

Brief Introduction to VR

Session 1:

VR Transcends the Traditional Experience



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Huawei iLab has released many VR research reports including *Whitepaper on the VR-Oriented Bearer Network Requirement* and *An Analysis of Live VR Services in Faye's Moments Live 2016* and received comments from our readers. We have sorted out some hotspot issues and summarized them into three sessions: VR Transcends the Traditional Experience, Good VR Experience Elements, and Good VR Experience Requirements for Network. This is the first session.

1. VR experience surpasses watching 3D movies.

VR experience surpasses viewing experience of 3D movies. If we say that 3D vision technology makes movie characters jump off the screen, then VR technology allows us to enter a virtual reality environment.



Stereoscopic 3D experience



Immersive VR experience

The stereoscopic displays of VR and 3D movies are both based on the principle of parallax. Since left and right eyes of a human are at different positions, they perceive slightly different images of the surrounding world. This phenomenon is called parallax. It helps us determine distance.

- The common practice of 3D movies is to add different polarized light to the images respectively perceived by the left and right eyes, and simultaneously play the images on the same screen. The images are fuzzy with unaided eyes. With the help of polarized light glasses, the left and right eyes can only see the corresponding images respectively and the brain automatically generates information about the depth of field, hence creating the three-dimensional effect.
- As to the practice of VR, a simpler and more direct way is to provide two sets of images with parallax to the left and right eyes respectively.

VR technology provides three-dimensional senses of sound, touch, smell and other sensory experiences, more than just sight.



3D movies: images from left and right eyes overlapped



VR: images from left and right eyes

2. VR experience surpasses watching TV.

VR provides FreeD and 360° panoramic video modes, enabling viewing experiences to completely surpass watching TV.

- FreeD (Free Dimensional Video), also called 360° shooting technique, is applied to live sports events such as basketball and baseball games. Take NBA games for example, FreeD provides experience from an omnipotent perspective, enabling users to watch the games from any angle and position. It is commonly used for playing back highlights to facilitate tactics commentary and analysis.



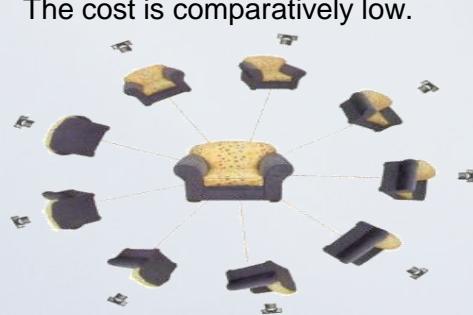
- VR 360° panoramic videos provide experience from the first-person perspective. Currently, it can only make you feel that you are sitting beside

the court and watching the games. You can turn your head but cannot walk around freely for the time being.



The two video modes are differentiated by production method.

- In FreeD application, several cameras are placed around the subject or field to shoot pictures in different positions and 3D models are composed through a high-performance computer. The technical cost of FreeD is relatively high.
- A VR panoramic video is recorded using multiple cameras to shoot pictures from inside out. And then these pictures are stitched to make a 360° video. The cost is comparatively low.



FreeD: shooting from outside in



VR 360° panoramic video: shooting from inside out

3. Natural input control provided by VR surpasses the traditional input control.

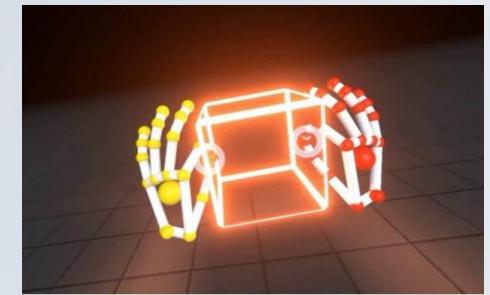
Traditional input modes, such as keyboard and mouse, are relatively mechanical. Before using the keyboard, you must learn a set of input method

and get familiar with the positions of the 26 letters at least.

In contrast, VR provides gesture input control that fits human's behavior and habits. For example, while playing games, you wave your wand to cast spells like Harry Potter; while watching live NBA games, you slap hands with other fans. You act as naturally as you do in the real life.



Mechanical input

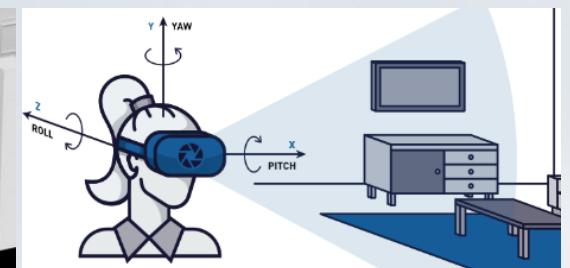


Gesture control

Motion sensing technology is a key VR technology that allows you to input information into the VR headset, including locating and tracking, motion detection, gesture recognition and some other technologies. There are mainly two ways to carry out locating and tracking. One is outside-in tracking that is similar to the technology applied to HTC VIVE. Base station devices are installed outside of the headsets using sensor technologies such as laser and infrared light. The other way is inside-out tracking, which integrates locating and tracking systems within the headsets. The inside-out tracking was applied to most of the mobile phone VR devices and all-in-one VR devices that were displayed on the International Consumer Electronics Show (CES) in January 2017. At present, there are various ways to carry out motion sensing and capture. No uniform standard has been set up yet.



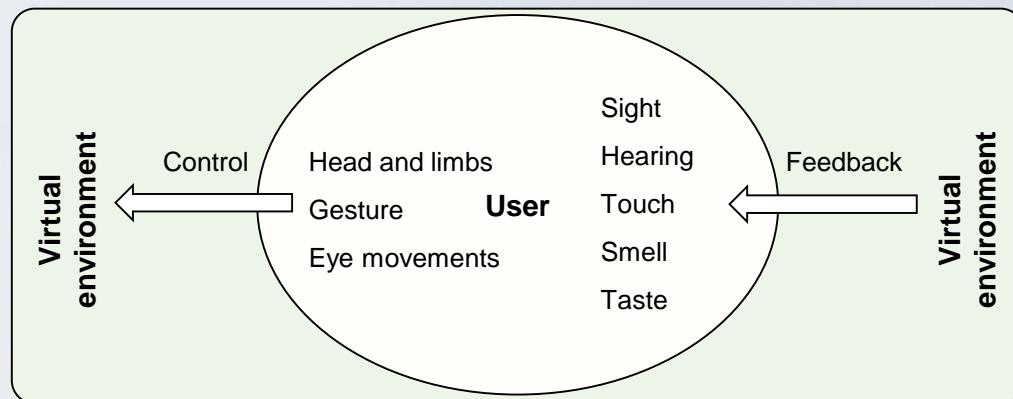
Outside-in tracking



Inside-out tracking

4. Strong computing capabilities are required for good VR experience. Cloud rendering boosts the popularity of VR.

With computer technologies and various sensor technologies, VR enables you to totally immerse yourself in a virtual world perceived by sight, hearing, touch and other sensory experiences.



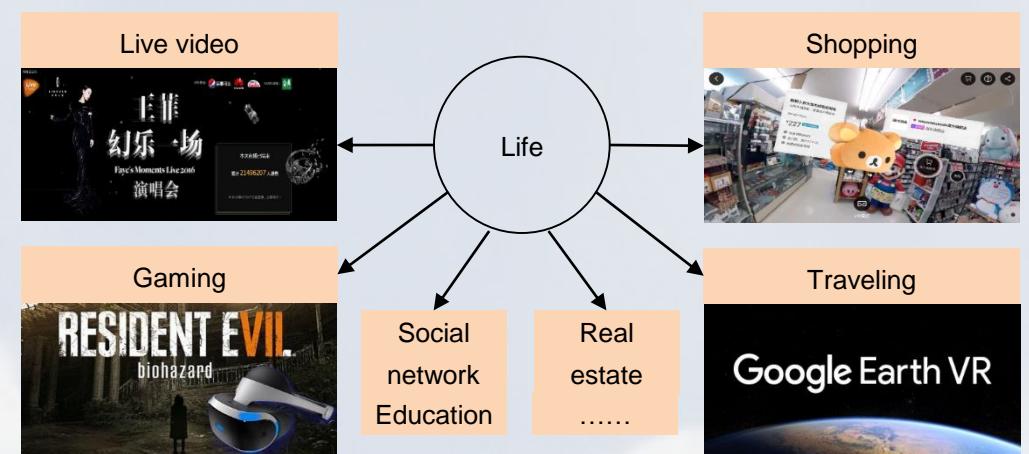
Currently, there are mainly three types of VR headsets in the market: PC/console VR, mobile phone VR and all-in-one VR devices. PC/Console VR devices provide the best experience because of its strongest computing capabilities. Experience provided by mobile phone VR and all-in-one VR devices is limited.

- A PC/console VR headset works only when it is connected to a high-performance PC or console. It has strong computing capabilities and abundant functions. Therefore, the VR experience is good. Accordingly, the headset is relatively expensive.
- A mobile phone VR headset works properly only when it is connected to a smart phone. The VR performance is limited by the phone. Therefore, the VR experience is not satisfactory. Accordingly, the mobile VR headset is the cheapest among the three kinds of devices.
- All-in-one VR headset is a kind of independent VR device. Independent from a PC or a phone, you can wear it and start to use it. The VR experience is modest, so is the price of the headset.

Due to the fact that good VR headsets are expensive, it is difficult to have good VR experience. If the cloud rendering technology is applied to VR in the future, the performance requirements for VR headset will be greatly lowered, thereby reducing its price, enabling most people to experience good VR.



Gradually, VR has been integrated into our daily life, changing our way of life. For example, the VR video of the Spring Festival Gala has made it come into lives of ordinary people. A VR music concert enables you to get a real sense of the scene without actually being there. VR gaming provides you with exciting game challenges. Alibaba Buy+, a VR shopping service, allows you to go to different shopping malls instantly. If you are tired from work and want to go out for a walk, you can wear a VR Headset to enter the Google Earth VR.



Good VR experience is related to many factors. More detailed analyses to be continued.