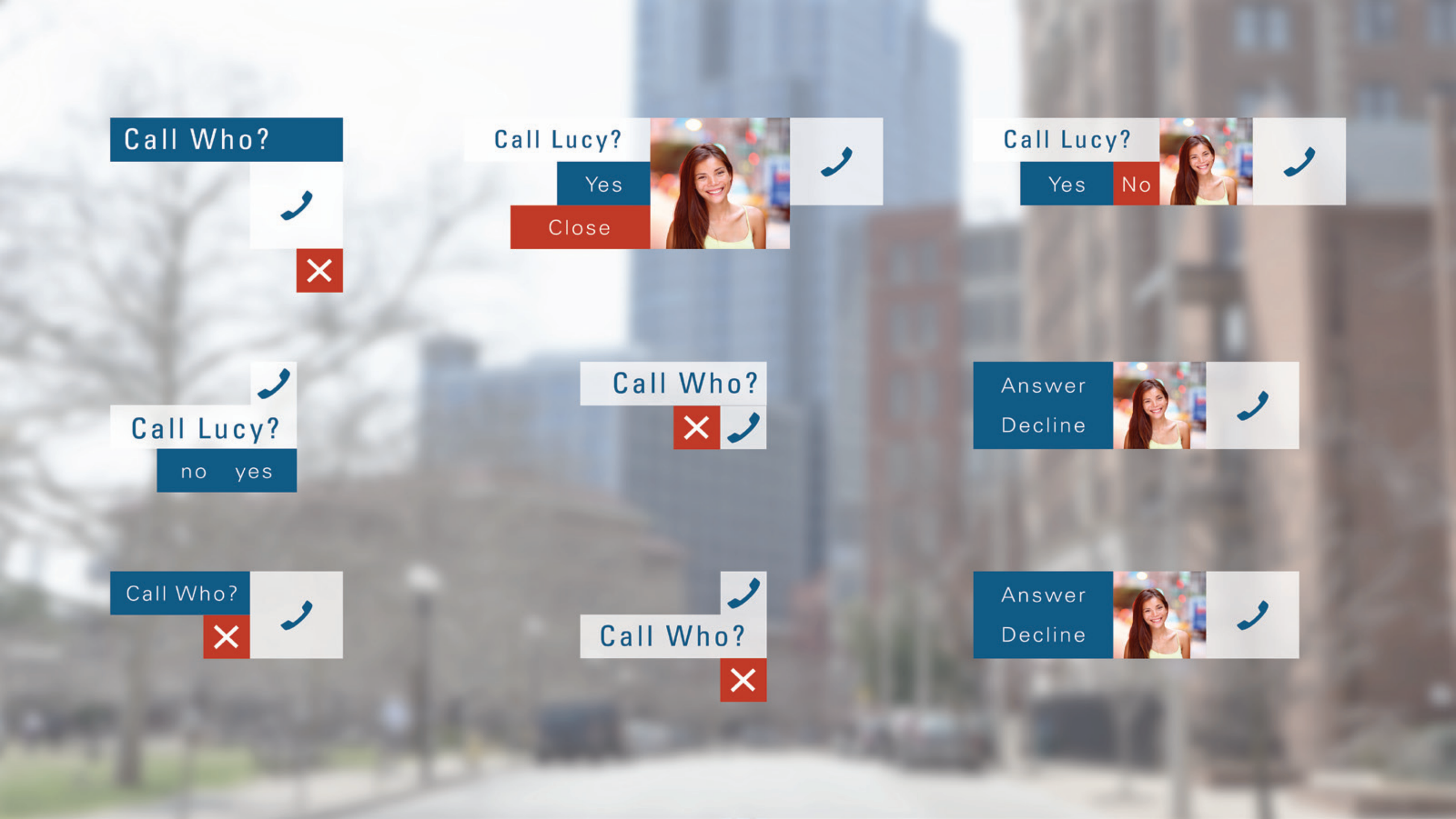
The phone module is controlled entirely by voice, this means that the rider can keep his eyes on the road at all times.

I considered leaving the phone module out of this project because it is kind of trivial and does not make motorcycle travel safer. After talking to my professor and critique group about this, we decided to leave the phone module in because it is an industry standard for a smart helmet to have a phone module. We decided that it is an industry standard because Skully's AR-1 helmet has a phone module.



INTERACTION

The user says, "Glide, call, <name of contact>." to initiate a phone call. When the user receives a call they can say, "Glide, accept." or, "Glide, decline."


Call Who?
Call Lucy?
Yes
Close
Call Lucy?
Yes
No
Call Lucy?
no yes
Call Who?
Answer
Decline
Call Who?
Call Who?
Answer
Decline

Call Lucy?

Yes No

Who?

End Call

End Call

Call Who?

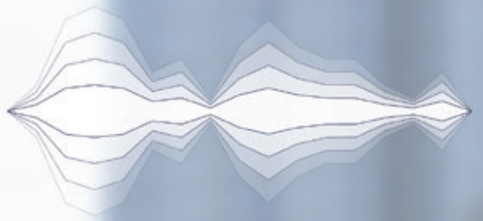
Call Lucy?

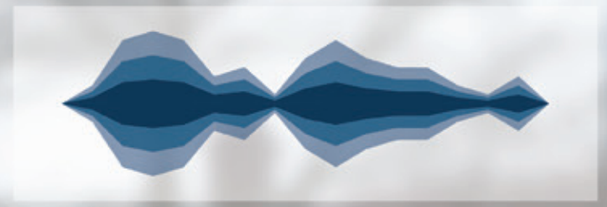
Call Lucy?

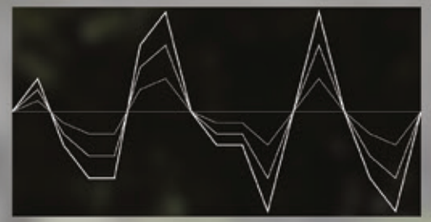
no yes

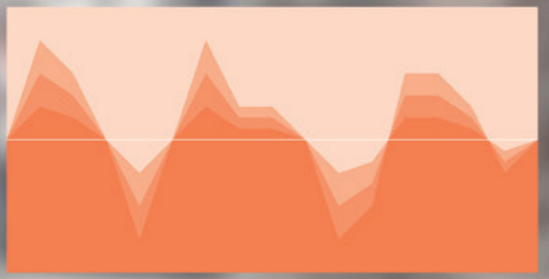
Call Lucy?

no yes



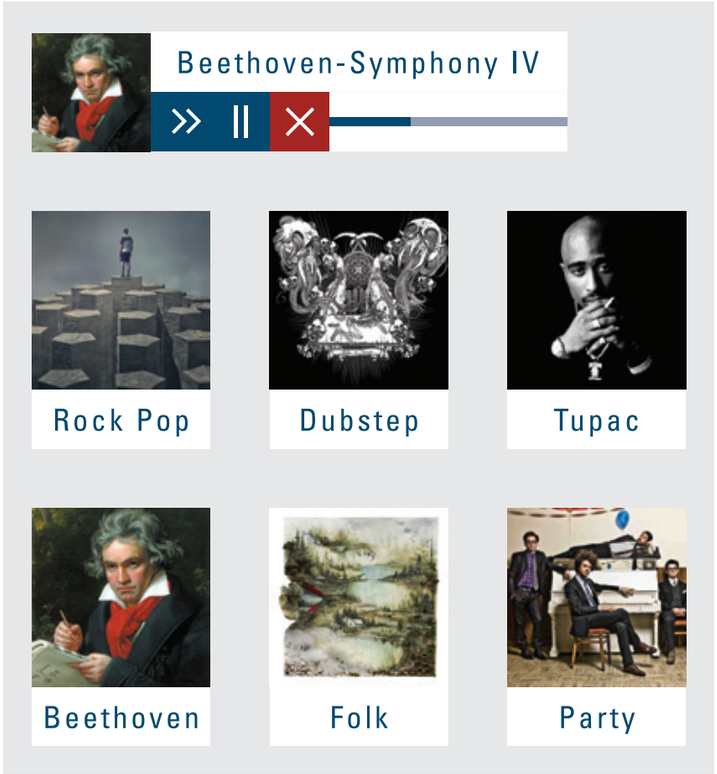






Music

The music module is controlled completely by voice, this means that the user can keep his eyes on the road at all times. The user creates playlists with a companion app. This keeps him from ignoring the road while he searches through his entire iTunes. I considered leaving the music module out of this project because it is kind of trivial and does not make motorcycle travel safer. After talking to my professor and critique group about this, we decided to leave it in because it is an industry standard for a smart helmet to have a music module. We decided that it is an industry standard because Skully's AR-1 helmet has a music module.



INTERACTION

The user says, "Glide, music." to initiate the music module.
The user says, "Glide, play <name of playlist>." to play a pre-programmed playlist, "Glide, skip." to skip a song, "Glide, pause." to pause a song, or "Glide, close music." to exit the module.
Once initiated, the user reveals the music module by moving their pupils to the left.


Rock Pop


DubStep


Tupac


Beethoven


Folk


Party

Close


Rock Pop


DubStep


Tupac


Beethoven


Folk


Party

Close


Beethoven - Symphony IV


Beethoven - Symphony IV


Close


Beethoven - Symphony IV


Beethoven - Symphony IV

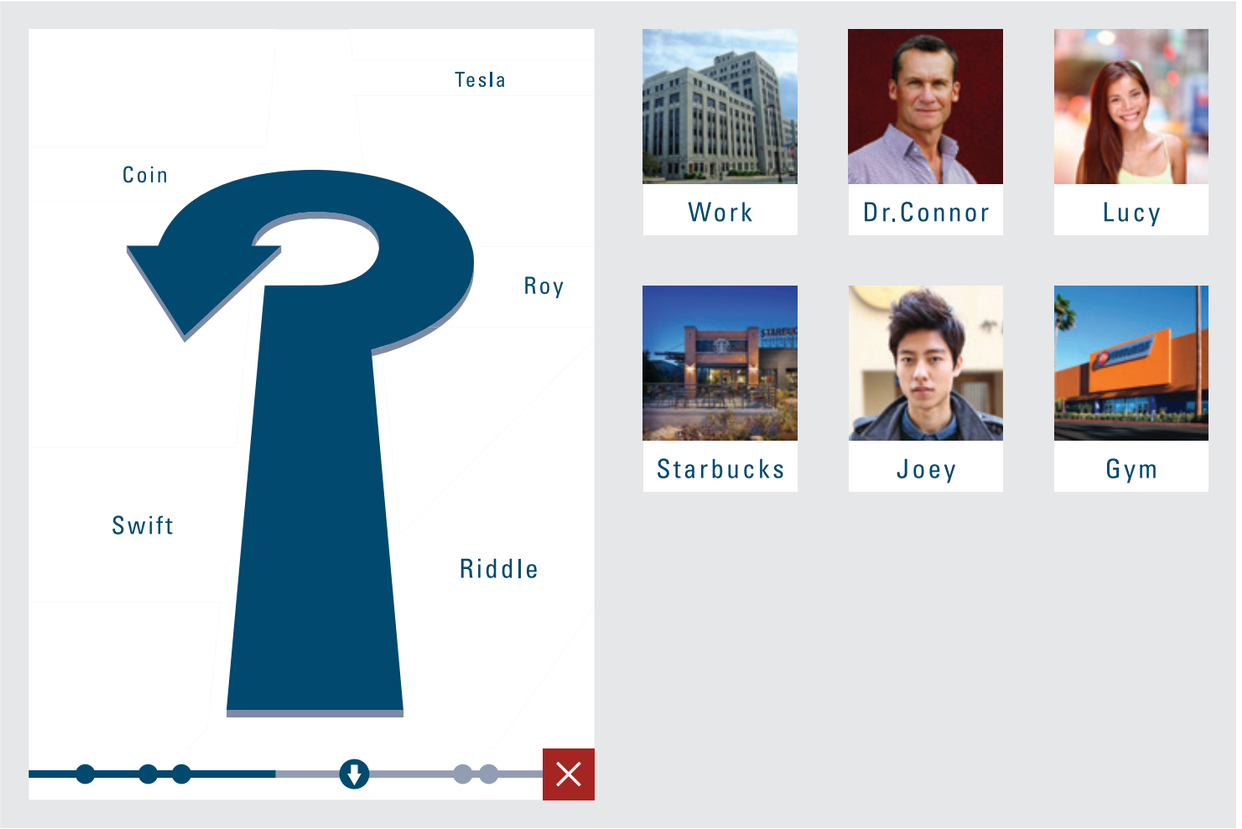
Close

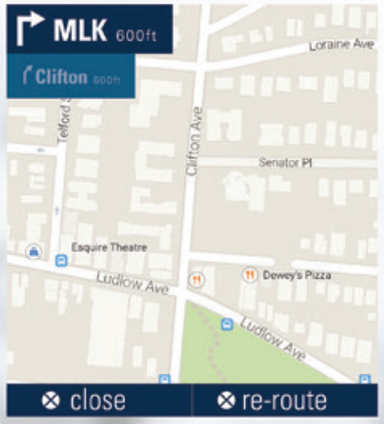
Navigation

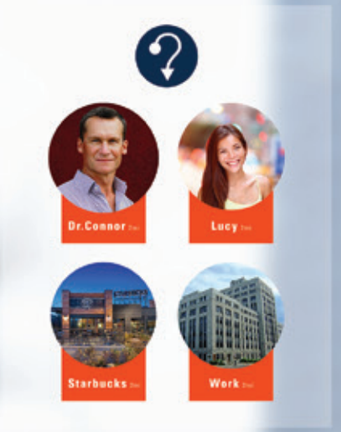
The navigation module is partially controlled by voice and partially controlled by the rider's pupils. The rider pre-programs destinations using a companion app. This ensures he doesn't distract himself by searching for the perfect Starbucks while driving. Augmented reality arrows appear at each turn. The arrows guide the rider to his destination. These arrows make the map optional. This is good because reading a map is a distraction to the rider. The map is still important because it also displays the rider's progress on his journey.

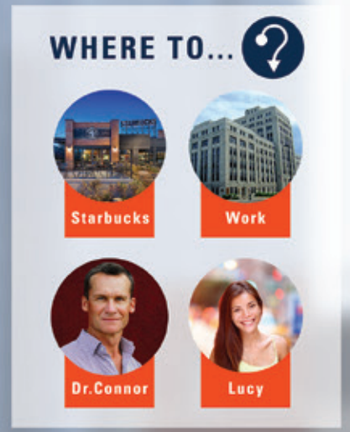
INTERACTION

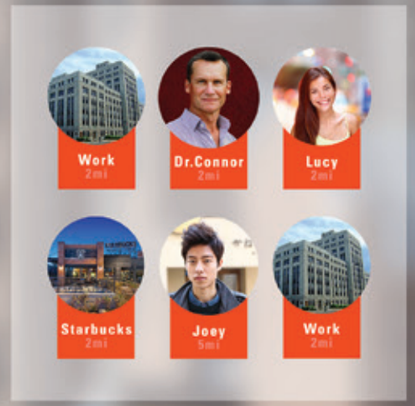
The user says, "Glide, navigation," to initiate the navigation module. The user says the name of a pre-programmed destination to start the navigation. Once the navigation module has been initiated, the user reveals it by moving his pupils to the left. The user says, "Glide, close navigation," to exit the navigation module.

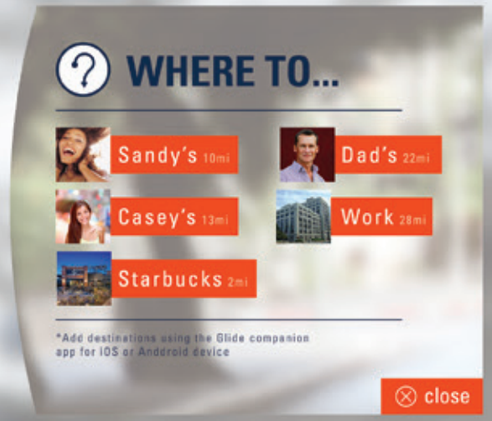


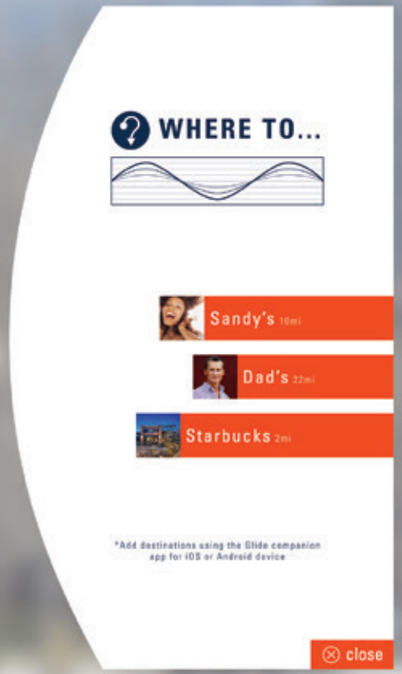

MLK 600ft
Clifton 600ft
Loraine Ave
Telford
Clifton Ave
Senator Pl
Esquire Theatre
Ludlow Ave
Dewey's Pizza
Ludlow Ave
close
re-route

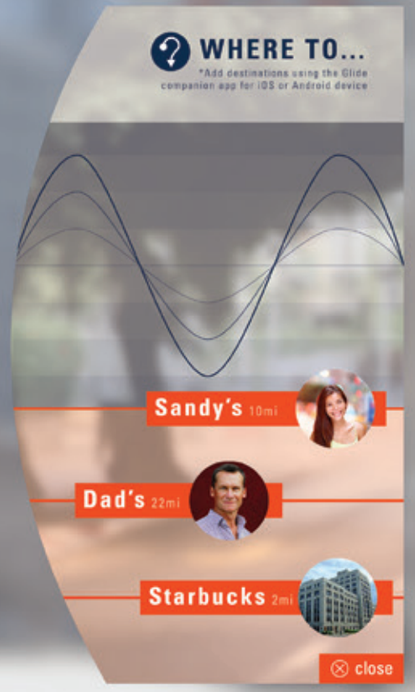

Dr.Connor
Lucy
Starbucks
Work


WHERE TO...
Starbucks
Work
Dr.Connor
Lucy

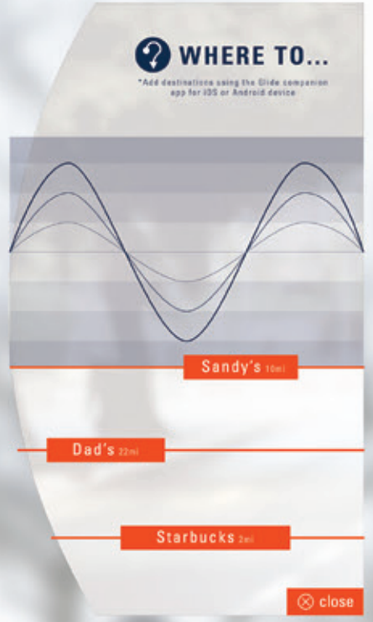

Work
2mi
Dr.Connor
2mi
Lucy
2mi
Starbucks
2mi
Joey
5mi
Work
2mi

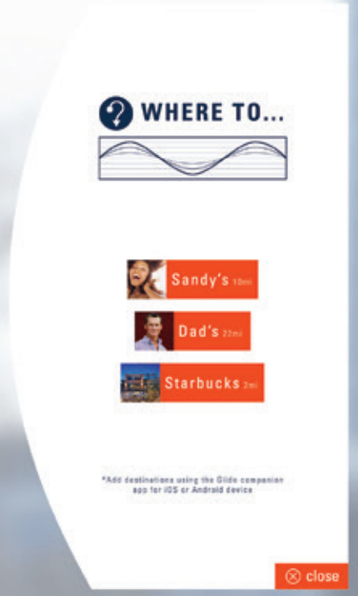

WHERE TO...
Sandy's 10mi
Dad's 22mi
Casey's 13mi
Work 28mi
Starbucks 2mi
*Add destinations using the Glide companion app for IOS or Android device
close


WHERE TO...
Sandy's 10mi
Dad's 22mi
Starbucks 2mi
*Add destinations using the Glide companion app for iOS or Android device
close

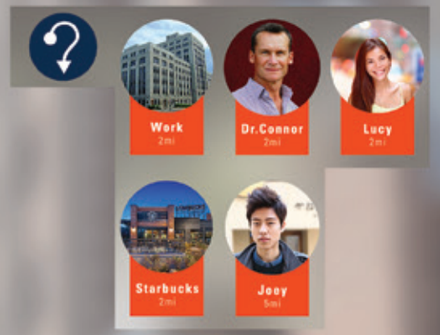

WHERE TO...
*Add destinations using the Glide companion app for iOS or Android device
Sandy's 10mi
Dad's 22mi
Starbucks 2mi
close

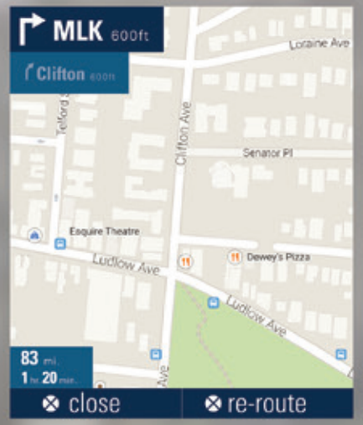

MLK 600ft
Clifton 320ft


WHERE TO...
*Add destinations using the Glide companion app for iOS or Android device
Sandy's 10mi
Dad's 22mi
Starbucks 2mi
close

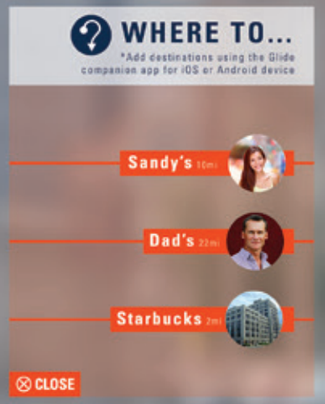

WHERE TO...
Sandy's 10mi
Dad's 22mi
Starbucks 2mi
*Add destinations using the Glide companion app for iOS or Android device
close

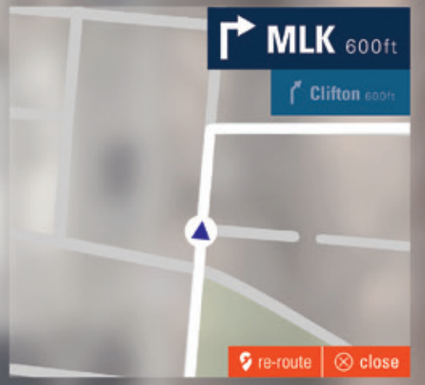

MLK 600ft
Clifton 320ft


Work 2mi
Dr.Connor 2mi
Lucy 2mi
Starbucks 2mi
Joey 5mi


MLK 600ft
Clifton 600ft
Loraine Ave
Clifton Ave
Senator Pl
Esquire Theatre
Ludlow Ave
Dewey's Pizza
83 mi.
1 hr 20 min.
close
re-route


WHERE TO...
Sandy's 10mi
Dad's 22mi
Starbucks 2mi
CLOSE

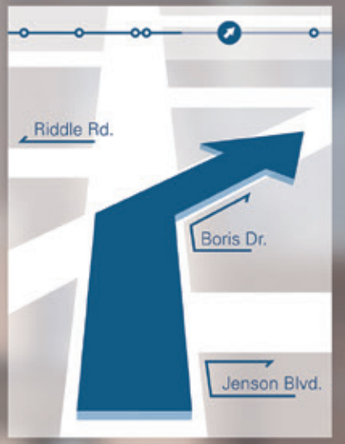

WHERE TO...
*Add destinations using the Glide companion app for iOS or Android device
Sandy's 10mi
Dad's 22mi
Starbucks 2mi
CLOSE


MLK 600ft
Clifton 600ft
re-route
close

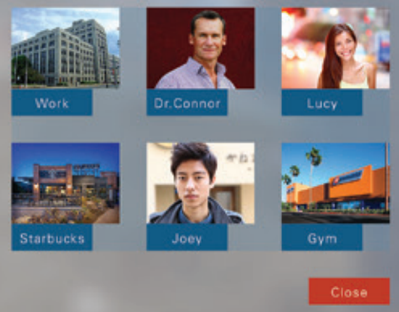

Gwin St.
Samuel Pl.
Riddle Rd.
Boris Dr.
Jenson Blvd.

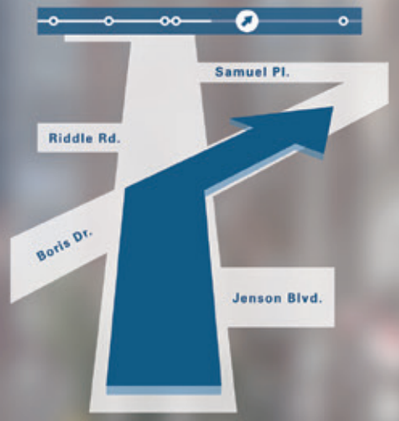

WHERE TO...
*Add destinations using the Glide companion app for iOS or Android device
Sandy's 10mi
Dad's 22mi
Starbucks 2mi
CLOSE

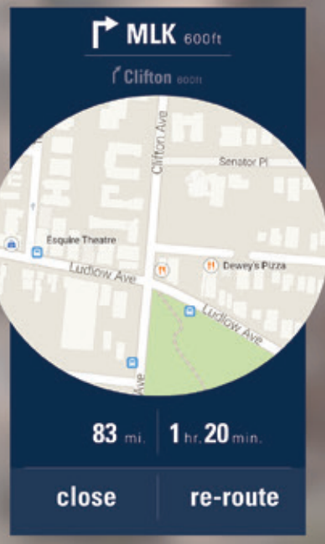

where to?
Sandy's 10mi
Dad's 22mi
Casey's 13mi
Johnny's 9mi
Starbucks 2mi
Work 28mi
*Add destinations using the Glide companion app for iOS or Anddroid device
close

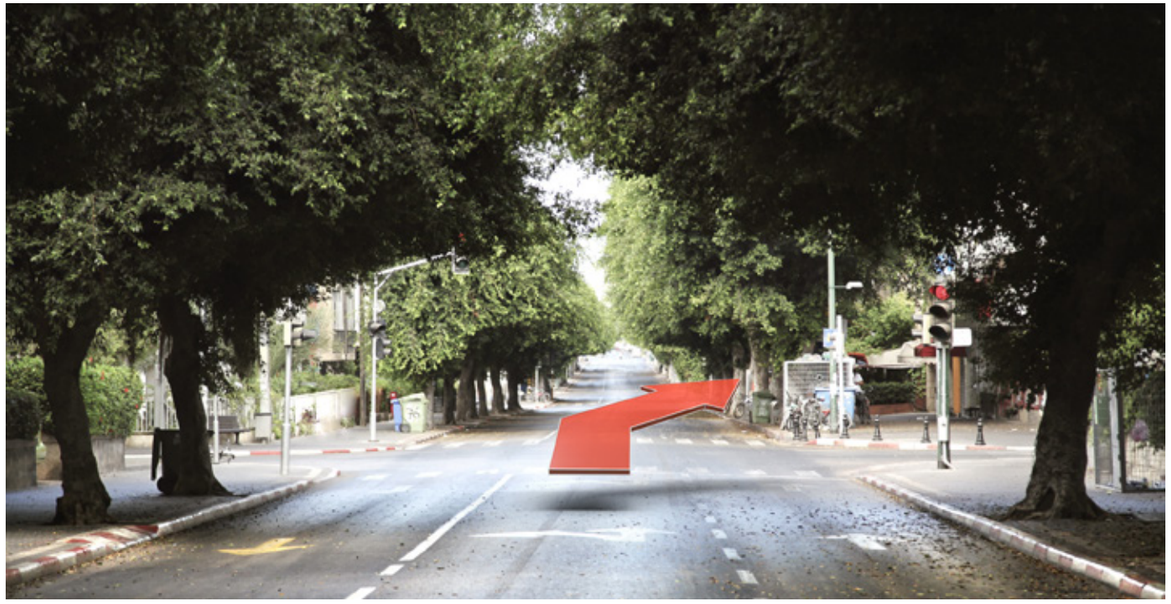

Riddle Rd.
Boris Dr.
Jenson Blvd.

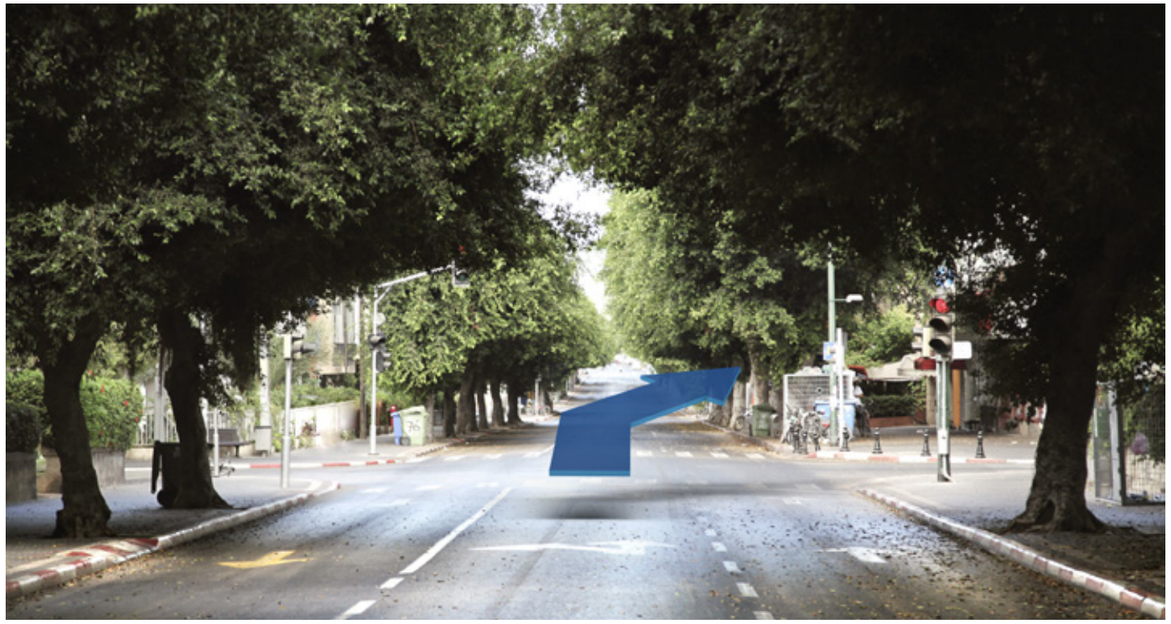

Gwin St.
Samuel Pl.
Riddle Rd.
Boris Dr.
Jenson Blvd.


Work
Dr.Connor
Lucy
Starbucks
Joey
Gym
Close

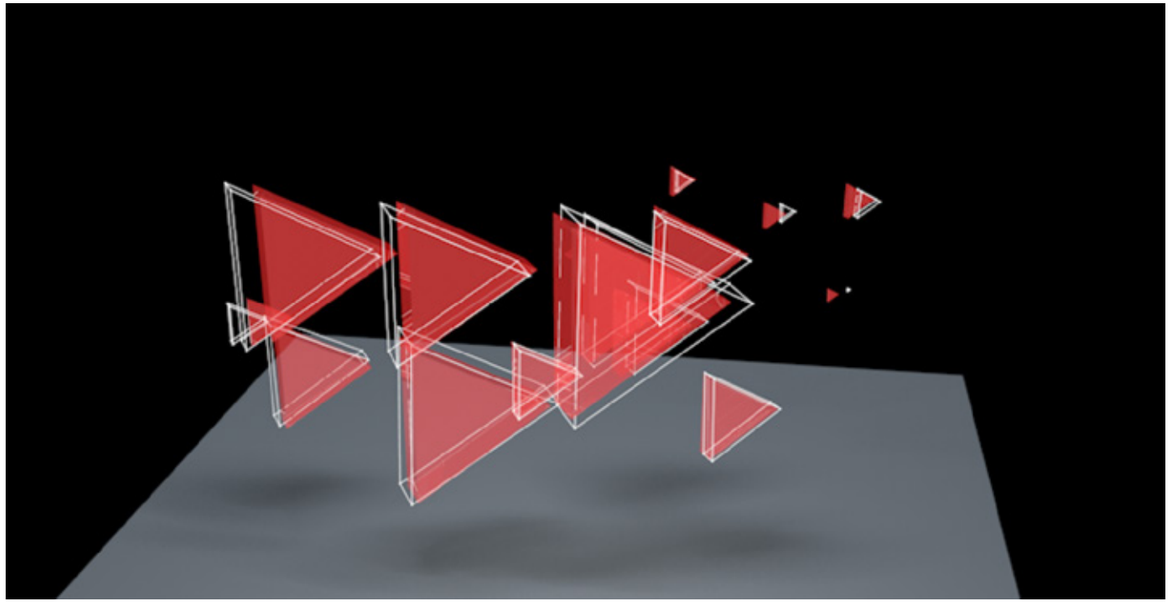

Samuel Pl.
Riddle Rd.
Boris Dr.
Jenson Blvd.


MLK 600ft
Clifton 600ft
Clifton Ave
Senator Pl
Esquire Theatre
Ludlow Ave
Dewey's Pizza
83 mi.
1 hr. 20 min.
close
re-route



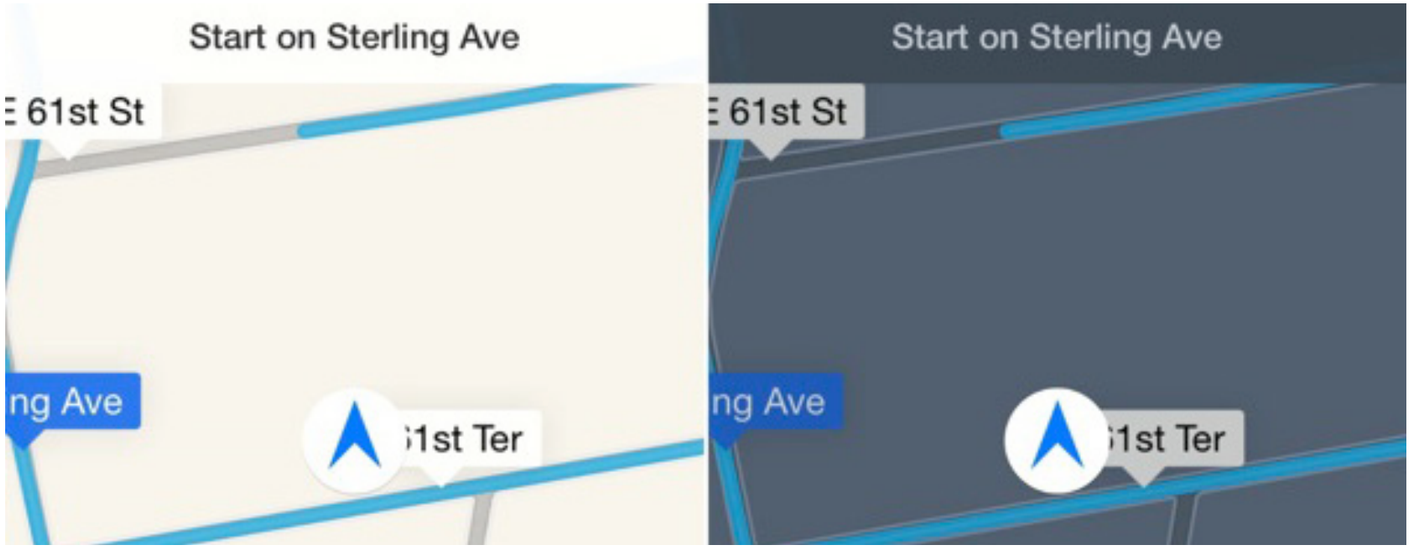


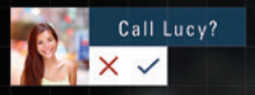

Plum Street
ONLY
ONLY

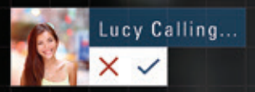


Night Mode

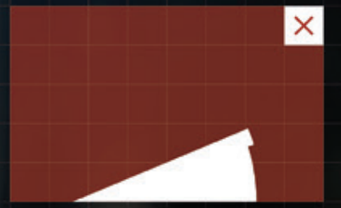
It is imperative that the user can easily read Glide's interface at all times of day, and in all weather conditions. Like many reading and navigation software that already exist, Glide has a day mode and a night mode. The day mode interface consists of dark shapes on light backgrounds. The night mode interface consists of light shapes on dark backgrounds.




Call Lucy?

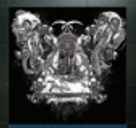

Lucy Calling...


Lucy



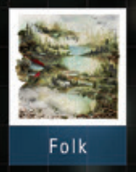

Beethoven-Symphony IV


Rock Pop


Dubstep


Tupac


Beethoven


Folk


Party


Work

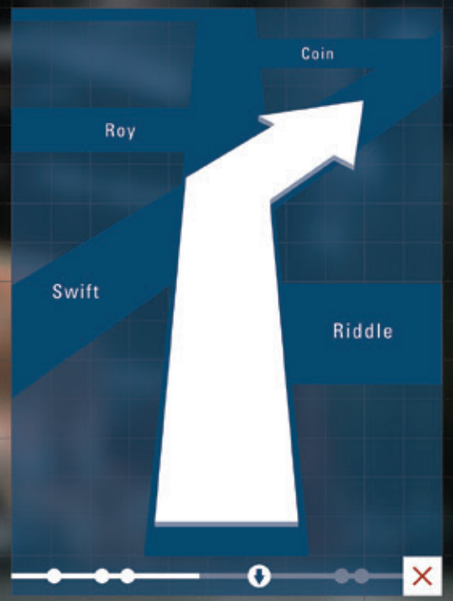

Dr.Connor

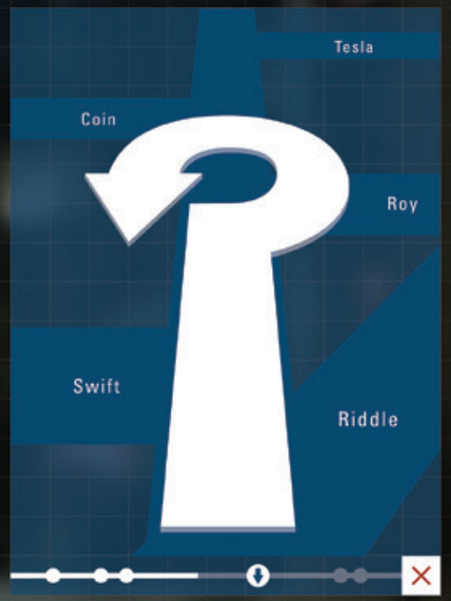

Lucy


Starbucks


Joey


Gym


Coin
Roy
Swift
Riddle


Tesla
Coin
Roy
Swift
Riddle


47
4


47
N


47
4


47
4

Next Steps

There are so many ways that Glide can make motorcycle travel safer, easier, and more enjoyable. Moving forward, I would like to:

-Continue my study of motorcycle riding and motorcycle dangers by reading David Hough's *Proficient Motorcycling*.
-Reconsider how the navigation module indicates the rider's end destination. Is it a beacon that is always visible? Is there a giant "x" that hovers above the destination?
-Integrate Glide into the rider's wardrobe. The helmet could be sold with smart boots or smart gloves. These items could rumble or tingle or have LEDs on them. They are another potential channel of communication between Glide and the rider.
-Visualize augmented reality components in night mode (pp.90-91).

Graphically, my presentation of Glide could be improved. The core of my presentation of Glide is an image series of the interface in use by a rider. Throughout the series, the interface changes but the bike stays the same. I think it would be nice if I photographed a wide variety of motorcycles and then used a different motorcycle for each road image. This would communicate that Glide is for every kind of rider, not just the rider of a certain kind of motorcycle.

Yellow lights equal death. According to the Motorcycle Safety Foundation, 90% of motorcycle accidents occur on non-interstate roads, and that 45% of those accidents occur in intersections. A large portion of intersection collisions occur because both a motorcyclist and a car are rushing to make it through before the light turns red. The navigation module could tell the rider to take extra caution if they are approaching a yellow light.

Strengths / Weaknesses

This project successfully integrates visual communication, research, and imaginative innovation. From the beginning I knew that there was potential in a motorcycle HUD, but I didn't know what the HUD would actually do or how it would look. My first inclination was, "make it like iron man." Bad idea! Iron man's HUD is extremely beautiful, but it's not practical. Of course this is true. It was made to be looked at, not used. Research and usability thinking make this project strong. I started the project by researching what technology exists. I then researched the leading causes of motorcycle accidents. Then my project became easy. All I had to do was use state of the art technology to combat the leading causes of motorcycle accidents.

We're all familiar with inputing data into a computer by clicking, typing, and to an extent talking. This project explores unconventional computer inputs. The user also inputs information into Glide by leaning, using his brake system, talking, and moving his pupils.

Because of so much diverse functionality, it was difficult to create a design language that is cohesive. My design language evolved

throughout the semester. The modules determined the language for me. I knew what the modules needed to do and what they needed to say. I created a visual language that allows all of the modules to communicate effectively. The language is simple and practical.