

What is motion tracking?

Tracking is, in our context, the positional measurement of bodies (subjects or objects) that move in a defined space. Position and/or orientation of the body can be measured. If just X, Y and Z position are measured, we call this 3 degrees of freedom (3DOF or 3D) tracking. If position (3 coordinates) and orientation (3 independent angular coordinates) are measured simultaneously, we call this 6 degrees of freedom (6DOF or 6D) tracking.

There are various tracking systems, based on different measurement principles, available: e.g. mechanical trackers, magnetic trackers, optical trackers (VIS or IR), acoustic trackers and systems based on inertial or gyro sensors. Hybrid systems, combining different techniques, are also widely used.

Motion Tracking in Virtual Reality (VR)

Motion tracking is an essential part of the immersive visualization experience. Tracking the user's head, and even their entire body, allows them to be placed inside the 3D graphics, and this means that they can experience real-world spacial awareness due to correct viewing parallax and change of perspective during movement. In other words, it's more like looking out of a window onto a real object than looking at a picture on a wall...

Additionally, the user will want to navigate and act in the virtual world. For this purpose tracked interaction devices are convenient tools. ART has developed various models of interaction devices, such as Flysticks and Fingertracking device, which allow to navigate in the virtual environment, to use virtual menus and to handle virtual objects.

A great experience! ...But why is optical tracking today the "de facto standard" in professional VR installations? What are the benefits of optical tracking?

Optical tracking

In the group of contactless trackers, i.e. trackers that are not working with mechanical digitizers, the highest accuracy is provided by optical trackers. Optical tracking does not suffer from measurement distortions due to ferromagnetic metals as electromagnetic techniques do, or from drift problems, like inertial sensors. Every single frame provides data with „optical“ accuracy.

ART has been focused on optical tracking systems since the company's foundation in 1999. This means that we have continually refined our cameras and systems through each successive product generation so that we now provide one of the most accurate, robust and reliable optical motion tracking system on the market today.

What do you need to set up a VR system?

From time to time people ask us - especially newcomers in the business - what components do basically belong to a standard version of a VR system. And here we are talking about a projection-based system suitable for professional, industrial/academical use. ART collaborates with partners who are able to provide you all components for such a system. Please [contact](#) us if you are looking for a local partner - we are happy to connect you!

Projection-based systems - Requirements

- ART Tracking cameras
- Projection system (Powerwall, CAVE, etc.)
- Image generator (PC with high-performance graphics)
- ART Controller
- Realtime 3D visualisation software with device driver for ART tracking
- Interaction devices with head tracking

HMD systems

With regard to HMD developments emerging from the gaming market in recent years, the industrial VR market is experiencing increasing demand for HMD-based VR systems as well.

In order to serve this market, ART has implemented a special Sensor Fusion feature in the DTrack2 software so that we are now able to combine any current HMD device (equipped with a customized ART clip-on target) with ART tracking systems. So the customer is able to achieve accurate and smooth tracking, combined with a wide tracking range for HMD applications.

Requirements:

- HMD device with ART clip-on target
- ART Tracking cameras
- Image generator (PC with high-performance graphics)
- ART Controller
- Realtime 3D visualisation software with device driver for ART tracking
- Interaction devices

