RN2 Auto Presents

Clearpath

Minimizing Driver Distraction with an Advanced Head-Up Display for Cars.

RN2

The Team

We are RN2 Auto, The team behind the wheels 🏍️

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What is Clearpath?

A modular Heads-Up Display (HUD) aimed at significantly reducing driver distraction. By integrating all essential dashboard functionalities, our design removes the need for a traditional dashboard, resulting in both space and cost savings for manufacturers while aligning with the growing trend of minimalistic car interiors.

What Prompted Us to Re-Imagine HUDs?

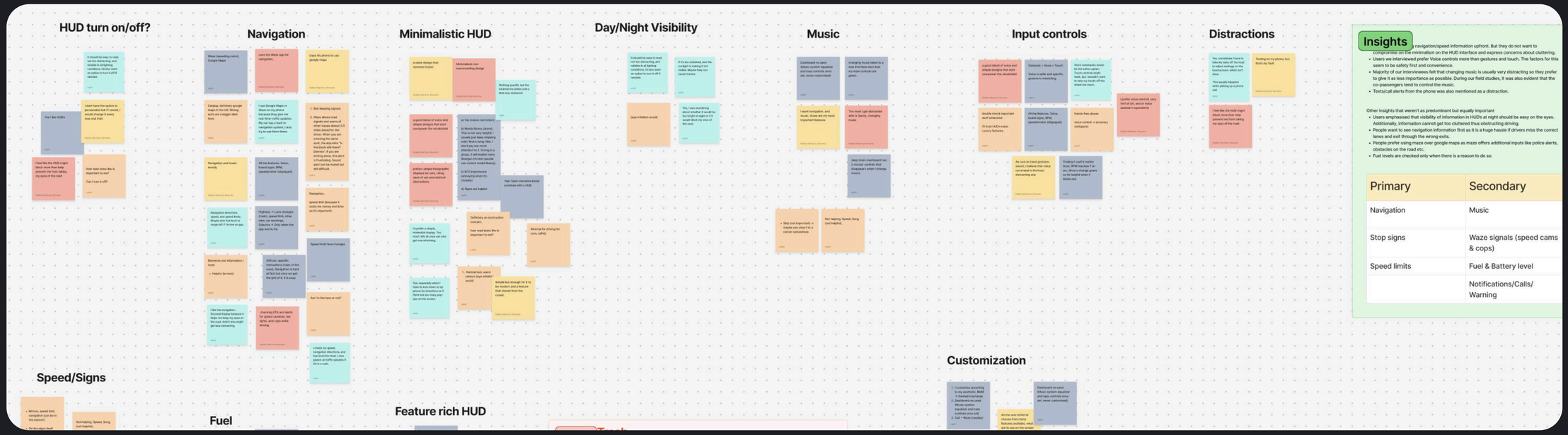
In-car infotainment systems can distract drivers for over 40 seconds & ***Just two seconds of distraction doubles crash risk***

Our heuristic review of current HUDs revealed most display only basics—speed, navigation, music—while relying on dashboards or secondary screens for info like fuel, calls, or ADAS alerts.

Advanced systems like the BMW i5 M60 and Audi Activesphere aim to reduce distractions, but still fall short. Audi's AR glasses shift focus from the road, while BMW's dense info layout risks cognitive overload. Both lack key usability principles like consistency, simplicity, and intuitive interaction.

User Research

- Interviewed **5 experienced U.S. drivers**, each with 3 to 5+ years of driving experience.
- Explored their **expectations, preferences, and behaviors related to HUDs.**
- Applied affinity mapping to analyze responses and extract **key insights.**



Insights from Research

Clarity over clutter

People prefer having navigation and speed information upfront.

But they do not want to compromise on the minimalism of the HUD interface and express concerns about cluttering.

Varying priorities

We also noticed that users have varying preferences regarding what they consider important.

One individual prioritized RPM and wanted it displayed in the HUD, while others did not share this preference.

Fear of distraction

Most drivers found music control and phone alerts distracting, often leaving music handling to co-passengers and minimizing its importance while driving.

The Challenge

How might we add functionalities to the HUD that reduce distractions while keeping it simple and easy to use?

The Solution

A 3-tier approach

We achieved a balance between functionality and simplicity by carefully placing elements, using smooth transitions, and making intentional design choices. This allowed us to add extra features without making the interface feel complex.

User Testing

ClearPath On a Test Drive

- Tested with experienced drivers.
- Simulated 4 critical driving scenarios with an advanced prototyping setup.
- Stress testing HUD quality by tracking user dwell time.

Scenario 1

Multilanes and exits

Audio Design

During our first user testing, the driver had to pretend to drive without audio but only the visual cues. Their feedback indicated that for a all-rounded testing scenario, our team would have to utilitse online audio libraries to play relevant instructions and sounds while the driver is driving in the pretend-scenarios.

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This prompted us to collect 4 audio files that were relevant for the scenarios described below.

1. "Take the right onto NE TIER I" - OpenAI was used to record a calming voice announcing which exit to take
2. Indicator sound- This ticking sound was played after we instructed the driver to turn on right indicator.
3. Warning - warning sounds were used to highlight the ADAS system.
4. Calling- A ringtone was played, few seconds prior to showing the call on HUD, preparing the user for the call.

Scenario 2

ADAS Information

Scenario 3

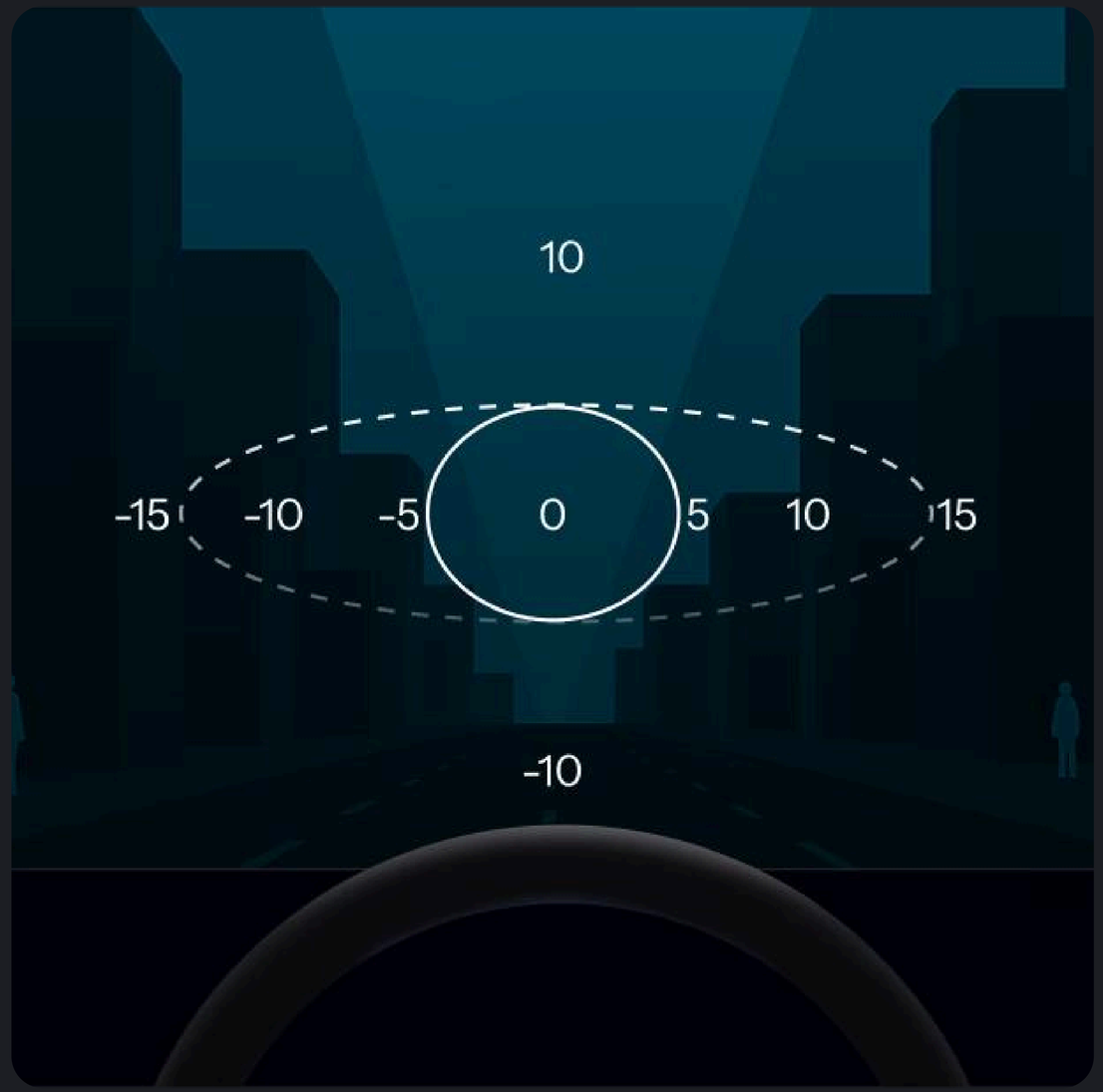
Incoming phonecall

Scenario 4

Changing Music

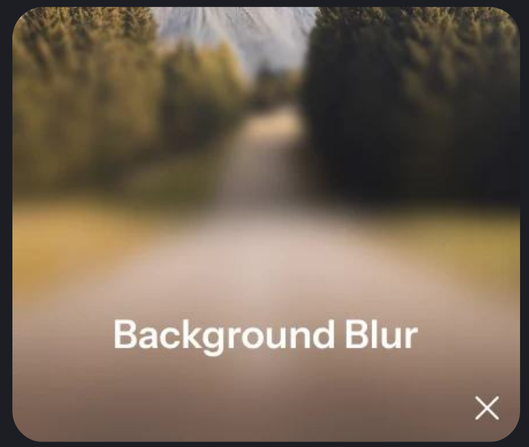
Positioning

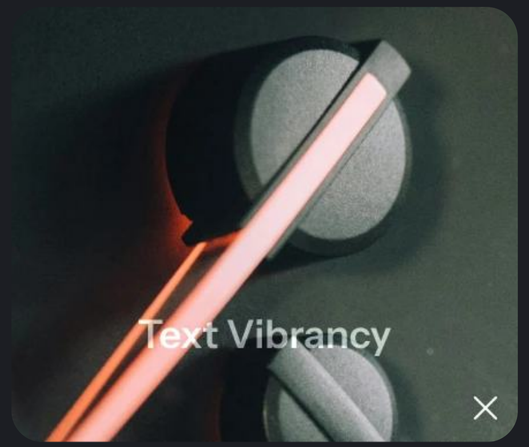
- Key elements should be positioned within 5–15 degrees of the driver’s line of sight in the HUD.
- Content that could potentially cause distraction should be placed outside this range.
- This is still beneficial because it would still cause less distraction compared to when they are displayed on secondary screens.

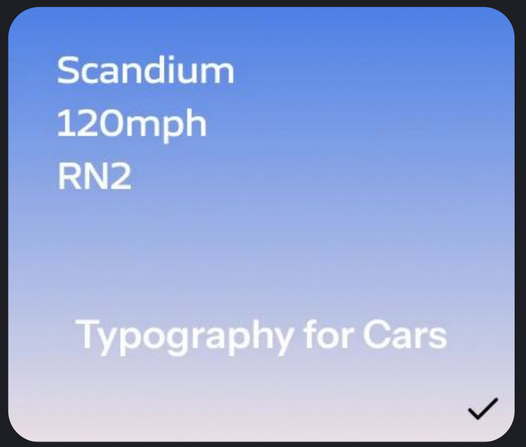


Design For HUD

AR design techniques like background blur and vibrancy are highly effective, but they don't work for HUDs due to projection limitations.







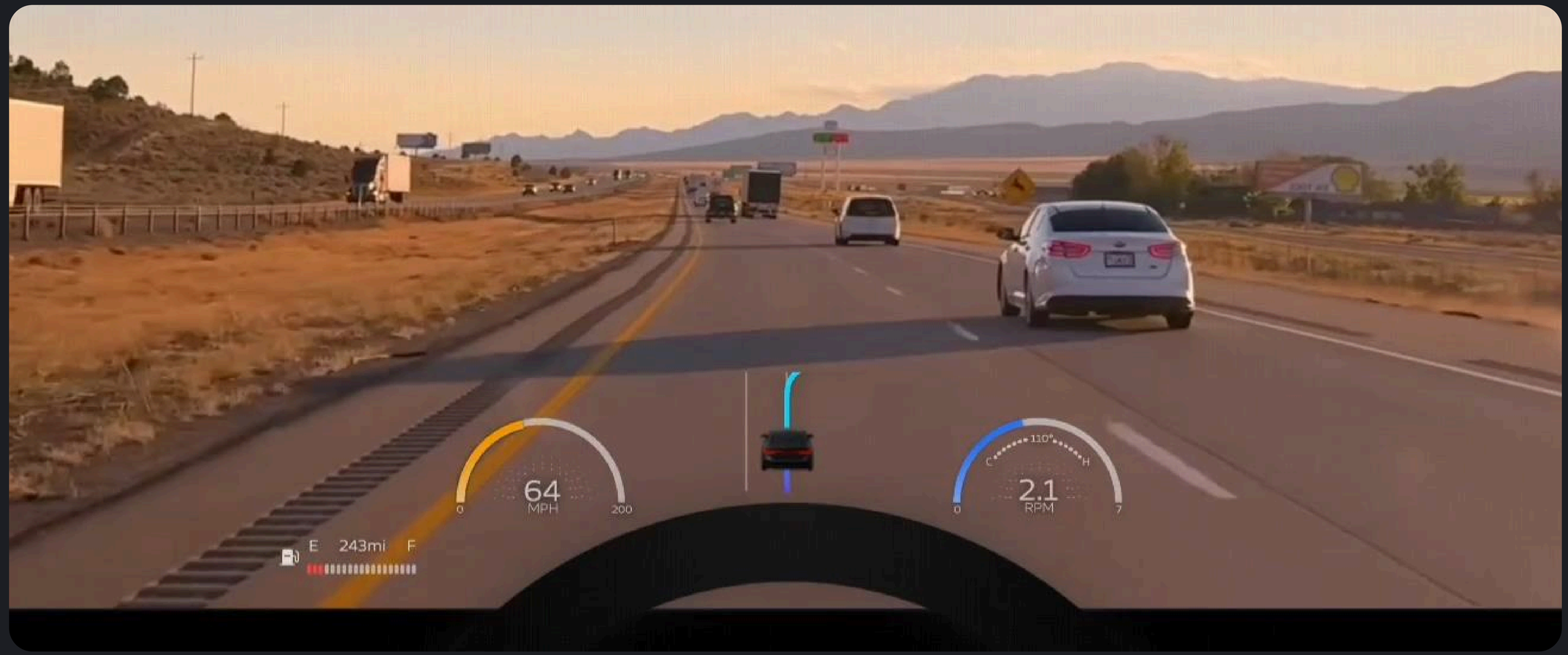
We stuck to practical design approaches which proved highly effective—none of the users we tested encountered any problems with **readability**, **visibility**, or **visual obstruction.**

Adapting to Light

Adaptive design variants that respond to lighting conditions. These versions adjust contrast, shadow hues, and modify color brightness and saturation to maintain clarity in any environment.

Transitions

Modular Design



HUD's Effect on Distractions

Dwell Time = Transition time + Fixation TIme

USERS	RECEIVING CALL USING HUD A	RECEIVING CALL USING SECONDARY SCREEN B	DIFFERENCE B - A
User 1	1.77s	3.34s	1.57s
User 2	1.44s	3.83s	2.39s
User 3	1.52s	2.23s	0.71s
User 4	1.23s	3.01s	1.78s
User 5	1.54s	2.89s	1.35s
Average			**1.56s**

Insights from Testing

> Yes, this causes much fewer distractions than the way I usually handle calls.

> Seeing my playlist here is clearly more efficient and makes it easy for me to change music

- All the users found the information easy to read and clear.
- None of the content obstructed or interfered with the driver's line of sight for any user.
- Automatically appearing information did not catch any user off guard, and the subtle transitions helped.

Insights from Testing

> I'd like to see a wider area displayed on the map, along with key navigation points

> I don't really understand what the blue light is, and based on that alone, I wouldn't make a decision.

- The map needs to provide more information well ahead of time. It should also display navigation milestones.
- For ADAS info. one improvement could be the inclusion of a detailed lane map to improve clarity.

Impact

1.56s

Is the avg. decrease in dwell time observed when attending calls via the HUD compared to using a secondary screen.

4/5

Users said that the HUD will improve their driving experience & significantly reduce distractions.

Efficiency

Cost & space is saved by adding a highly functional HUD instead of traditional dashboards.

Reflection & Future Scope

Designing for the automotive domain stands apart from other fields, it required unique adjustments in how we prototype and test products.

Along the way, we refined our approach based on insights . The outcome is a compelling solution focused on minimising driver distractions, an important design component in Automotive UX.

Thanks to the modular design, this HUD also adapts well to diverse driving experiences.

Reflection & Future Scope

Here are some future considerations

Research

- Analysing data on how drivers customise to understand user needs better
- Can we use AI to identify driver fatigue to turn on/off cruise control on the HUD?
- Do people find ADAS useful? Are they turning it on/off?

Design

- HUD color schemes to match car interiors
- How much functionality is too much?

Thank you, Open to questions!