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Key Technology in Augmented Reality

The Augmented Reality Technology is an important branch of Virtual Reality Technology. On the basis of virtual reality technology, augmented reality technology uses computer graphics technology and visualization technology to superimpose virtual images generated by computer operations to real pictures. Various technologies are used in augmented reality rendering, including optical projection systems, monitors, handheld devices, and display systems, which are worn on the human body. A head-mounted display (HMD) is a display device worn on the forehead, such as a harness or helmet-mounted. constitutes the core technology circle of AR and play an important role in the development of AR.

Intelligent display technology

- According to relevant data, more than 65% of the information acquired by human beings comes from their own vision, which has become the most intuitive way for human beings to interact with the real environment. With the development of intelligent display technology, augmented reality becomes a possibility, which is pushed to a new height by the various kinds of display devices generated based on intelligent display technology. Specifically, there are three main categories of display devices that occupy an important position in the field of AR technology today. First, helmet display (HMD *head mounted display*) was born in 1968. The optical perspective helmet display developed by Professor Ivan Sutherland makes it possible to superimpose simple graphics constructed by computers on real scenes in real time. In the later development, optical perspective helmet-mounted display and video perspective helmet-mounted display constitute the backbone of helmet-mounted display. Second, handheld device display, relying on the augmented reality technology of handheld display, handheld device display is very light, small, especially the popularity of smart phones, through video perspective to the use of augmented reality technology to present. Third, other display devices, such as PC desktop displays, match the



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- real-world scene information captured by the camera to a three-dimensional virtual model generated by the computer and are ultimately displayed by the desktop display. 3D registration technology
- As one of the most critical technologies in the augmented reality system, 3d registration technology enables virtual images to be superimposed accurately in the real environment. The main flow of 3d registration technology has two steps. First, determine the relationship between the virtual image, the model and the direction and position information of the camera or display device. Second, the virtual rendered image and model are accurately projected into the real environment, so the virtual image and model can be merged with the real environment. There are various ways of 3d registration, such as
 - the registration technology based on hardware tracker,
 - the 3d registration technology based on computer vision, • the 3d registration technology based on wireless network and
 - the mixed registration technology, among which the former two are the most popular. For the three-dimensional registration technology based on computer vision, it sets the reference point to realize the determination of the direction and position of the real scene by the camera or the display.

Intelligent interaction technology Intelligent interactive technology is closely related to intelligent display technology, 3d registration technology, ergonomics, cognitive psychology and other disciplines. In AR systems, there are a variety of intelligent interactions, including hardware device interactions, location interactions, tag-based or other information-based interactions. With the development of intelligent interaction technology, augmented reality not only superimposes virtual information to real scenes, but also realizes the interaction between people and virtual objects in real scenes. This interaction is based on the fact that people give specific instructions to the virtual object in the scene, and the virtual object can make some feedback, thus enabling the audience of the augmented reality application to achieve a better experience.

Augmented reality (AR).

Augmented Reality (AR) is a technology that seamlessly blends our real-world environment with computer-generated elements, enhancing our perception and shifting our perspective. Here are some key points about AR:

1. **Definition:** Augmented reality involves superimposing digital images or information onto our current view of the physical world. It enriches our reality by adding virtual components.
2. **How It Works:** AR alters our perception by overlaying digital content (such as images, videos, or 3D models) onto what we see through our devices (like smartphones, tablets, or AR glasses). This fusion of real and virtual elements creates an enhanced experience.
3. **Difference from Virtual Reality (VR):**
 - **Virtual Reality:** VR immerses users in entirely virtual environments, often requiring specialized headsets like Oculus Rift or PlayStation VR. Users are transported to computer-generated worlds.



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- **Augmented Reality:** AR, on the other hand, enhances our existing reality by adding digital elements. You can experience AR using modern smartphones or dedicated AR headsets like Google Glass or Microsoft HoloLens.
- 4. **Reality-Virtuality Continuum:** Imagine a scale that spans from completely virtual (virtuality) to entirely real (reality). In the middle lies “mixed reality,” where digital and physical coexist. AR falls within this spectrum, allowing us to interact with both worlds.
- 5. **Examples:**
 - **Pokémon GO:** An iconic AR game that overlays digitally created Pokémon onto our real-world view through our phone’s camera.
 - **Google’s ARcore:** A platform for developers to create AR apps. Try apps like “just a line” to draw virtually in the real world.
 - **Apps for Home Design:** Apps like “Houzz” (Google Play Store) or “Amikasa” (Apple Store) use AR to help you style and visualize furniture in your room.