



Hand tracking +  
mid-air haptics =  
The next generation  
of automotive HMI

## Gesture control needs accurate hand tracking

The automotive sector is rapidly adopting mid-air gesture technology. However, the success of gestural interfaces depends on accurate hand tracking.

Ultraleap's skeletal hand tracking is based on four generations of development powered by machine learning. Reliable detection, first-time gesture recognition, low compute requirements and easy integration.

## The value of adding mid-air haptics to gesture control

Ultraleap's mid-air haptic technology controls ultrasound waves to create tactile sensations in mid-air. It is the only commercially available technology suitable for adding haptic feedback to gesture control.

An award-winning 2018 study suggests adding mid-air haptic feedback to gesture control in automotive HMI reduces error rates, reduces "eyes off the road" and is preferred by users.<sup>1</sup>



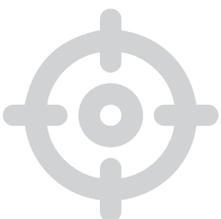
**39%**  
made no off-road  
glances

39% of participants were able to perform tasks with no off-road glances at all. There was also a 25% average decrease in total glance time compared to touchscreens.



**80%+**  
increase in  
preference score

For slider-bar tasks, mid-air haptics + gesture control had a preference score of 113 versus 61 for touchscreens.



**3x**  
greater accuracy

On slider-bar tasks, participants were 3 x more accurate on average compared to a touchscreen.

# Advantages of mid-air haptics + gesture control

- Fewer glances away from the road
- Controls come to you – no locating, no reaching
- Adding mid-air haptics results in higher accuracy than gesture control alone
- No disrupting conversations or disturbing passengers
- Dynamic, specific haptic feedback received that corresponds with the action

## Ultrahaptics automotive demo

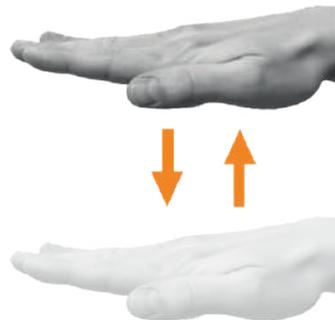
The Ultraleap automotive demo showcases how a set of core gestures can be coupled with mid-air haptic feedback to create intuitive, “eyes-free” control of infotainment functions.

## Core gestures



### Pinch

- Adjustment
- Radial menu operation
- Accept and reject



### Push-down

- Play/pause



### Grab-release

- Reject/decline
- Reset menu

<sup>1</sup>48 participants each did four simulated drives while using four different types of in-car HMI: touchscreen, touchscreen + mid-air haptics, gesture control, and gesture control + mid-air haptics. For full study, see Harrington, K., Large, D.R., Burnett, G. and Georgiou, O., 2018, September. "Exploring the Use of Mid-Air Ultrasonic Feedback to Enhance Automotive User Interfaces". In Proceedings of the 10th International Conference on Automotive User Interfaces and Interactive Vehicular Applications (pp. 11-20). ACM

# About Ultraleap

Ultraleap was formed when Leap Motion and Ultrahaptics came together in May 2019. Our spatial interaction toolkit includes the world's most powerful 3D hand tracking and the only haptic technology able to create the sensation of touch in mid-air. We provide these solutions both separately and together, and expertly support our customers to deliver immersive, intuitive and innovative experiences and products.



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