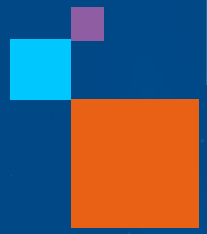
Experiencia de Usuario en proyectos reales

Ejemplos de Intel Labs

Dr. Ignacio Alvarez
Principal Engineer, Automated Driving
Intel Labs

April 2022



Introduction

Dr. Ignacio Alvarez

Principal Engineer
Automated Driving, Intel Labs

Universidad de Valladolid

UNIVERSIDAD DE BURGOS

Hochschule Offenburg
University of Applied Sciences

Universidad del País Vasco
Euskal Herriko Unibertsitatea

CLEMSON UNIVERSITY

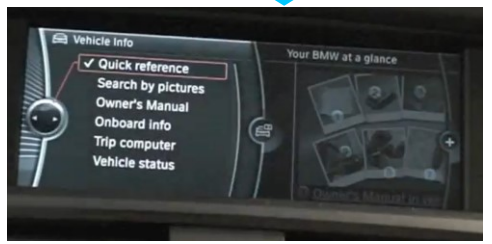
My first Human – Machine Interaction project

- Integrated Owner's Manuals

Developed the first multimodal owner's manual integrated into the in-vehicle infotainment system

Launched in 7 series 2009

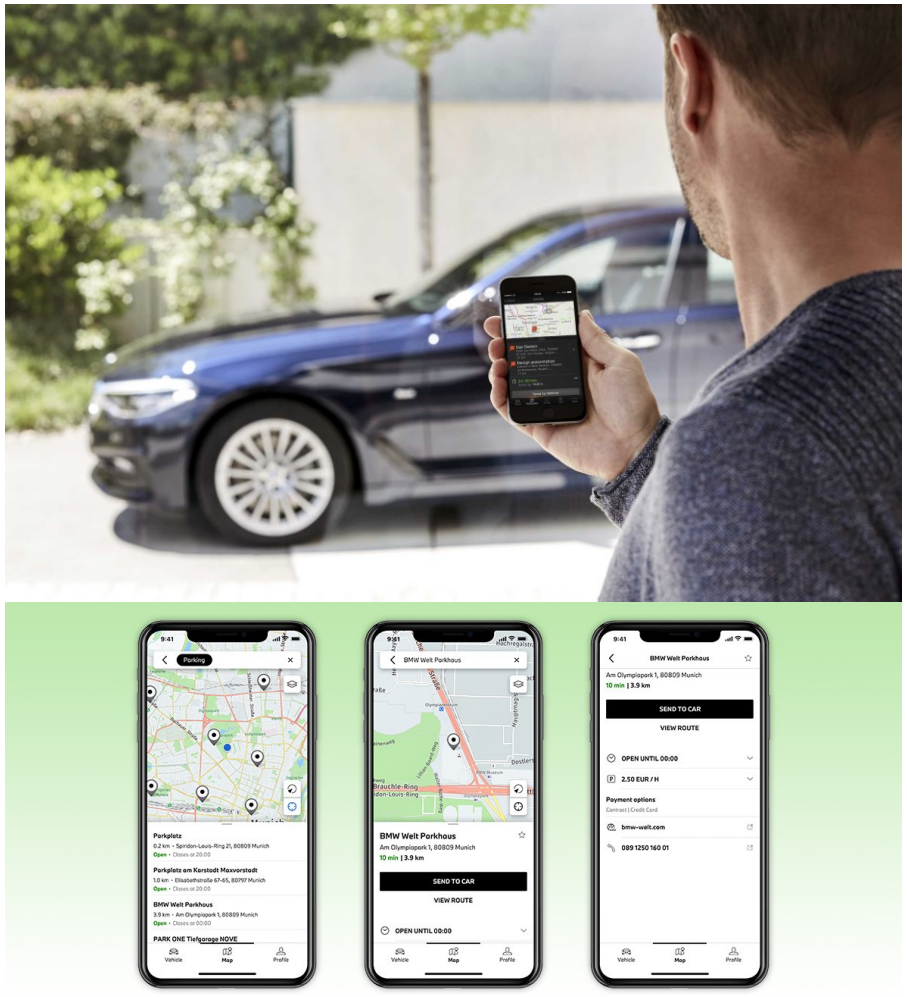
- Hyperlinks
- Search by Pictures / Keywords
- Video Animations



Smartphone - Car Integration

- Integrated Owner's Manuals
- 1st Send to Car Prototype

Implemented the first prototype of send to car. Successfully sending Point of Interest from smartphone to vehicle navigation system

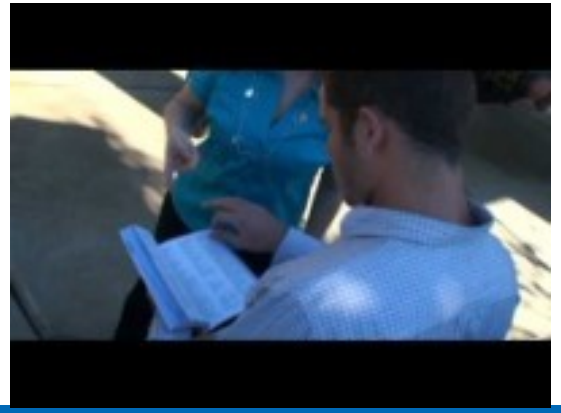


Natural Language Understanding

- Integrated Owner's Manuals
- 1st Send to Car Prototype
- Voice User Help

Developed the first Voice Vehicle Assistant

- Natural Language Understanding
- Owner's Manual Knowledge
- Contextual Driving Conditions
- Query/Answer dialogue

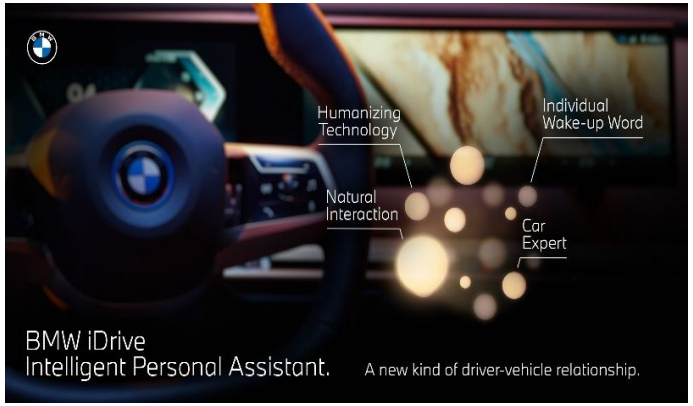


Voice Authentication & Context

- Integrated Owner's Manuals
- 1st Send to Car Prototype
- Voice User Help
- BMW Speech Technology

Product Owner for In-Vehicle NLP

- Voiceprint
- Custom Activation
- Personalization
- Context Knowledge

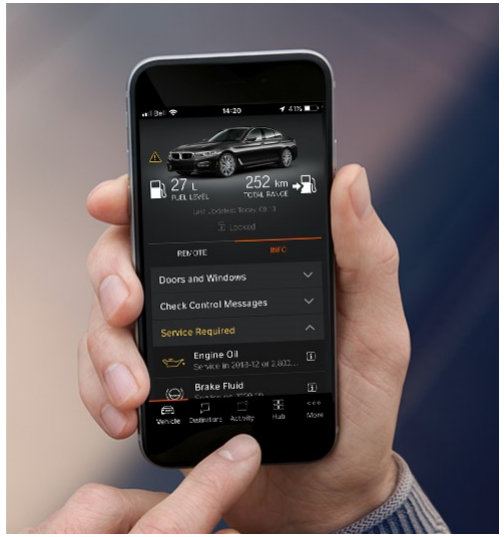


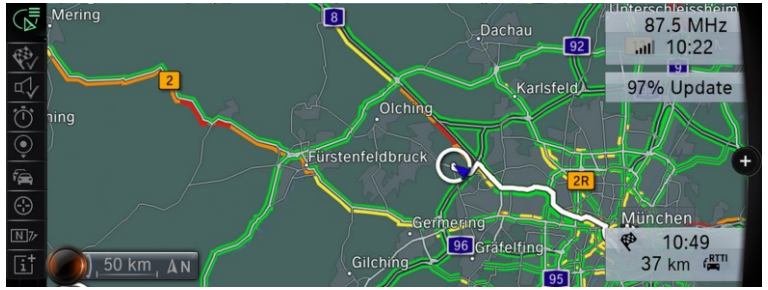
Connected Vehicle

- Integrated Owner's Manuals
- 1st Send to Car Prototype
- Voice User Help
- BMW Speech Technology
- Connected Drive APAC

Product Manager for Vehicle Telematics

- Emergency Calls
- Navigation
- Real Time Traffic
- News / Weather
- Apps
- Connected Drive Store
- Web Services
- ADAS





intel® labs

700+
RESEARCHERS

500+
PHDS

100+
PRINCIPAL ENGINEERS & FELLOWS

30+
TECHNICAL DISCIPLINES

- Neuroscientists
- AI Researchers
- Ethnographers
- Software Architects
- Physicists
- Circuit Technology Researchers
- Computer Scientists

intel labs Areas de Investigacion

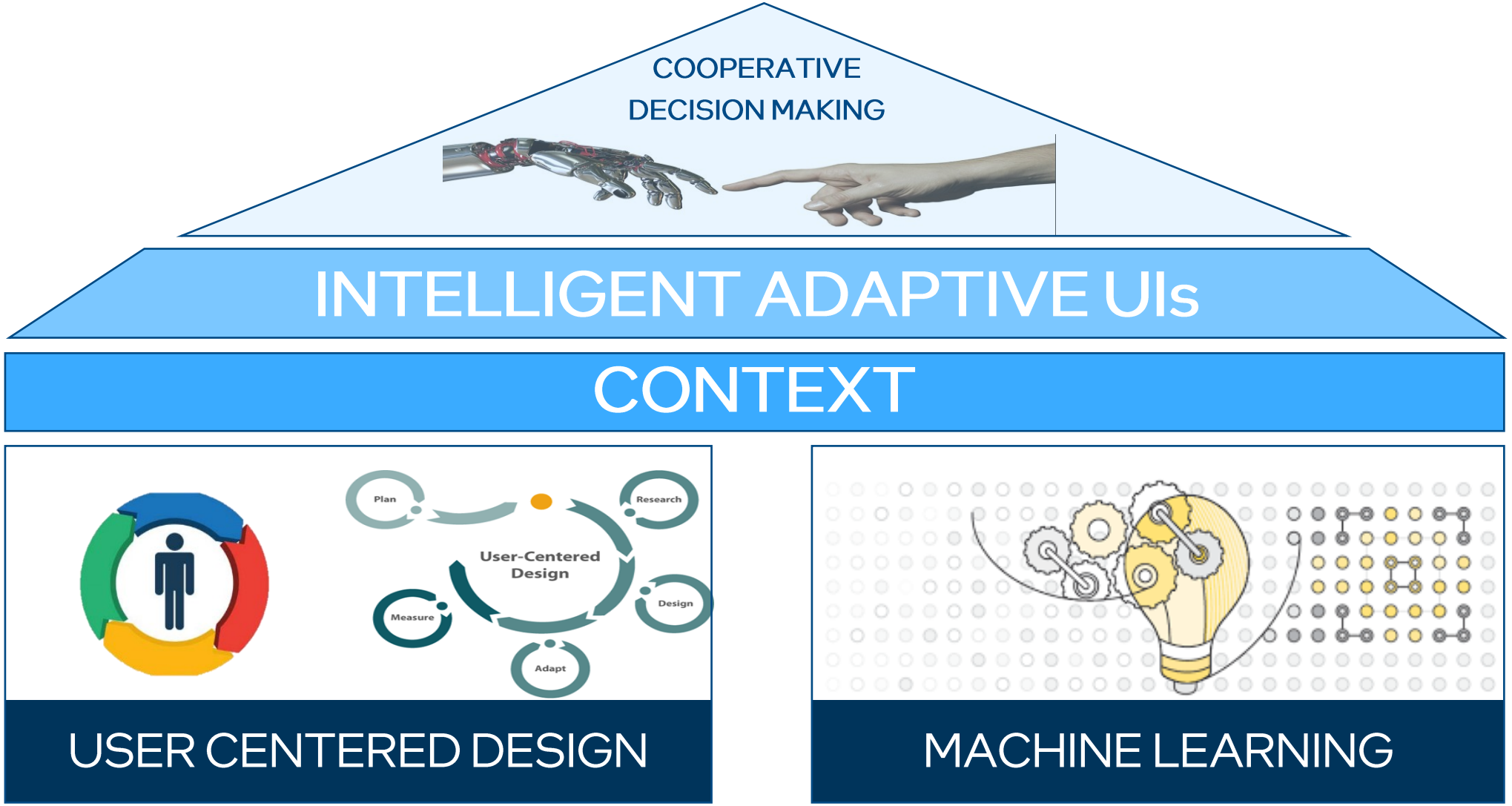
Data Security, Trust & Privacy

- Future of Artificial Intelligence
- Autonomous Systems
- Datacenter of the Future
- Edge and Beyond 5G Infrastructure
- Design and programming efficiency
- New Compute Models
- Future of Microarchitecture
- Future of Heterogeneous Integration

Human – Machine Cooperation in Autonomous Driving

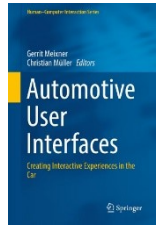
"At the intersection between AI and HCI we can build autonomous systems that understand humanly contextual situations and act upon them to enhance our experiences"

Bridging the skill gap for UX in autonomous driving



Human – Machine Interaction in Automotive

Ethnographic research - Carcheology



In Automotive User Interfaces

Chapter 14

The Insight–Prototype–Product Cycle

1 Ethnographic Visits

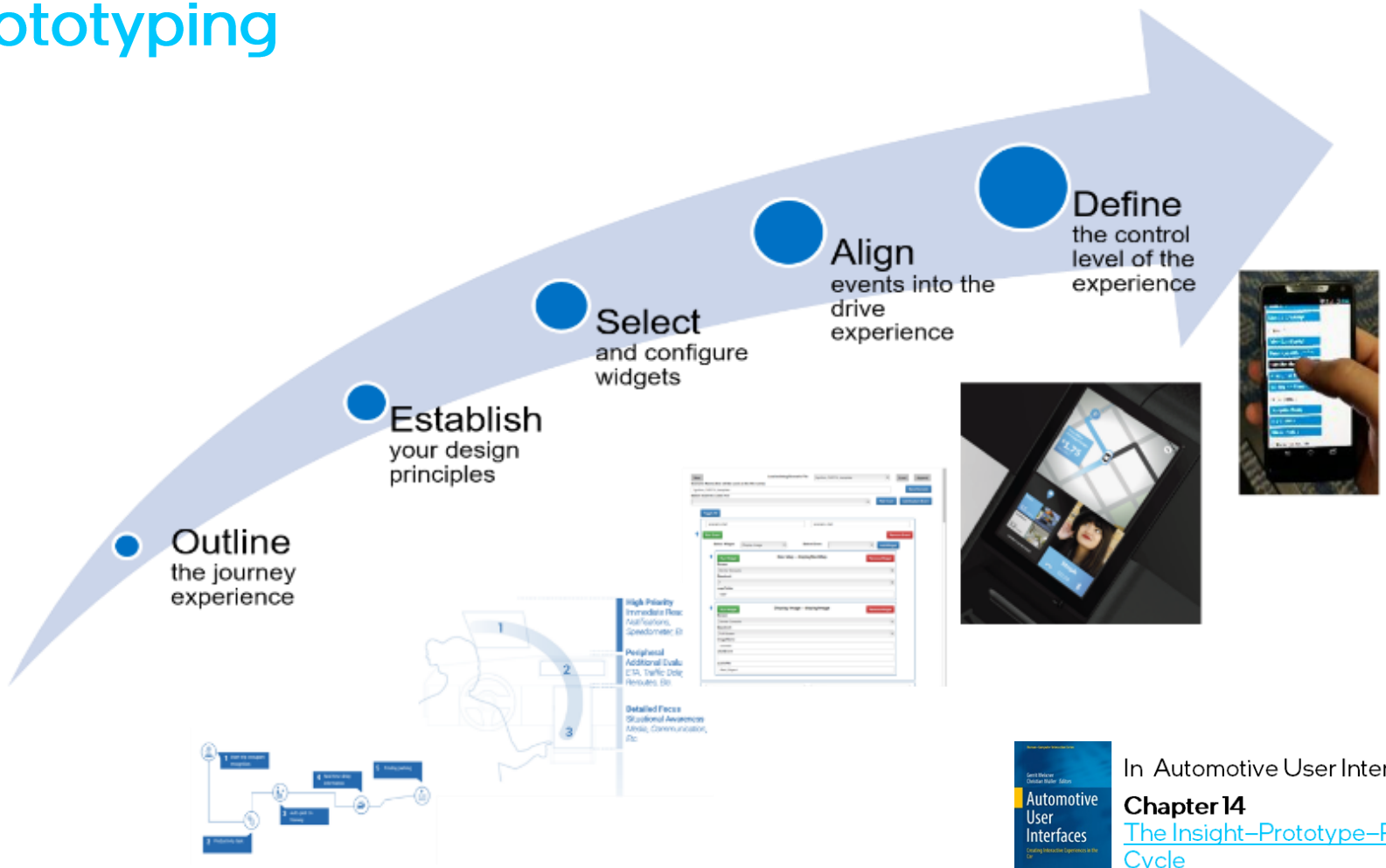
2 Sensor research, phone tracking & video

3 Follow up Visits

Human – Machine Interaction in Automotive

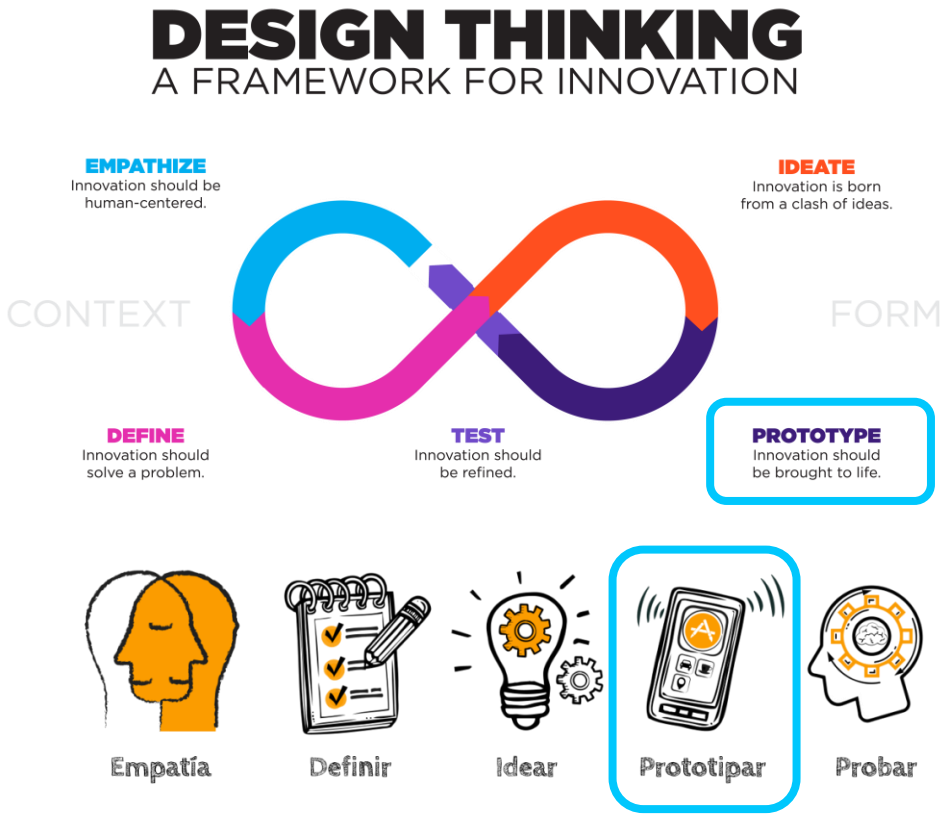
User Experience prototyping

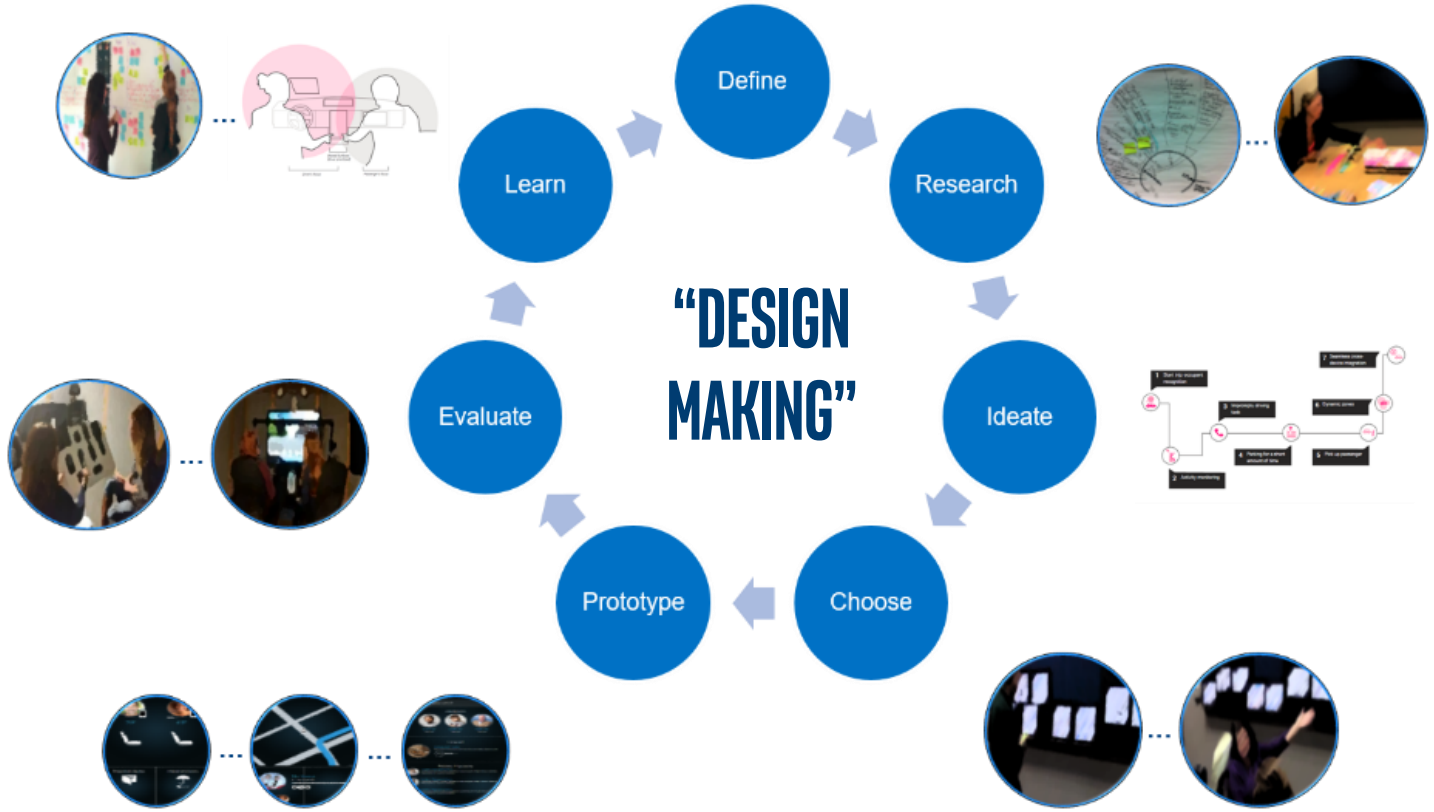
SKYLINE PROTOTYPING PLATFORM



In Automotive User Interfaces
Chapter 14
The Insight–Prototype–Product Cycle

Creating by doing, the design making process





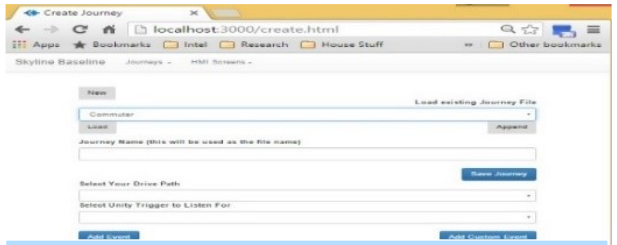
Hendrie, M., Alvarez, I., & Hooker, B. (2015). Prototyping adaptive automotive UX: A design pedagogy approach. In *Extended Proceedings of the 7th International Conference on Automotive User Interfaces and Interactive Vehicular Applications—AutomotiveUI* (Vol. 15).

Skyline a tool for rapid UX prototyping

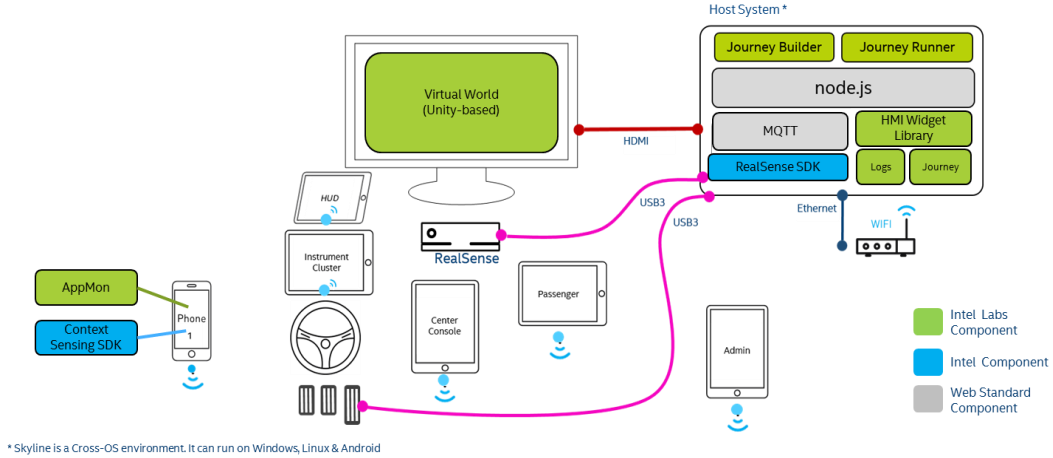
reconfigurable HMI dashboard

Controlled virtual environment

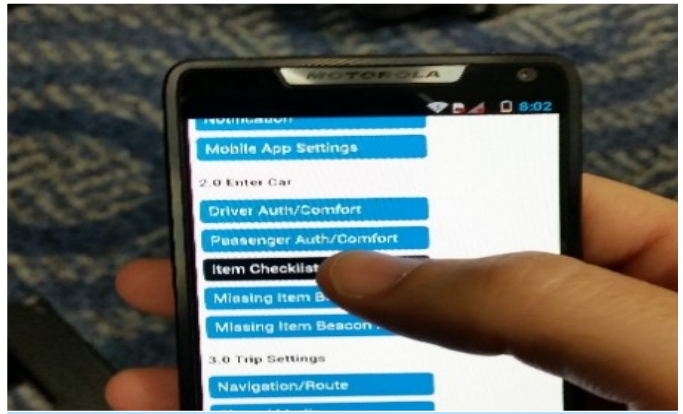
Sensor SDK integration



Code-less UX development



Extensible HMI widget library

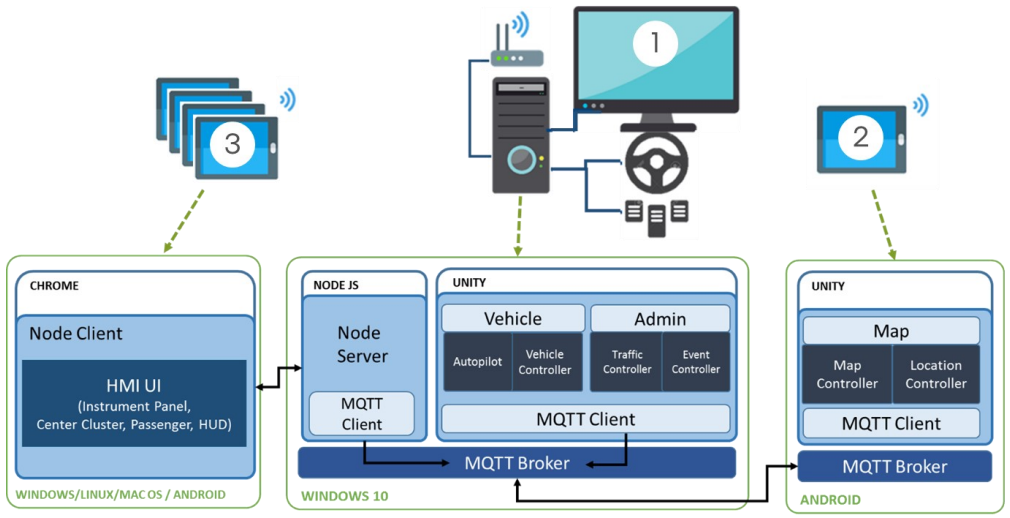


Wizard-of-Oz Control

Alvarez, I., Rumbel, L., & Adams, R. (2015, September). Skyline: a rapid prototyping driving simulator for user experience. In *Proceedings of the 7th International Conference on Automotive User Interfaces and Interactive Vehicular Applications* (pp. 101-108).

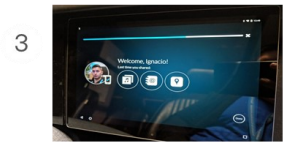
SKINIVI: Increasing Automated Driving Simulator Fidelity

- Full automation
- Customizable Traffic with event triggering
- Navigation UI
- Multimodal datasets collection



DRIVING VIEW

NAVIGATION VIEW



IVI USER INTERFACE

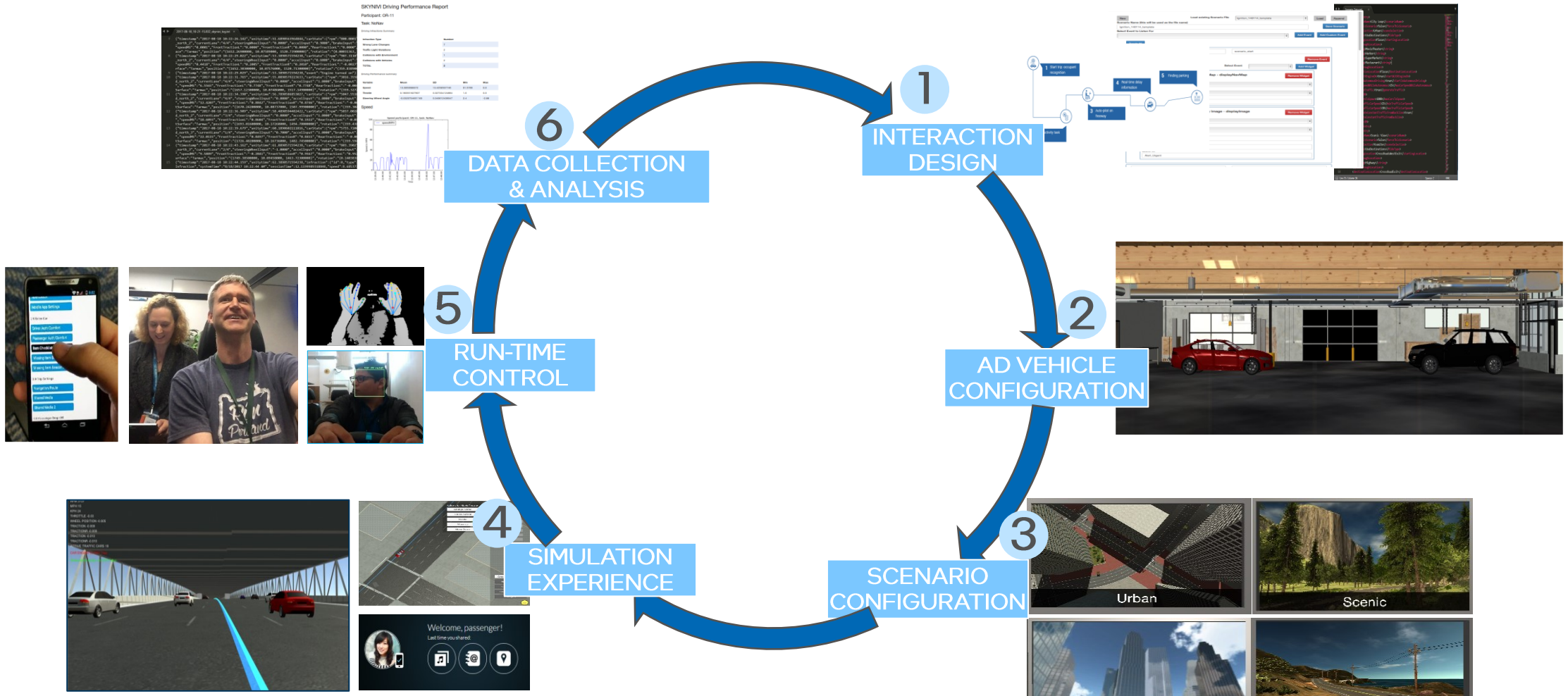

SKYNIVI 5 SEAT SIMULATOR SETUP


AUTONOMOUS DRIVING IN SKYNIVI


MANUAL DRIVING IN SKYNIVI

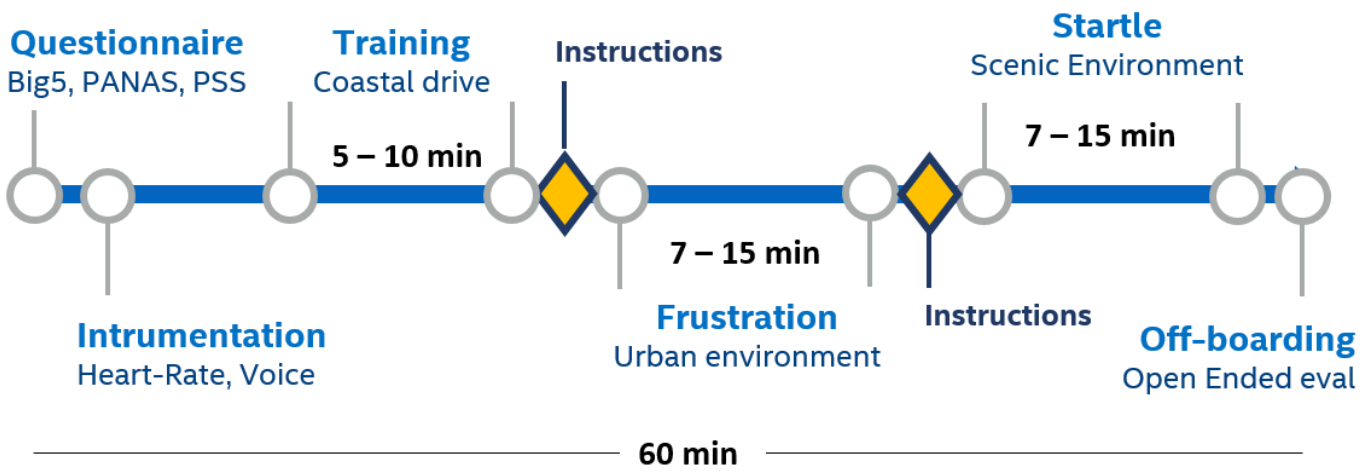
https://github.com/GENIVI/genivi-vehicle-simulator

Design Making for Autonomous Driving



Rivera, V. P., Rumbel, L., & Alvarez, I. (2016, October). Autonomous hmi made easy: Prototyping reactive in-cabin aware hmis. In *Adjunct Proceedings of the 8th International Conference on Automotive User Interfaces and Interactive Vehicular Applications* (pp. 1-7).

Emotion Induction in automated driving

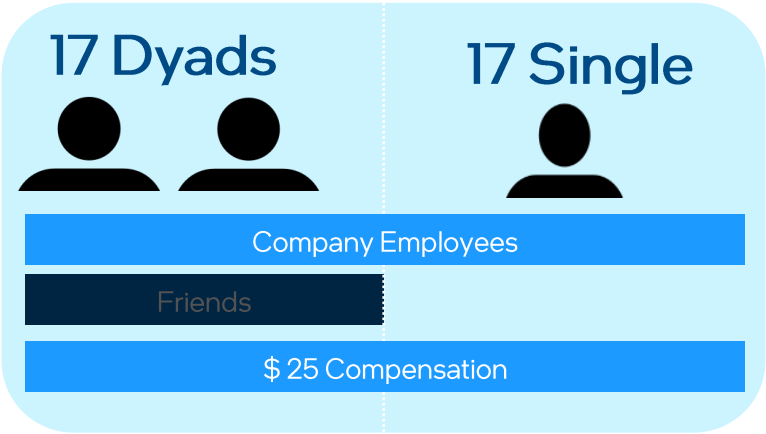


- Cameras
- Microphone
- Heart-rate
- wristband

Drive scenarios:

(1) Urban environment

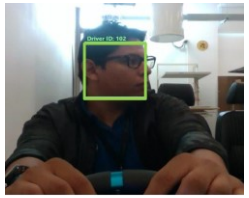
(2) Scenic environment

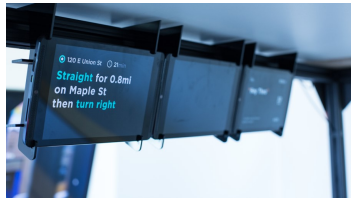


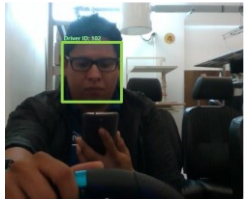
Alvarez, I., Healey, J., & Lewis, E. (2019, June). The SKYNIVI experience: evoking startle and frustration in dyads and single drivers. In *2019 IEEE Intelligent Vehicles Symposium (IV)* (pp. 76-81). IEEE.

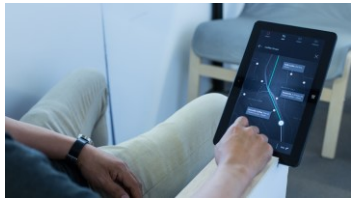
UX tools can serve multiple purposes …

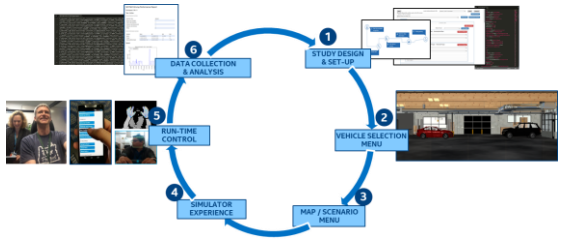
Research Platform











Product

Design Wins

FCA FIAT CHRYSLER AUTOMOBILES

Ford

VxWorks Integration

WIND™ AN INTEL COMPANY

open - sourced

GENIVI™

Showcase Platform

Understand the user mental models

Human – Machine interactions for Automotive Safety
requires understanding the user current behavior / relation with vehicle automation

Online survey
Over **250** respondents

1:1 Interviews and design exercise
20 participants in Hillsboro
10 participants in São Paulo
16 participants in London

Gamified Workshop
20 people in Hillsboro
10 people in São Paulo

Framework Analysis
Design Guidelines
User's perspective of safety
ADAS requirements

Strano, M., Novak, F. & Alvarez, I. (2018, November). "Peace of Mind", An Experiential Safety Framework for Automated Driving Technology Interactions. In *2018 21st International Conference on Intelligent Transportation Systems (ITSC)* (pp. 53-59). IEEE.

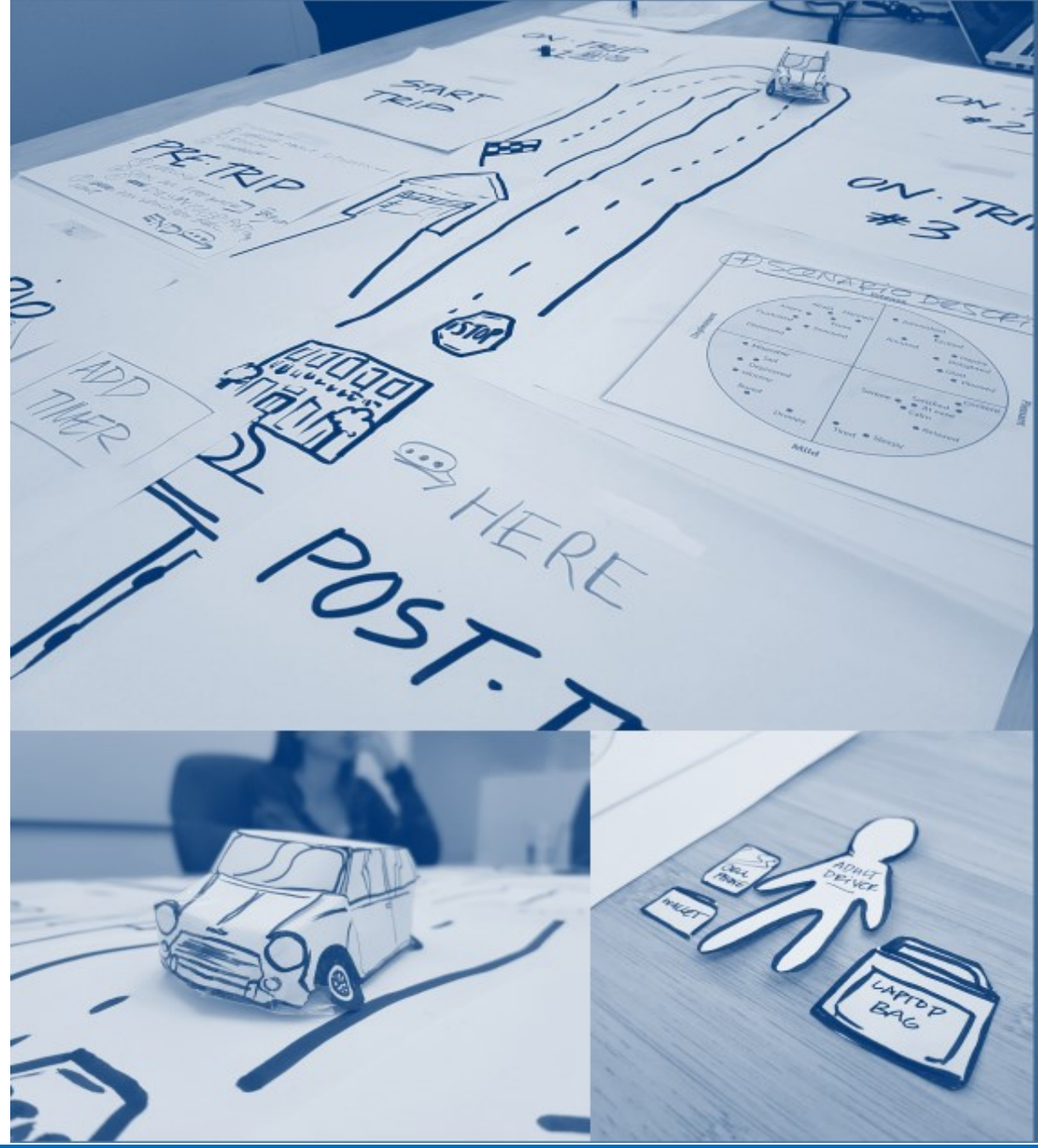
Gamified UX Workshops

Aimed to gather insight of vehicle automation safety concerns in a social environment and required feedback.

1. **Icebreaker**
2. **Road-trip**
3. **Commute**

Road Event + Safety Feedback + + ADAS Feedback

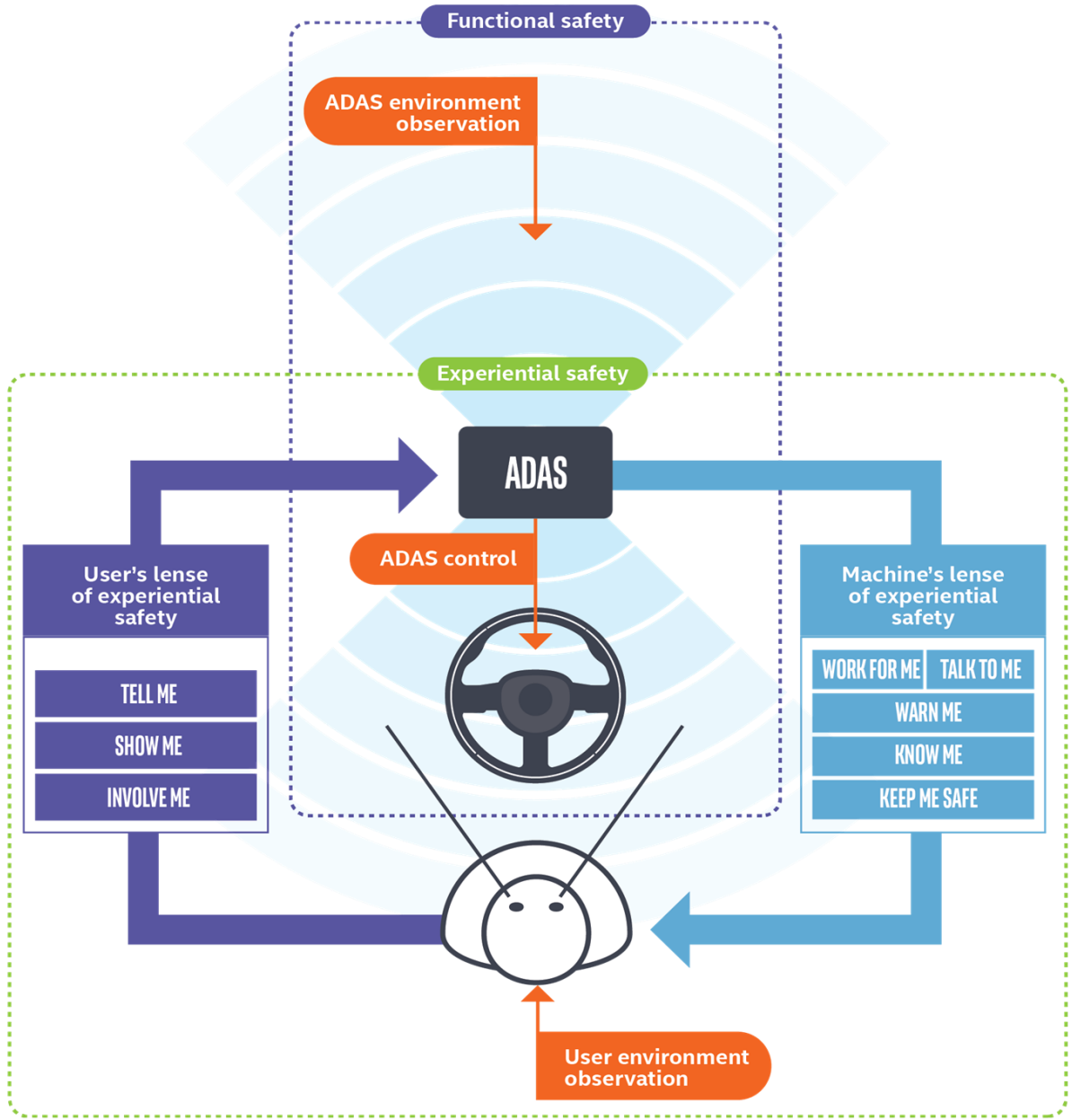
experiential.safety.gitbook.io



Strano, M., Novak, F. & Alvarez, I. (2018, November). “Peace of Mind”, An Experiential Safety Framework for Automated Driving Technology Interactions. In *2018 21st International Conference on Intelligent Transportation Systems (ITSC)* (pp. 53-59). IEEE.

Experiential frameworks help UX articulate their designs

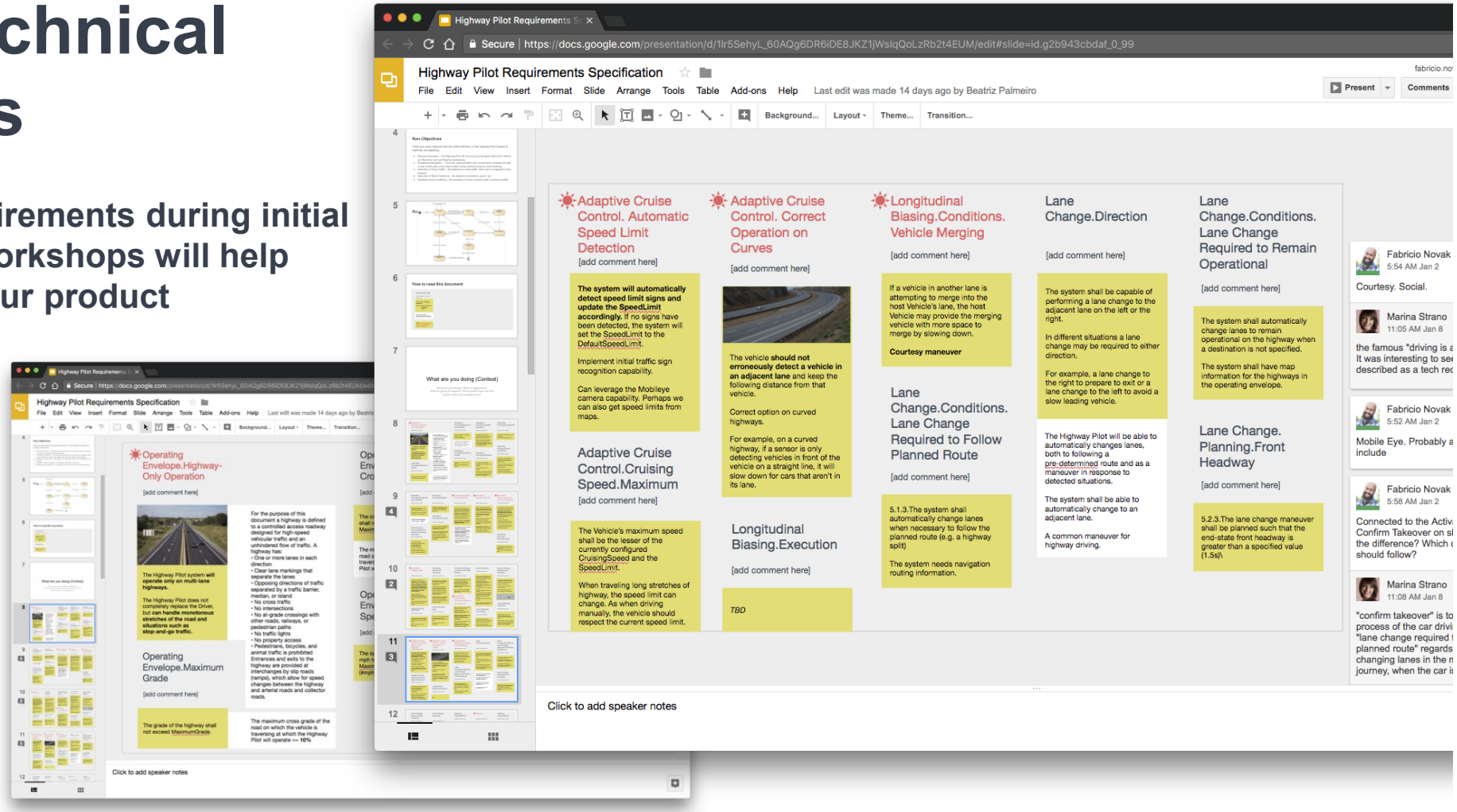
- For example in our experiential safety framework (*) we created a bridge between automation and user
- The user's lense tailors feedbaack in criticality levels that correlate to involvement.
- Machine's lense guides functional safety operation in a layered stage with peace of mind fulfilment at the top



(*) Strano, M., Novak, F. & Alvarez, I. (2018, November). "Peace of Mind", An Experiential Safety Framework for Automated Driving Technology Interactions. In *2018 21st International Conference on Intelligent Transportation Systems (ITSC)* (pp. 53-59). IEEE.

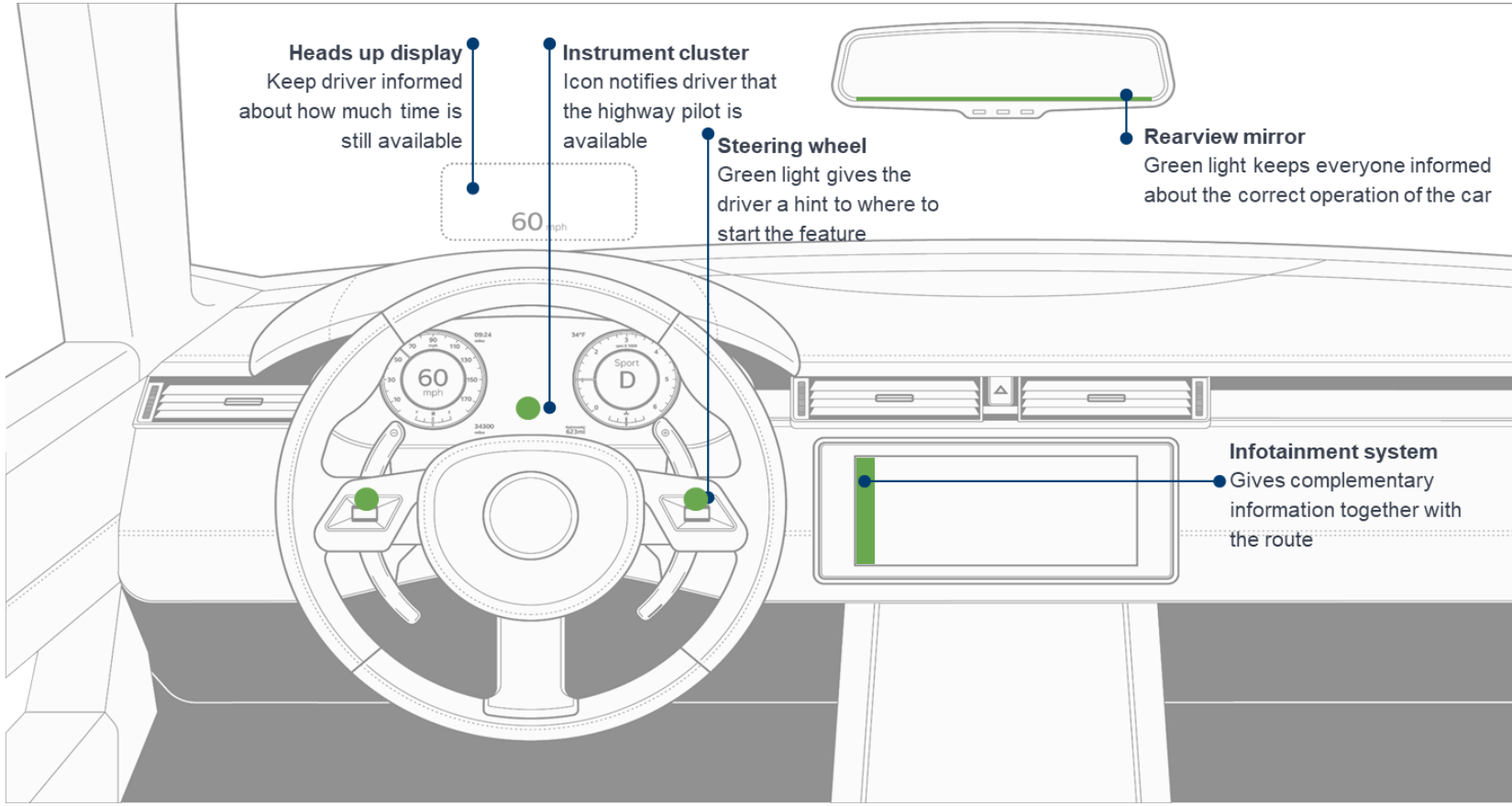
Gathering technical requirements

Gathering technical requirements during initial survey and participant workshops will help you start to document your product specifications



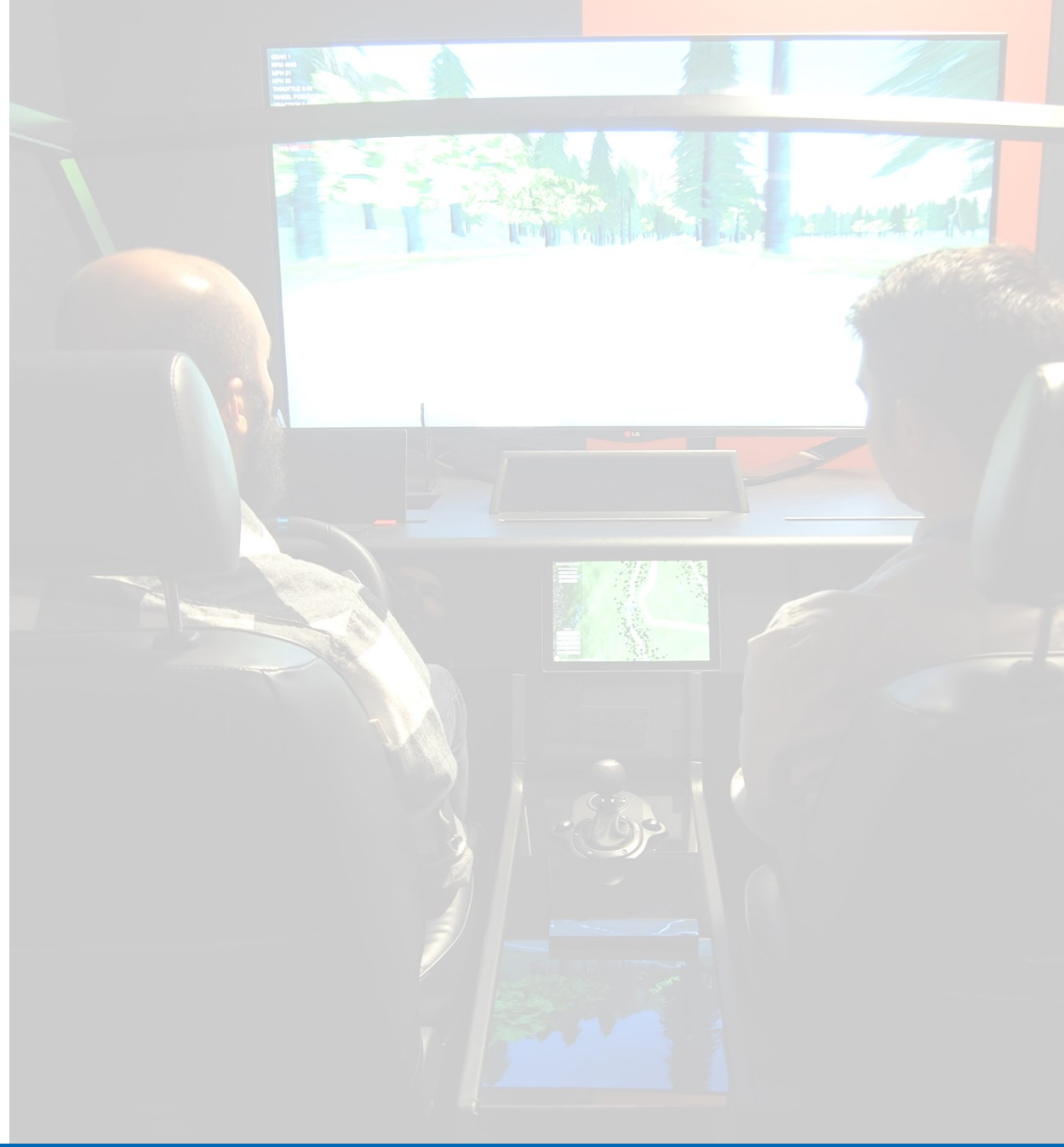
Then you can start articulating your Interaction Touch points

Orchestrating all touch points inside the cabin to grant peace of mind



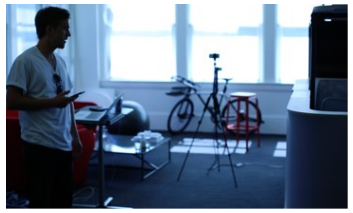
Keep an open mind and consider how to deliver the message with both traditional and novel interfaces.

Using Traditional and novel interaction points for experiential safety



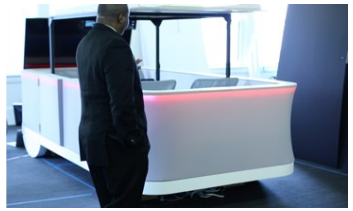
A User Journey offers multiple interaction touchpoints in a familiar context

RE-ROUTING
DUE TO TRAFFIC



HAILING A RIDE

ADDING A STOP



PEDESTRIAN DETECTION
(OUTSIDE)

planning trip
deciding destination
deciding desired arrival time
deciding when to depart
considering accompaniment
deciding what things to bring
planning route

approaching vehicle
locating vehicle
observing vehicle state
deciding how to enter
unlocking vehicle

entering vehicle
unlocking vehicle
opening vehicle
closing vehicle
orienting to vehicle

adjusting environment
adjusting seating
adjusting climate
inputting destination
moving objects around
plugging in devices
adjusting music

riding in vehicle
re-routing vehicle
adding stops
adjusting vehicle behavior
interacting with occupants

concluding ride
deciding drop-off location
paying for ride
completing activities
disconnecting devices
gathering belongings
exchanging pleasantries

exiting vehicle
unlocking vehicle
opening vehicle
orienting to environment

post-trip actions
paying for parking
going to destination
reflecting on ride

UX in robotaxies requires closer bridges to reality

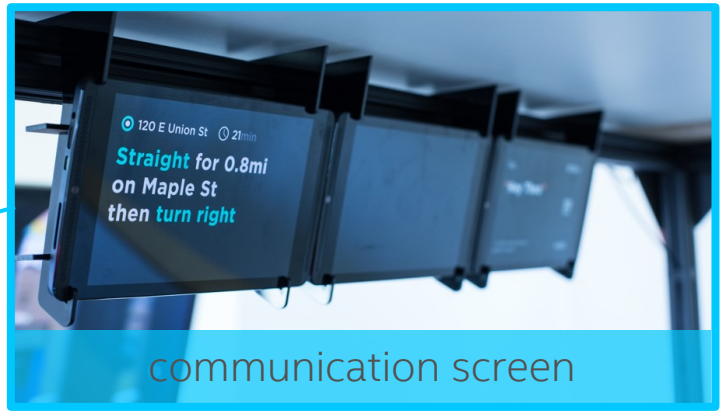
perspective view

front view

side view

… with clearly defined interaction areas


perspective view

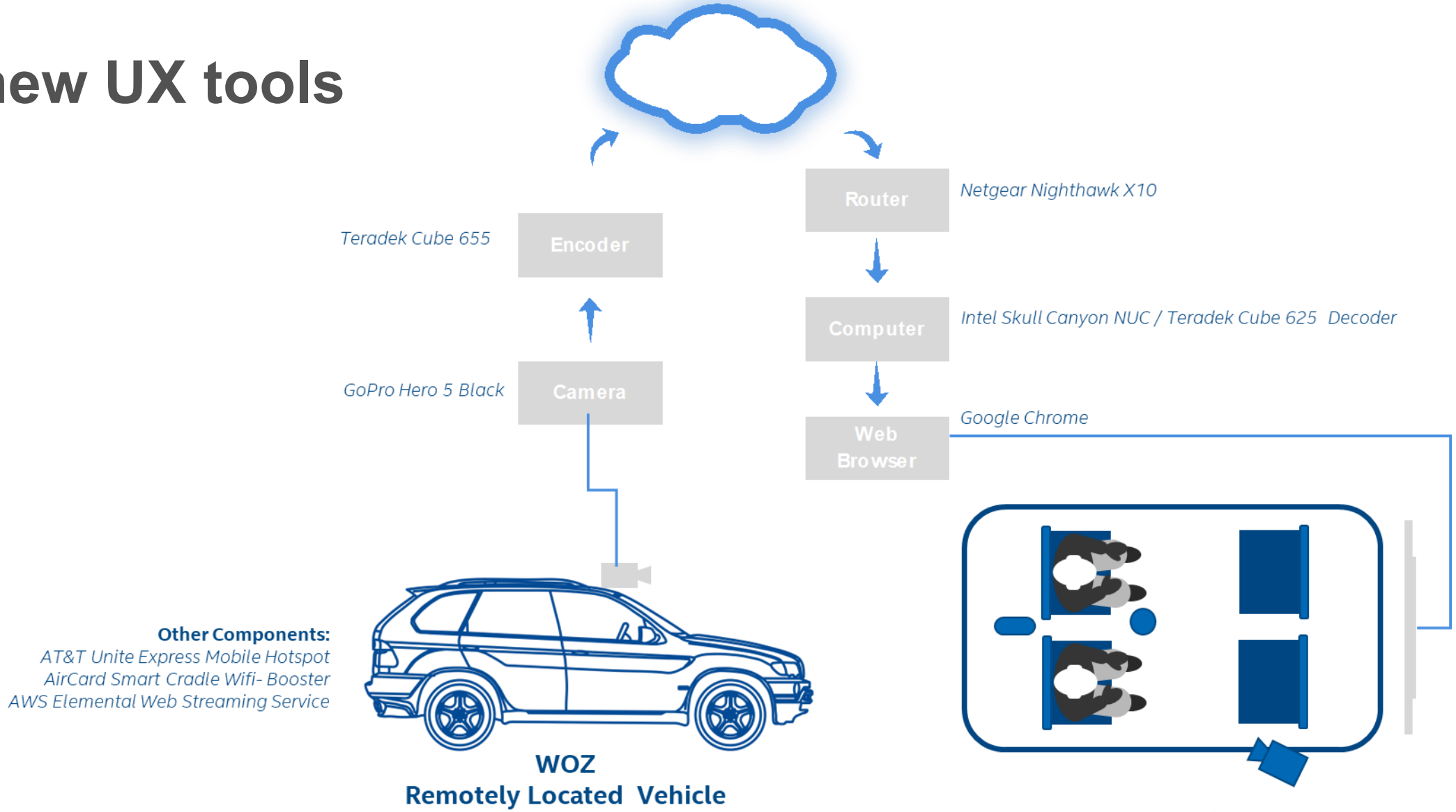


communication screen

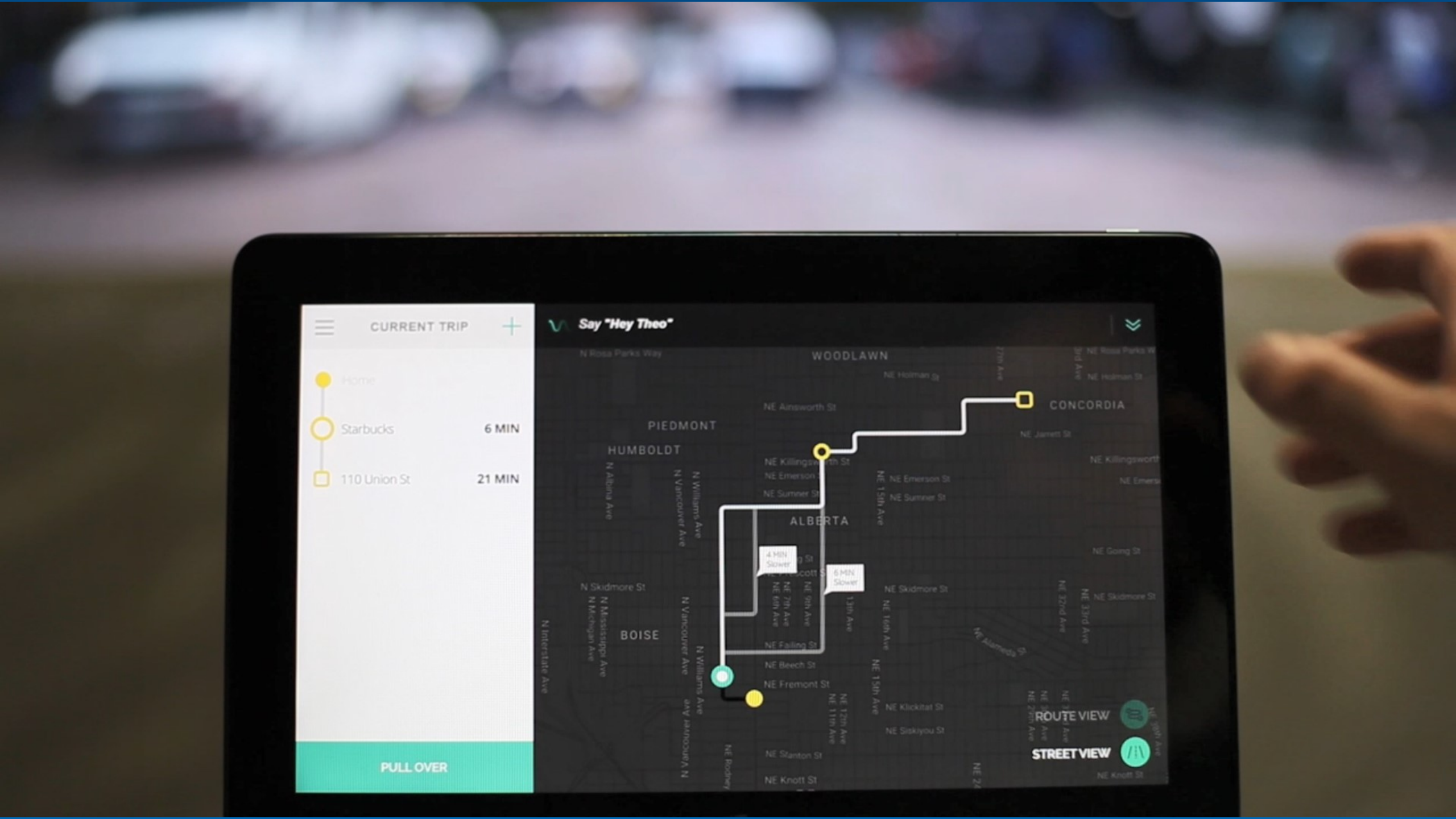

zone-centric touchscreen


pedestrian feedback

… and new UX tools



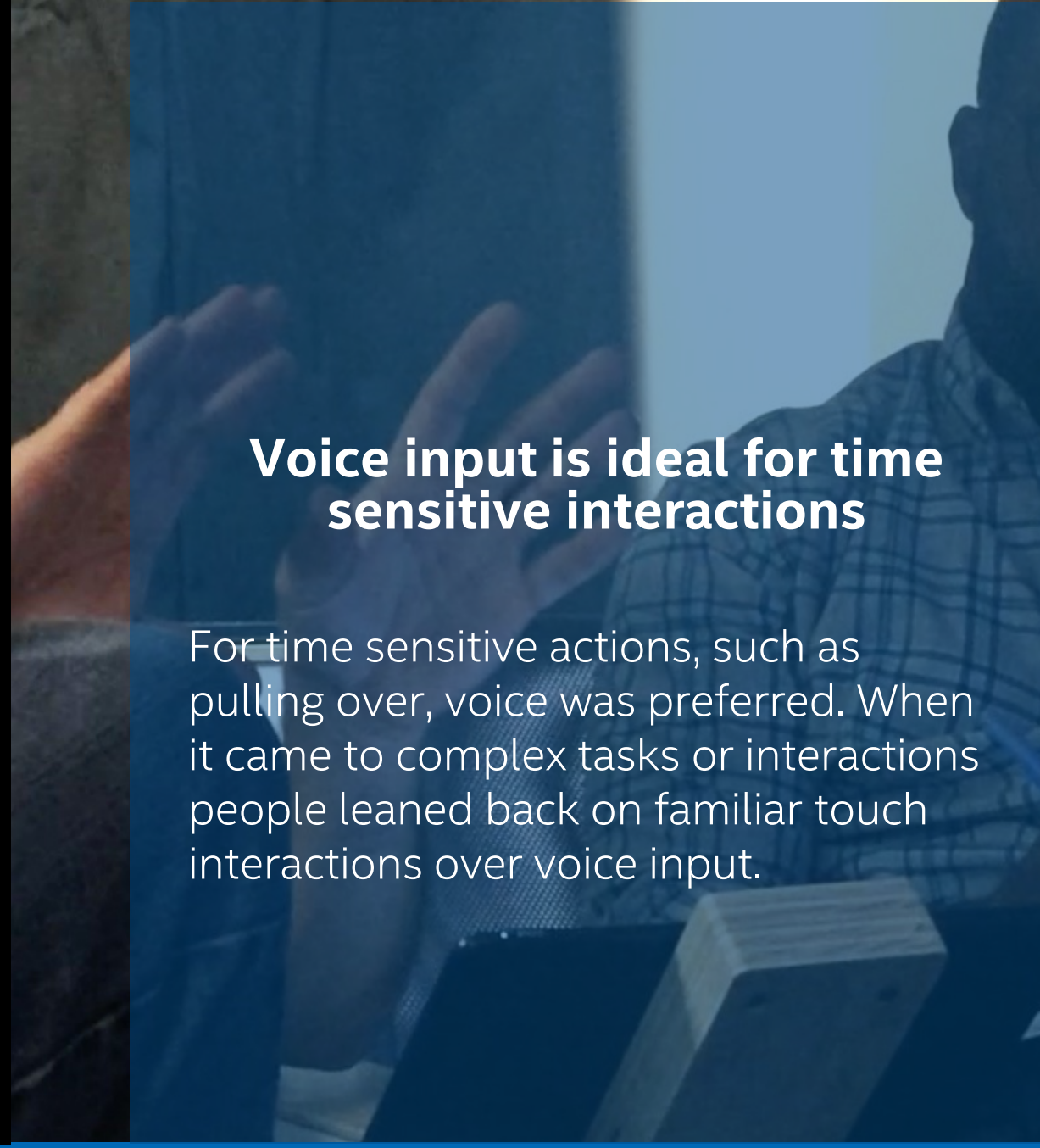
Ekandem, J. E., Alvarez, I., Rayburn, C., & Johnson, A. (2018, September). Conversational Route Negotiations with Autonomous Driving Assistants. In *Adjunct Proceedings of the 10th International Conference on Automotive User Interfaces and Interactive Vehicular Applications* (pp. 261-262).


CURRENT TRIP
Home
Starbucks
6 MIN
110 Union St
21 MIN
PULL OVER
Say "Hey Theo"
WOODLAWN
CONCORDIA
PIEDMONT
HUMBOLDT
ALBERTA
BOISE
4 MIN Slower
6 MIN Slower
ROUTE VIEW
STREET VIEW

“

I’M MUCH QUICKER TALKING THAN I AM WITH MY FINGERS

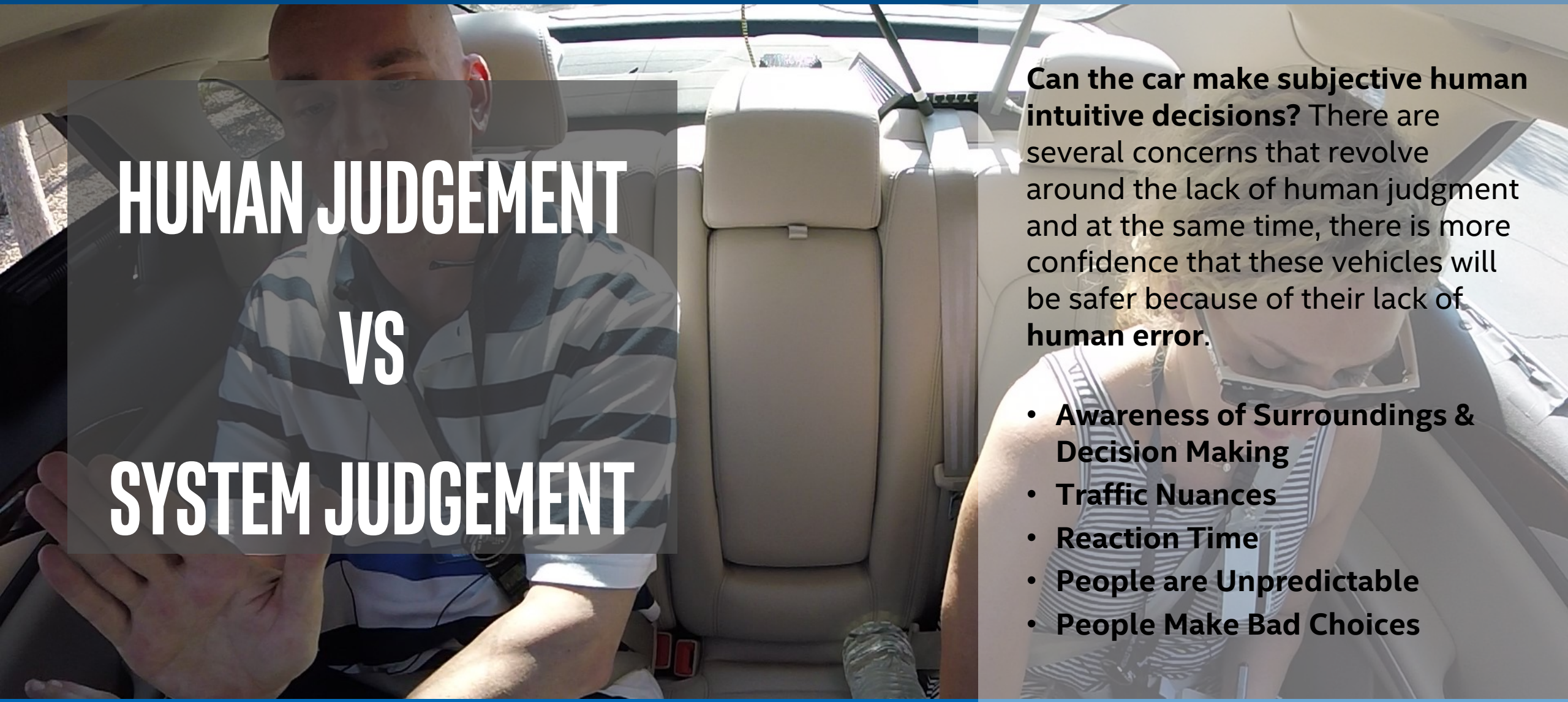
Participant



Voice input is ideal for time sensitive interactions

For time sensitive actions, such as pulling over, voice was preferred. When it came to complex tasks or interactions people leaned back on familiar touch interactions over voice input.

Automotive UX in the field



Can the car make subjective human intuitive decisions? There are several concerns that revolve around the lack of human judgment and at the same time, there is more confidence that these vehicles will be safer because of their lack of **human error**.

- **Awareness of Surroundings & Decision Making**
- **Traffic Nuances**
- **Reaction Time**
- **People are Unpredictable**
- **People Make Bad Choices**


“
I’M WATCHING THE ROAD
TO SEE HOW IT’S DRIVING

Automotive UX in the wild

Speed [MPH]	ICC Display Enabled	ICC Engaged	ICC Set Speed	ICC Following Distance	Brakes	ICC Speed Above Set
64	On	Engaged	64	Medium	0	-

Type your message to send to the car here:

Do you feel that car changes lanes smoothly while engi

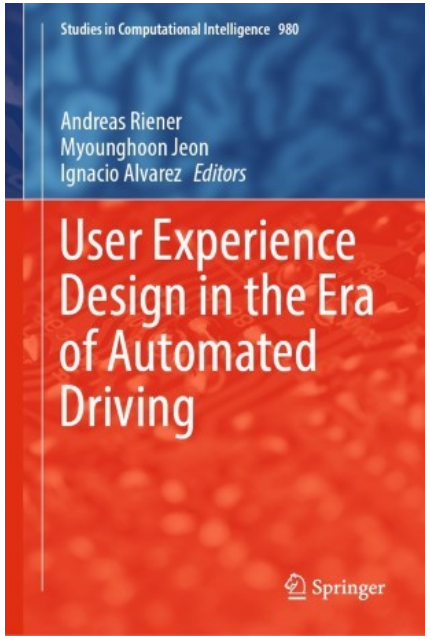
Send Reset

Common Questions

What is the best part of the system?	Play
What is the worst part of the system?	Play
What would you change?	Play
How do you feel using the system?	Play

Martelaro, N., Ju, W. WoZ Way: Enabling real-time remote interaction prototyping & observation in on-road vehicles In CSCW 2017. Portland, OR.

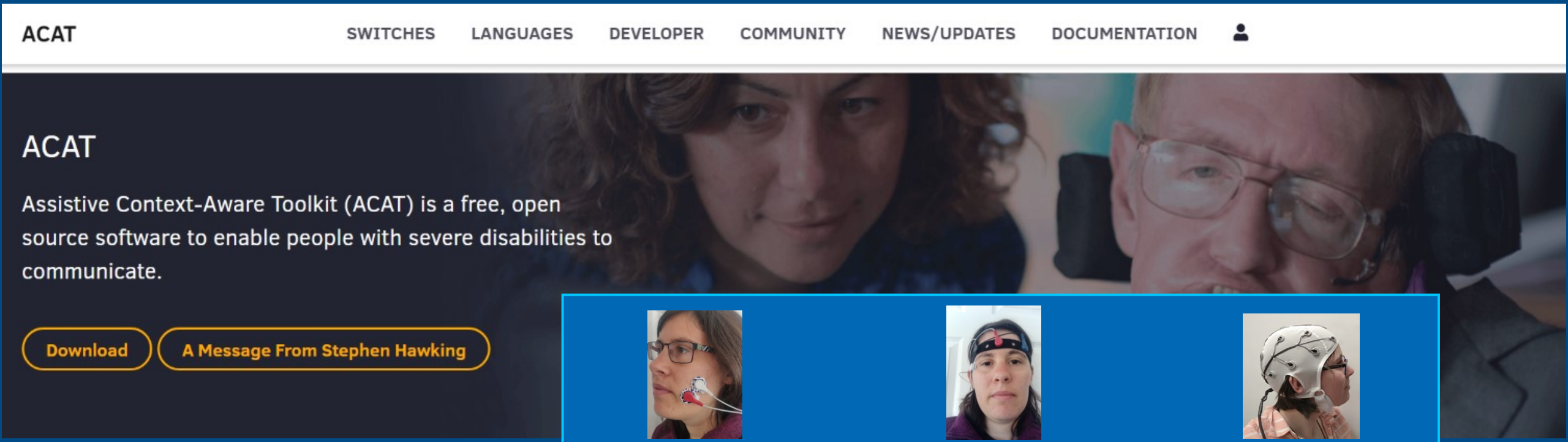
If you are considering working in Automated Driving UX I recommend my latest book…



- broad overview of the state-of-the-art user experience research in automated driving
- Help researchers, engineers, and designers speed-up the implementation of automated vehicles
- Dedicated to user experience design for automated driving
- Provides fundamental knowledge, tools and UX design methods and methodologies,
- Provides a range of examples how UI/UX design can positively influence users' perception on automated driving technology

https://link.springer.com/book/10.1007/978-3-030-77726-5

Beyond Automotive …



Facial gestures (EMG)

Eye movements (EOG)

Brain signals (EEG)

Camera

Cheek Sensor

Ring Sensor

Gaze Tracker

Enabling developers to rapidly innovate and customize solutions using ACAT

https://01.org/ACAT

4x Speed


Typing with your brain
Typing with your
A B C D E F G
H I J K L M N
O P Q R S T U
V W X Y Z _ <
lenovo

Human – Machine interaction in Education

Adaptive Learning

Multi-modal Sensing → Feature Extraction → Labels & Models

Camera — Appearance — Facial landmarks, head pose, etc.

Content Platform — Context& Performance — Content duration, number of trials/hints, difficulty level, etc.

Emotional States: Satisfied, Bored, Confused

Behavioral States: On Task, Off Task

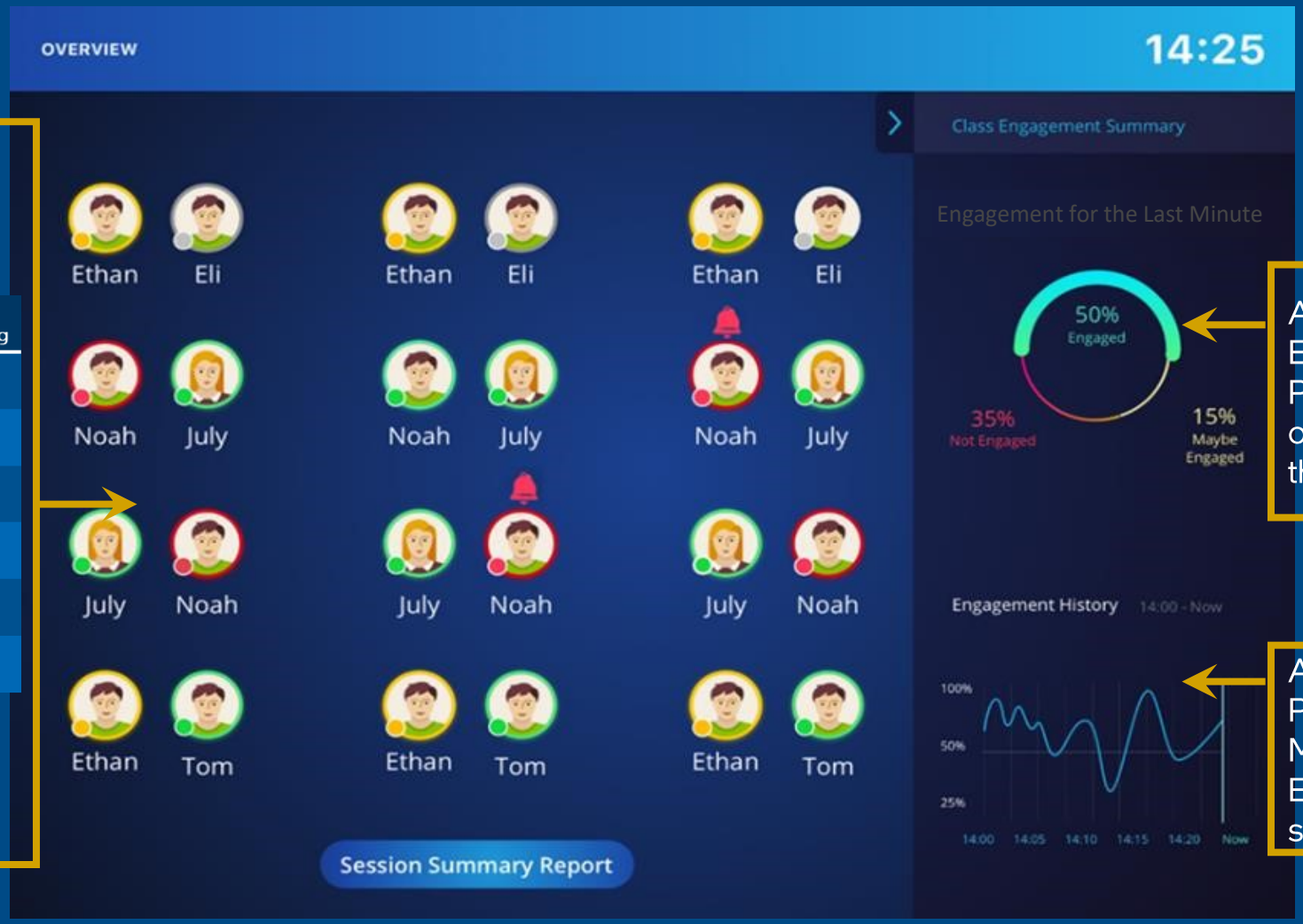
Engagement Level

Teacher Dashboard [Class View]

Color Codes: dominant engagement label for each student is displayed and it is updated every minute.

Contextual State	Behavioral State	Emotional State	Engagement Mapping	Color Mapping
On-Platform	On-Task	Satisfied	Engaged	Green
On-Platform	On-Task	Bored	Maybe Engaged	Yellow
On-Platform	On-Task	Confused	Maybe Engaged	Yellow
On-Platform	On-Task	Cannot Decide	Maybe Engaged	Yellow
On-Platform	Off-Task		Not Engaged	Red
Off-Platform			Not Engaged	Red

Notifications: If the dominant contextual state for the last minute is Off Platform, a bell is displayed.

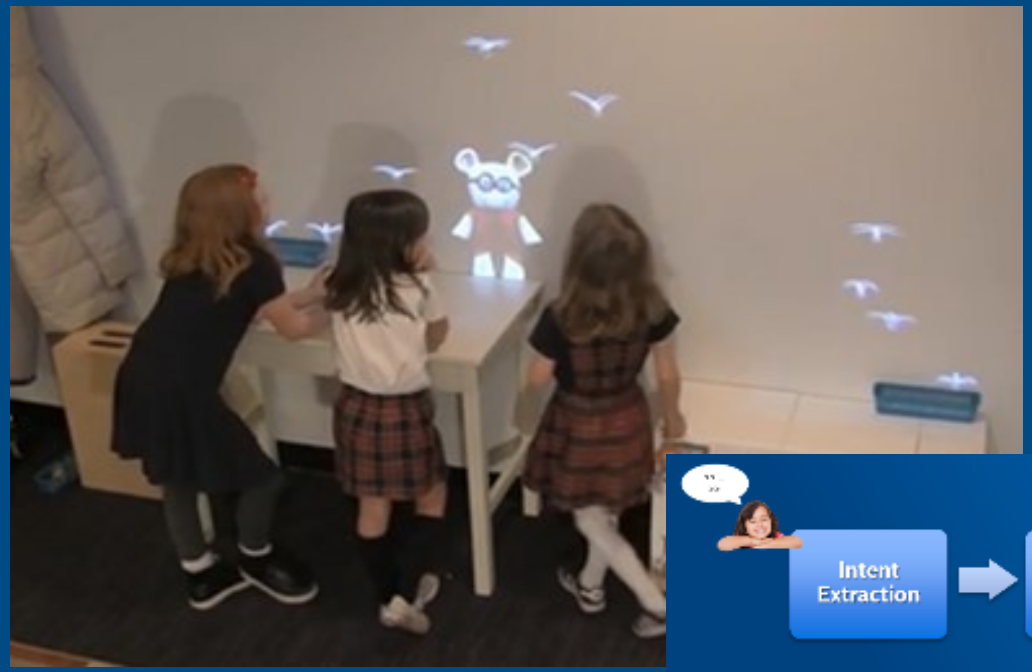


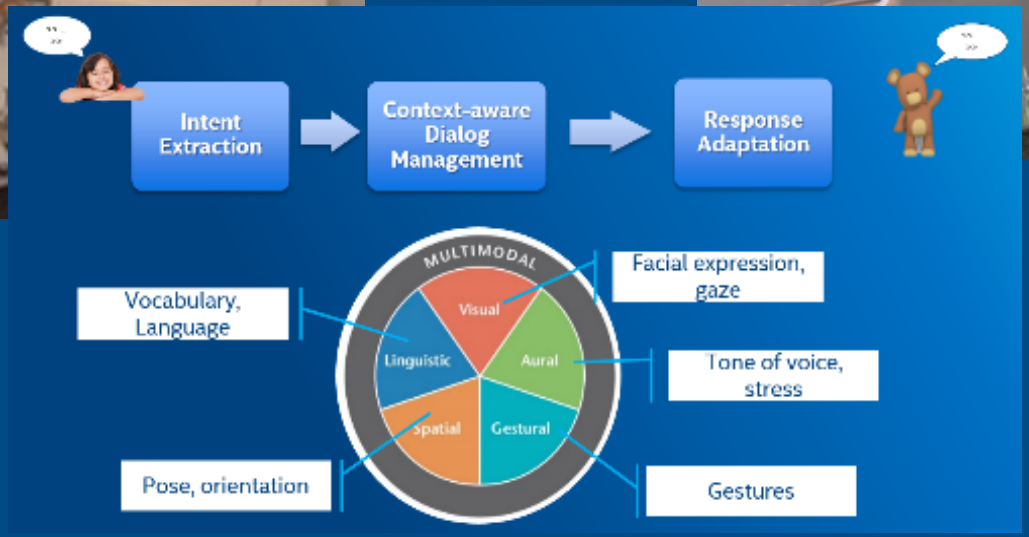
Average Engagement Percentages of all students for the last minute.

Average Percentages of May be Engaged + Engaged since session-start.

Investigating the Impact of a Real-time, Multimodal Student Engagement Analytics Technology in Authentic Classrooms.
S Aslan, N Alyuz, C Tanriover, S Mete, E Okur, S D'Mello, A Esme. CHI 2019

Smart Spaces



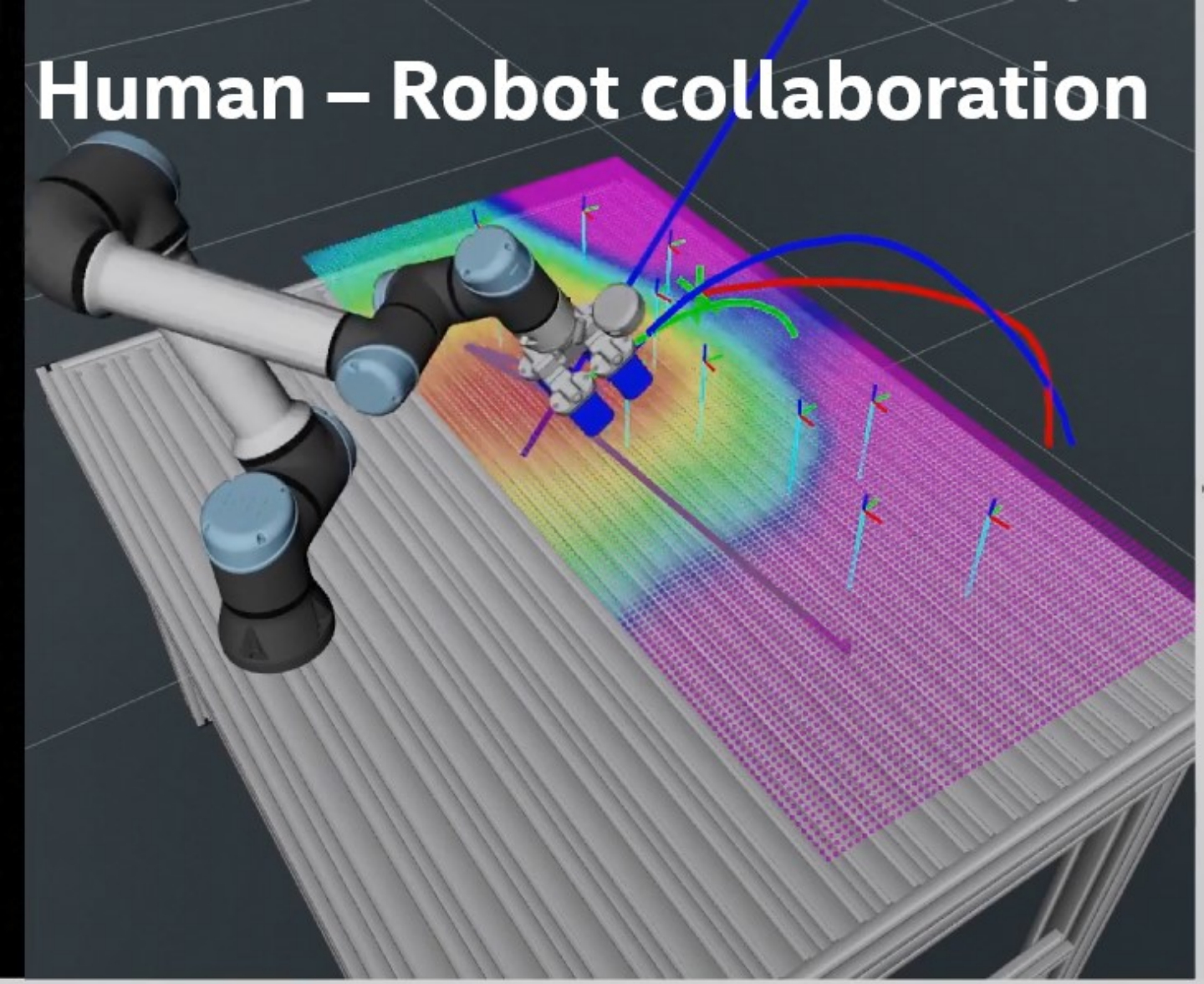


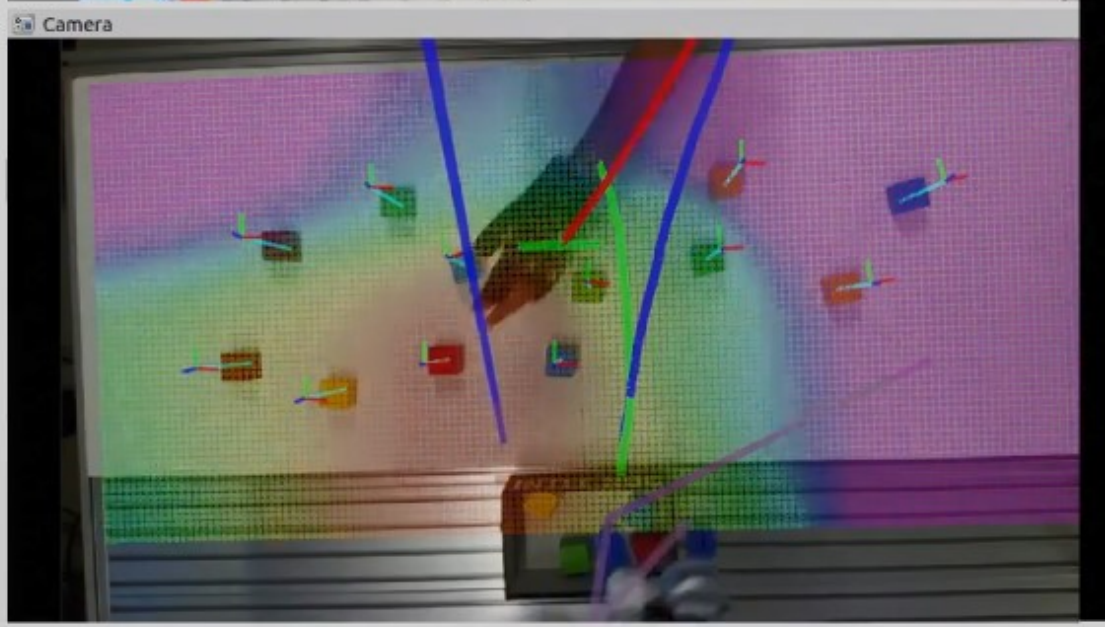
We want technology ...

but not screen time

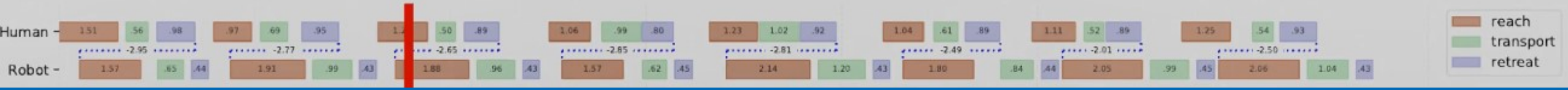
AI agents supporting early childhood learning in the physical environment

Human – Robot collaboration





Functional Delay (s): -2.63 ± 0.281 Robot Idle Time (s): 0.43 ± 0.254 Human Idle Time (s): 0.96 ± 0.244 Total Task Time (s): 33.58



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