

Touchless digital signage

Design guidelines for ergonomics
and first use

Best practice to ensure that first-time users of touchless digital signage powered by Ultraleap's technology understand how to operate it and can do so comfortably.



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Ultraleap Hardware Explained

Hand tracking

Optical hand tracking modules capture the movement of users' hands and fingers so they can interact naturally with digital content.

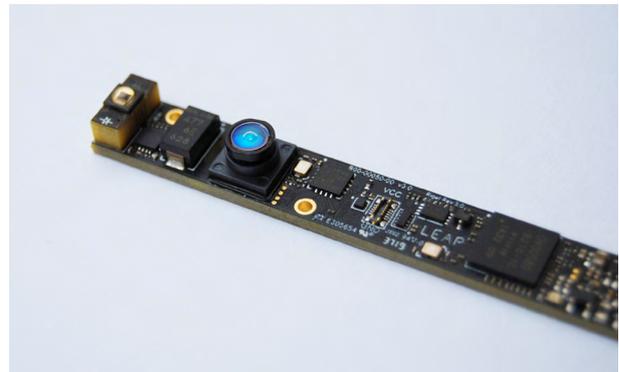


Leap Motion Controller

Small. Fast. Accurate. Whether you're an indie developer or a multinational company, the Leap Motion Controller makes human interaction in digital worlds natural and effortless. Tracking up to 60cm or more and typical FOV 140x120 degrees.

STEREO IR 170 Camera Module

The STEREO IR 170 Camera Module is the next generation of hand tracking hardware. Designed to be integrated into commercial hardware solutions, displays, and installations. Deeper range than the Leap Motion Controller, with tracking up to 75 cm or more and typical FOV 170x170 degrees (minimum 160x160 degrees).



Integration

Designed for simple integration into customer applications and can be retrofitted to existing hardware.

Plugins for [Unity](#) and [Unreal](#) enable developers working with two leading 3D development platforms to incorporate hand tracking into their existing workflows.

HTML and JavaScript tools are also available for integrating Ultraleap hardware into existing web technology based platforms (in beta).



“Virtual touch” haptics

STRATOS Inspire



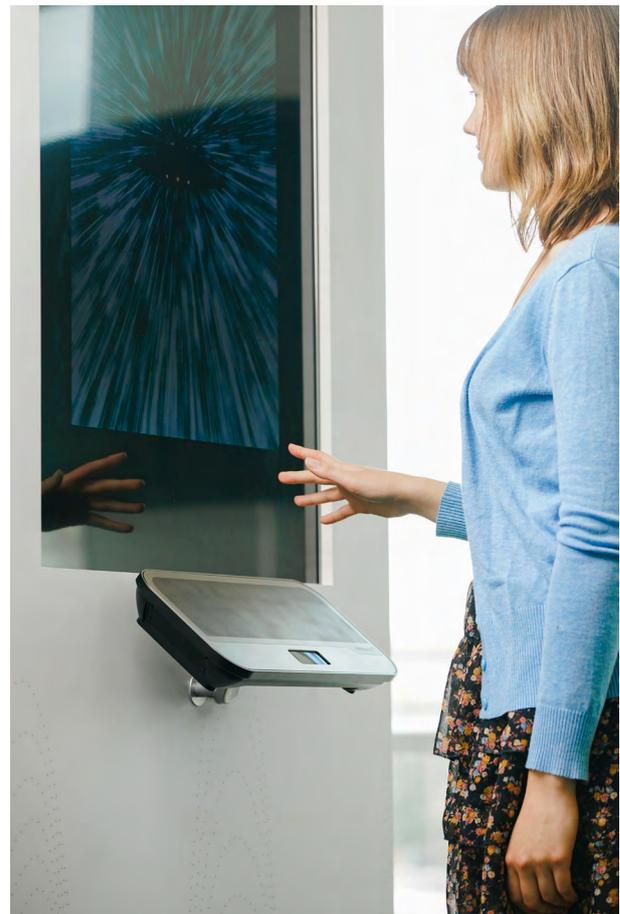
STRATOS Inspire is a bolt-on module that incorporates both hand tracking and mid-air haptics. Mid-air haptics is a “virtual touch” technology that uses ultrasound to create the sensation of touch in mid-air.

Overview

The haptic module is bolted onto 2D digital screens, transforming them into 3D interactive canvases by creating tactile interaction zones in mid-air. STRATOS Inspire is usually positioned underneath a digital screen, as demonstrated in the image to the right.

Customers can use 3D gestures to interact with content and experience haptics on their bare hands. No handheld devices or wearables are required and customers do not need to be in contact with any surface.

To interact with the technology, users place their hand approximately 20cm above the device. Here they can feel the mid-air haptic feedback in response to visual on-screen cues.



Features

The tactile interaction zone is over 63cm deep x 48cm wide x 48cm high (25” x 19” x 19”).

The simplest type of effect is a single pressure point measuring 8.6mm in diameter. With a 40kHz refresh rate, pressure points are then moved very rapidly in 3D space to create a variety of tactile effects in mid-air including:

- Virtual buttons and sliders, as well as haptic pulses and alerts
- Immersive sensations such as textures, and presence for virtual objects, surfaces and shapes
- Magical sensations such as lightning, fireballs, ghosts, clouds, bubbles and forcefields



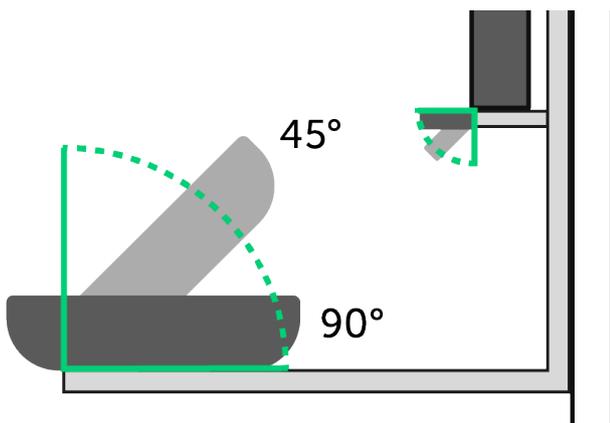
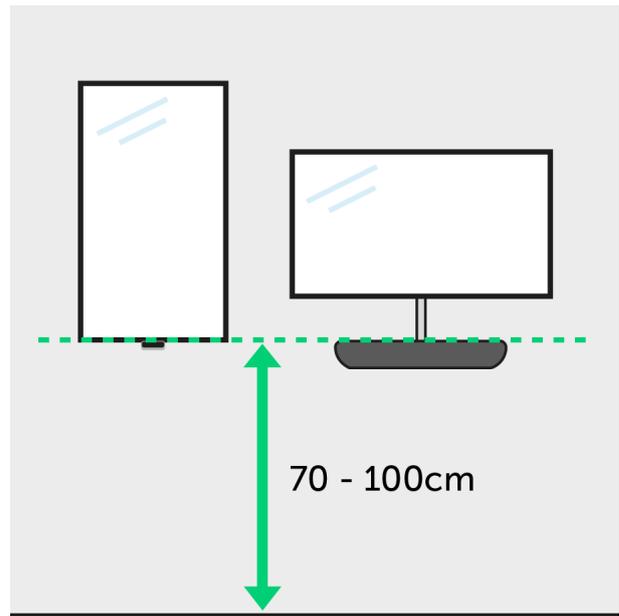
Ergonomics

Module placement

Distance from the ground

The **surface** of the tracking and haptic modules should be placed anywhere **between 70cm and 100cm** (2.3ft - 3.3ft) above the ground.

This is based on average comfortable reach ranges and the user's hands being ideally held between 20cm and 40cm (8" - 16") above the module.



Angle

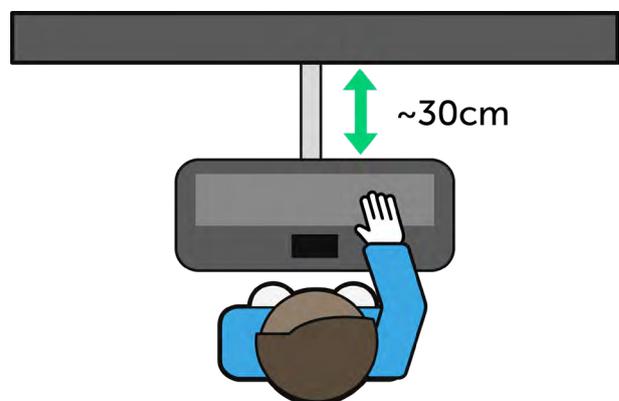
The modules should be positioned at an angle **between 45° and 90°** (as illustrated) to ensure user comfort and reliable hand tracking whilst interacting.

Distance from the screen

Placing the modules about 30cm (1ft) from the screen will encourage users to stand further away from it. It can also make viewing content more comfortable and touching the screen less likely.

Distance from the user

The module and footprints (if used) should be placed in a way so that the user does not have to move their elbows too far away from the sides of their body to interact. This is to help prevent physical fatigue.





Screen position and size



Comfortable viewing distances

To ensure legibility and comfort of viewing information, users should not be positioned too close to (or too far away from) large screens.

There are various viewing distance calculators available online that can help you determine comfortable viewing distances based on the size of the screen.

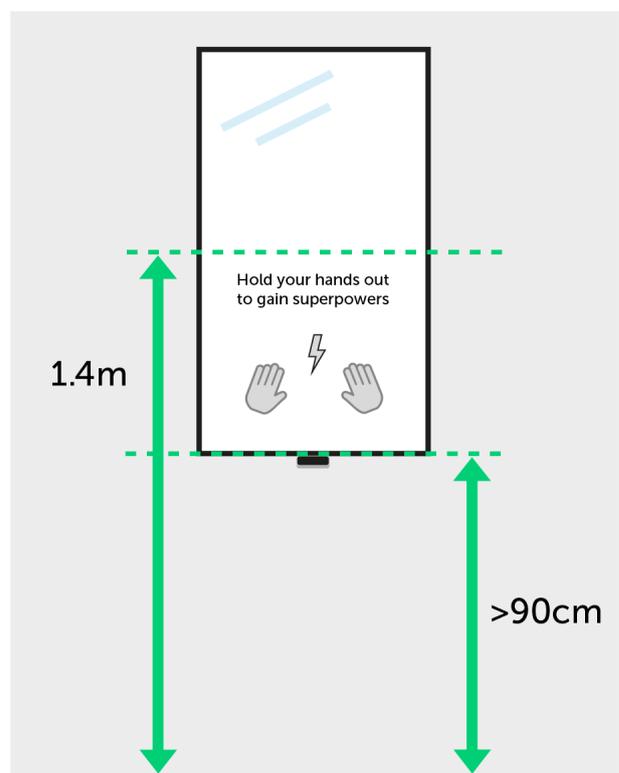
Distance from ground level

If the user is expected to be in close proximity to the sign and the sign contains detailed information such as diagrams or maps the **centre of the screen** should be positioned **1.4m (4.6ft) above ground level**.

The lowest edge of the screen should not be less than 90cm (3ft) above ground level and the top edge should not be more than 1.8m (6ft) above ground level.

If the screen is likely to be obscured at times (e.g. by a crowd), the centre of it should be placed at 2m (6.5ft) or higher to provide adequate visibility.

Also ensure that key content or text-based instructions are positioned around or below average eye height, which is typically between 1.35m and 1.8m (4.5ft- 6ft).





The Call-To-Interact (CTI)

Introduction

A crucial part of using our technology in digital signage is driving passers-by into the interaction space.

There are two aspects to this. The first is to catch their attention; the second is to convert them into users.

The user needs to understand how to perform the mid-air interactions as intended and be in range of the hand tracking and haptic modules.

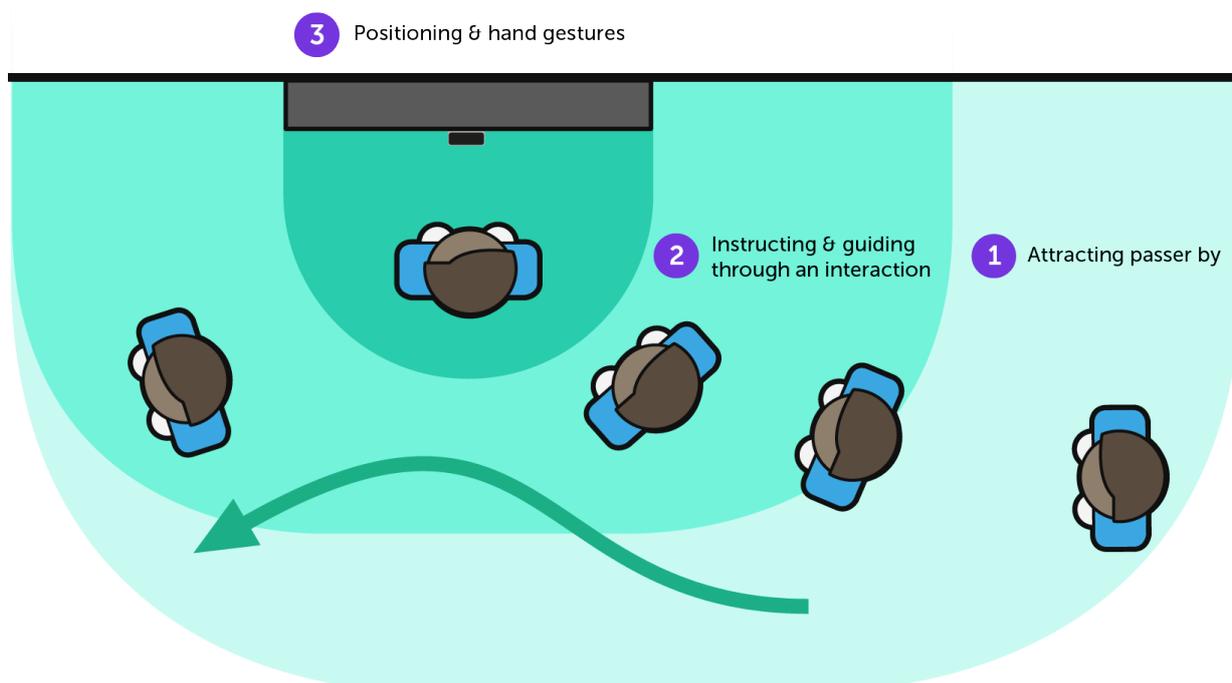
To describe how we achieve this we've coined the term **Call-To-Interact (CTI)**.



The CTI funnel

The average consumer has not yet developed a mental model of how to engage with interactive out-of-home displays, beyond the familiar realms of touchscreen interaction. A CTI is critical to bring users into position (in front of the interactive display) and to educate them how to interact with mid-air technology.

If we look more closely at the user journey of a passer-by, we see they must be guided through a funnel.





Attracting passers-by

Many passers-by ignore the increasing number of digital displays they are presented with. The first step is to capture their attention and encourage them to approach the technology.

Apart from the general rule of simply creating quality content that people want to engage with, there are two methods specific to interactive digital signage:

1) Dynamic content

Movement is likely to attract attention and is key for interactive digital signage.



2) The “honeypot” effect

This is where people already engaging with interactive content inadvertently attract the attention of passers-by.

The inherently social aspect of interactive digital signage content can be leveraged by letting users easily share their experiences and encouraging others to seek it out.

You can leverage the honeypot effect by creating experiences that:

- Can be participated in as a group or are multi-player. (Gamified experiences are often particularly effective here.)
- Can easily be shared on social media.





Converting passers-by into physical users

Once a passer-by's attention has been caught and they are physically located in the correct space to begin interacting, you need to show the actions required to get started.

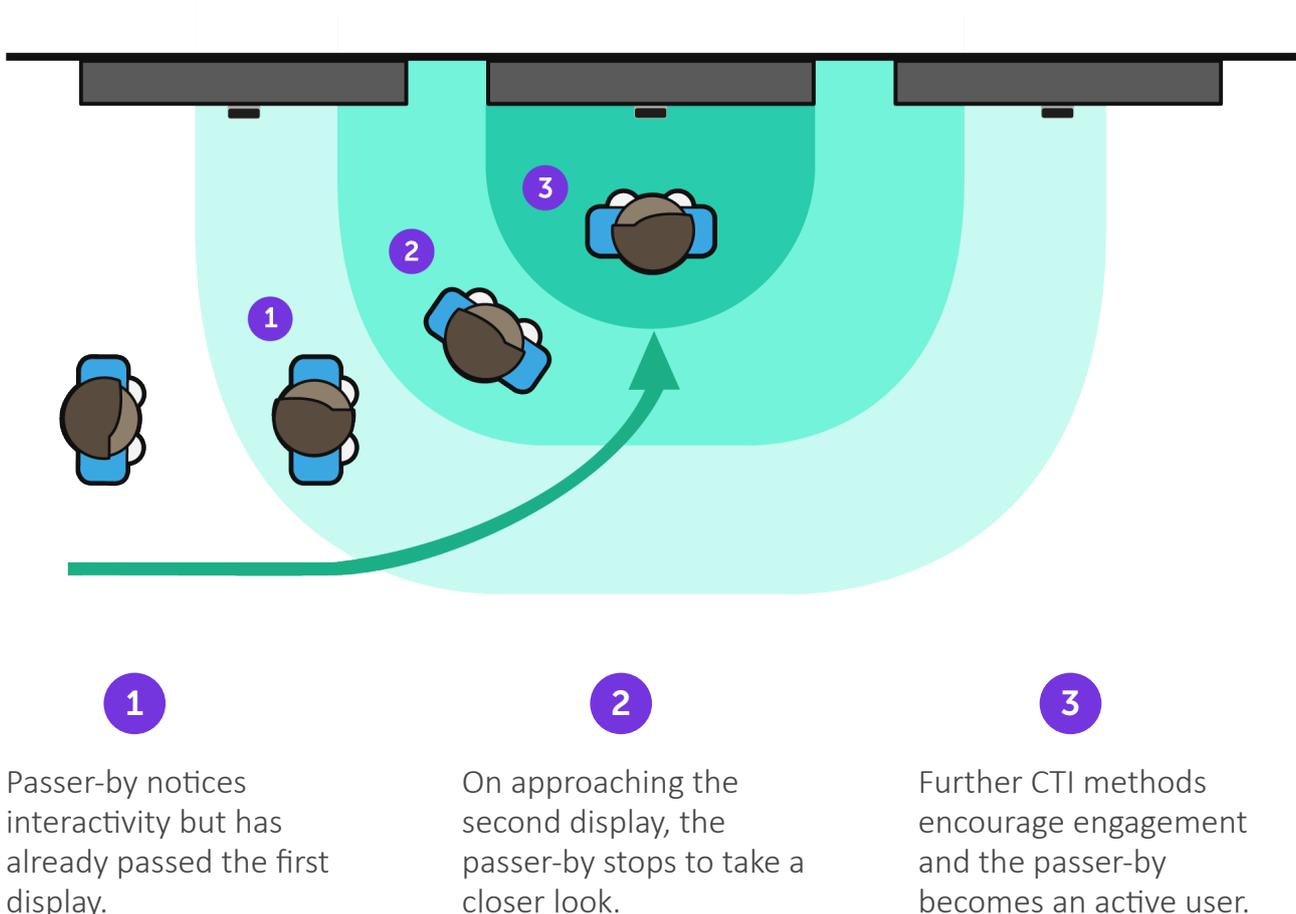
Users need to position their hands within a specific zone in order to interact and feel the mid-air haptic feedback (if applicable). There are 6 key CTI strategies you can use to teach users where to position their hands and how to interact:

1. Physical set-up and location
2. Footprints on the floor
3. Adapting to the environment
4. Animated hands
5. On-screen messaging
6. Printed instructional panels

1) Physical set-up and location

Passers-by may only recognize that a particular display has interactive content when they are already walking past it. This is known as the “landing effect.” Many are then unlikely to stop and turn back to interact.

To catch a passer-by consider displaying multiple screens of interactive content along the trajectory users are walking. This changes the scenario to look more like this:





2) Footprints on the floor

Putting footprints on the floor in front of the display serves 3 purposes:

1. They draw users over to the display because they can be seen at a distance and make the display stand out from others in the area.
2. They tell passers-by that the display is interactive and not just a regular screen.
3. They help guide the user into the optimal position for using the tracking or haptic modules.

This results in higher numbers of users and an increased chance of people having a positive experience while using it.



3) Adapting to the environment

The display's environment, placement, and direction it faces can have a huge impact on usage.

Think about:

- The user's highest priority at the point they are walking past the display. Are they likely to stop to interact at all if they have limited time to complete their main reason for being there?
- What the user could be carrying as they walk past. They need at least one hand free in order to interact.

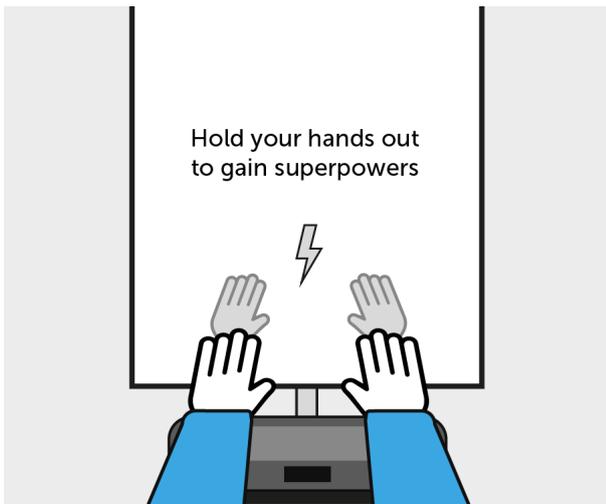
For example, a digital poster in a cinema should face users as they walk towards the exit, because they are less likely to be in a rush to see a movie or be carrying popcorn and a drink using both hands.



4) Animated hands

When used correctly, animated hands on screen are one of the most effective CTI methods.

They indicate the interactive nature of the display and tackle the challenges specific to hand tracking and mid-air haptics by ensuring that users place their hands in the correct position.



Animated hands should align naturally with the desired placement of users' hands in a comfortable standing position.

For most people, this alignment zone falls within the **100cm - 150cm** (3.3ft- 5ft) space above the ground.

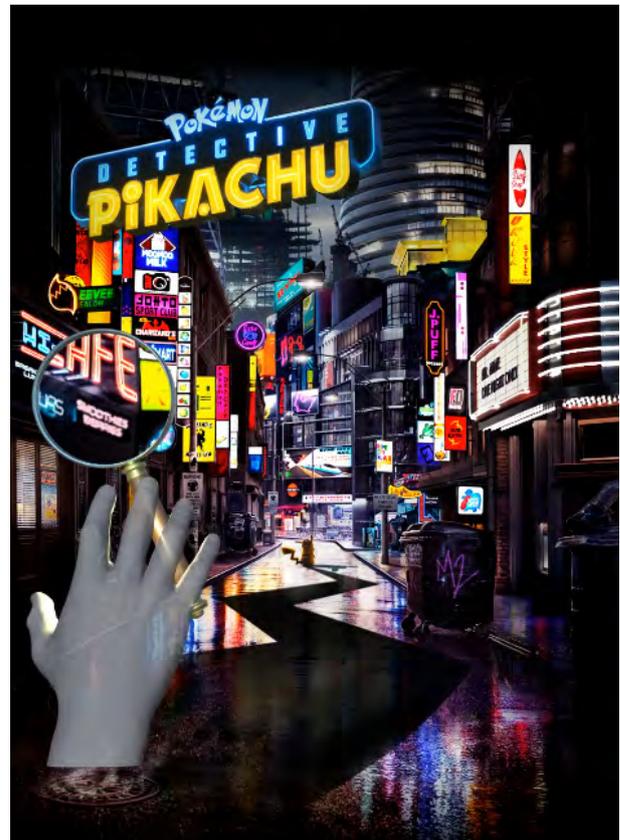
This generally works out to be the lower third of a vertical screen.

The animated hands should match the hand position, movement, and pose required to interact.

They should also be angled in a way that makes them look like they're coming from the user's own arms.

The animation should loop and not move too quickly, so the user has plenty of time to learn the interaction. Users will then mimic the animated hand movement, speed, and motion with their own hands.

We often refer to these animated hands as "ghost hands" due to their ghost-like appearance and behaviour.





5) On-screen messaging

Visual instructions confirm there is an interactive experience present. With the presence of on-screen messaging, users spend more time trying to understand the interactivity and how to use it.

Ideally on-screen messaging should be used in conjunction with animated hands.

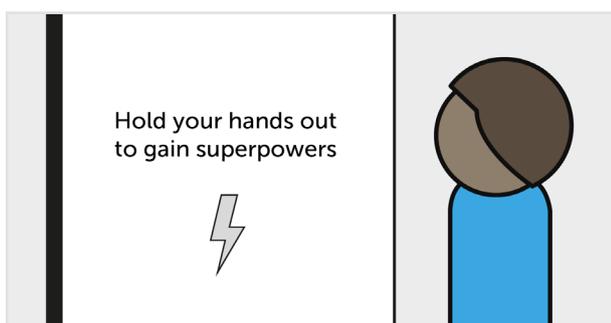
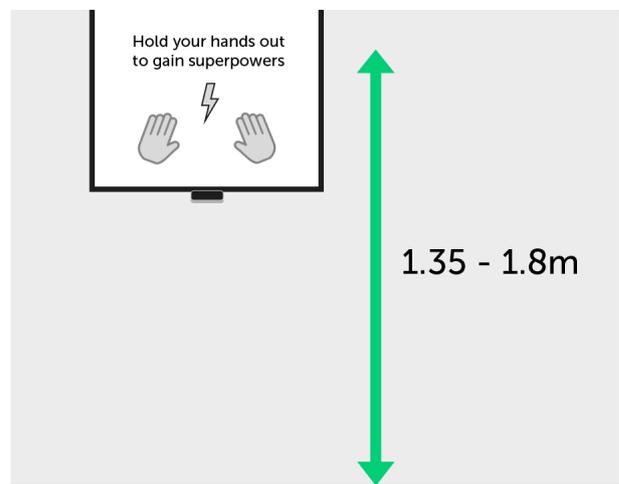


Keep on-screen messaging clear and easy to understand by:

- Keeping it short and sweet – too much text and people won't read it.
- Using commanding and authoritative text (the imperative tense).
- Using words such as "hold," "reach," and "hover" to provide clarity for the actions you're asking people to do.

Text instructions should be placed at or below eye-height so they are easy to read aren't missed by the user.

Standing eye-height for able-bodied users ranges between 1.35m and 1.8m (4.5ft - 6ft), and wheelchair users have an eye height of around 1.15m (3.8ft). Therefore, **text should not be higher than 1.8m** (6ft) so users will notice and read it without discomfort.



The size of text is also important to ensure it is readable from certain distances.

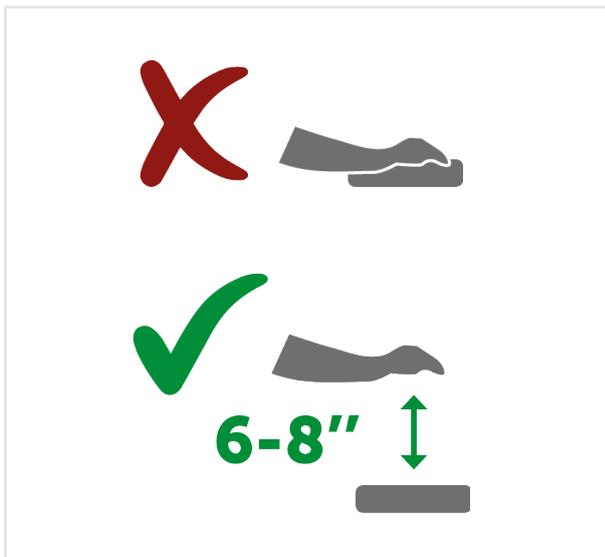
Text for attracting potential users over should be larger than text used when they're stood in front of the display.



6) Printed instructional panel

Printed, physical instructional panels (that are separate to the display's main content) can be placed to the side of the display to help teach users how to interact.

They should be placed at eye height, which is between 1.35m and 1.8m (4.5ft- 6ft) for able bodied adults and 1.15m (3.8ft) for adult wheelchair users.



Example Panel

The panel text should be large enough so it's easy to read from where the user is expected to stand in front of the display.

The title should be large enough to read from 1m away. 36-point size font is typically readable at this distance.

We recommend a minimum 14-point size font for the detailed text instructions.

Be sure to use appropriate measurement units for your target audience. (Imperial for the US, metric for Europe, etc.)



CTI best practice summary

To attract passers-by and turn them into active and engaged users we have developed a few best practice techniques.

The key aspects centre around catching attention, diverting a passer-by from their trajectory, bringing them over to your display, and then educating them on the actions they are required to perform. When developing any interactive digital signage experience, we recommend the following key steps for a successful CTI.

1. Use **animated hands** along with **on-screen messaging** to guide users to interact as intended.
2. Use **dynamic content** as movement is likely to catch attention.
3. Be aware of and intentional about how you leverage the **honeypot effect** (where those engaging with the interactive content inadvertently attract other people).
4. Use **footprints on the floor** to help break through display blindness barriers and drive people into the interaction zone.
5. If using Ultraleap's **STRATOS Inspire**, position the haptic module such that if a user reaches in to touch the screen, their hand will pass into the interaction zone and they will notice the mid-air haptic feedback.



Further reading

To learn more about Ultraleap digital signage and the research we based our design guidelines on, follow the links below.

Interactivity adds measurable value in digital out-of-home

ultraleap.com/company/news/blog/dooh-interactivity-study

Boosting customer engagement in digital out-of-home

ultraleap.com/company/news/blog/boost-customer-engagement-study

The end of public touchscreens?

ultraleap.com/company/news/resources/public-touchscreens-whitepaper/

Quantifying the impact of interactivity in digital out-of-home advertising

ultraleap.com/dooh-interactivity-whitepaper

How Arrow boosted brand engagement at CES

ultraleap.com/enterprise/case-study/arrow-boosted-engagement-ces

Fallen Planet deepen immersion with mid-air haptics

ultraleap.com/enterprise/case-study/fallen-planet-affected

Bodyspace: Anthropometry, Ergonomics and the Design of Work

taylorfrancis.com/books/9781315375212

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