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Research on VR equipment based on VR technology

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Abstract: Virtual reality technology, also known as virtual reality or psychic technology, is a new practical technology developed in the 20th century. Virtual reality technology includes computer, electronic information, simulation technology, its basic realization is based on computer technology, the use and integration of three-dimensional graphics technology, multimedia technology, simulation technology, display technology, servo technology and other high-tech latest development achievements, With the help of computer and other equipment to produce a realistic three-dimensional vision, touch, smell and other sensory experience of the virtual world, so that people in the virtual world have a sense of being in the scene. With the continuous development of social productivity and science and technology, the demand for VR technology is increasingly strong in all walks of life. VR technology has also made great progress and gradually become a new field of science and technology.

Keywords: VR technology; VR product design; VR design.

1. The fundamentals of VR

Virtual reality is the application of high technology to establish a virtual field in computer development, so that participants can get the same feeling as reality [1]. For example, if you put on a special helmet and gloves, you find yourself in a tall building, and if someone pushes you from behind, you feel like you're falling off a building, and your body automatically reacts, when in fact you're just in your original position -- that's what virtual reality really feels like. VR technology uses computer simulation technology to create a virtual three-dimensional world and provide users with sensory simulation of vision, hearing and touch [1]. This virtual three-dimensional world is almost indistinct from the real world, and these simulations of the user's sight, sound and touch allow the user to have the same feelings as in the real world. VR is like a dream, where the scenes and characters you see are fake and you bring your consciousness into the virtual world. As the user moves from place to place, the computer can quickly perform complex calculations and send back accurate three-dimensional images of the world, creating a scene that resembles the real world. When people look at the world around them, they get slightly different images due to the position of the two eyes. This difference allows us to perceive depth and can make things appear three-dimensional. VR technology can also use this visual difference to organize different images in front of our eyes, making us feel the three-dimensional nature of the images [2]. Unlike 3D movies, VR emphasizes 360-degree panoramic interaction, which not only makes the environment deeply immersive and three-dimensional, but also allows users to communicate with the virtual world. In this artificial virtual environment, each object has a position relative to the system coordinates, and the user has a position relative to the system coordinates. The scene the user sees is determined by the user's position and head (eye) direction, and the virtual mask that tracks the head movement can detect the user's head movement. This way, when we move, we can move in the same way in the virtual world. When the user looks in a certain direction, the virtual reality headset recognizes the movement and the hardware renders the scene in that direction in time. Therefore, you can see the left scene when you look to the left and the right scene when you look to the right [3-4].

2. Core technology of VR technology

2.1. Real-time 3D computer graphics:

By contrast, it is not too difficult to use computer models to produce graphic images. With a sufficiently accurate model and enough time, we can produce accurate images of various objects in different lighting conditions, but the key here is real time. For example, in the flight simulation system, the image refresh is very important, and the quality of the image is also very high, coupled with a very complex virtual environment, the problem becomes quite difficult.

2.2. Display principle:

When people look at the world around them, they get slightly different images because of the position of their eyes. These images are combined in their minds to form an overall picture of the world around them, which includes information about distance. Of course, distance information can also be obtained by other methods, such as the distance of the focal length of the eye, the comparison of the size of the object, and so on.

In VR system, binocular stereo vision plays an important role. The different images seen by the user's two eyes are produced separately and displayed on different monitors. Some systems use a single display, but when the user wears special glasses, only an odd number of frames can be seen in one eye and an even number in the other. The difference between odd and even frames, known as parallax, creates a three-dimensional sense.

User (head, eye) tracking: In the artificial environment, each object has a position and attitude relative to the system's coordinate system, and so does the user. What the user sees is determined by the user's position and the direction of the head (eye).

Virtual reality headset tracking head movement: In the traditional computer graphics technology, the change of field of view is realized through the mouse or keyboard, the user's visual system and motion perception system are separated, and the use of head tracking to change the Angle of view of the image, the user's visual system and motion perception system can be connected, feel more realistic. Another advantage is that the user can not only recognize the

environment through binocular stereo vision, but also observe the environment through head movement.

2.3. Sound:

People are very good at determining the direction of a sound source. In the horizontal direction, we determine the direction of a sound by the difference in phase and intensity of the sound, because the time or distance between the two ears varies. The common stereo effect is to rely on the left and right ears to hear different sounds recorded in different locations to achieve, so there will be a sense of direction. In real life, when the head is turned, the direction of the sound heard changes. But currently in VR, the direction of sound has nothing to do with the user's head movement.

2.4. Sensory feedback:

Generally speaking, in a virtual environment, if you can see a cup and try to reach for it with your hand, your hand will not feel the cup and will pass through the virtual cup, which is the opposite in real life. A common device used to solve this problem is to activate some contacts to vibrate in the inner layer of the glove to simulate touch. In this way, when we touch the "virtual cup", we can feel the existence of the cup, and VR will give us a tactile feeling [5].

2.5. Voice:

Voice input and output are also important in VR systems. This requires that the virtual environment can understand human language, and can interact with people in real time. And it is very difficult for a computer to recognize human speech, because speech signals and natural language signals have their "multi-sided" and complex.

The use of human natural language as computer input currently has two problems, the first is the efficiency of the problem, in order to facilitate computer understanding, input speech may be quite verbose. The second is the correctness of the problem, the method of computer understanding speech is to compare and match, and no human intelligence.

2.6. Eye-tracking technology

In fact, the VR box of mobile phone also has some key hardware technologies mentioned above (mobile phone simulates head tracking through gyroscope), but in the field of VR, eye-movement tracking is relatively rare. Eye-tracking technology is realized by acquiring our eye-movement information and modeling [6]. For example, when we put our fingers in front of our eyes and we see the scene in front of us, our fingers become blurry. Our fingers also blur when we look at the background, which is the difference in depth of field caused by the change. Eye-tracking technology knows what we're looking for and mimics the depth of the site to make the user experience better. At the same time, because the eye-tracking technology can get the real eyeball fixation, so as to get the depth of the field of view to the position of the virtual object. Therefore, most VR practitioners regard eye-tracking technology as an important technological breakthrough to solve the problem of headset vertigo in virtual reality.

3. Evolution trend of wearable device technology

Since its development, wearable devices have been focusing on computing, perception, interaction, energy and other aspects of innovation to meet the mapping needs between the virtual world and the real world. In a real sense, the realization of smart wearable requires the integration of chip, sensor, system software, display, storage, battery and other technologies, and the comprehensive use of new display technology, interactive technology, lightweight and large-capacity battery technology, ultra-micro sensor technology, as well as the communication protocol of seamless communication with peripheral devices. To sum up, wearable devices will make breakthroughs in mobile chips, display technology, energy technology and operating system.

3.1. Mobile chips for wearable intelligent devices

Mobile chips are accelerating their penetration into multiple fields. In addition to smartphones and tablets, mobile chips are penetrating into more smart hardware fields such as wearables. Since wearable devices facing new interactive requirements have a similar architecture to smart phones, and considering problems such as operating system matching and application compatibility, most manufacturers of wearable devices directly conduct research and development based on mature mobile chip products, such as Google Glass and Samsung Watch. However, for wearable devices, mobile chips need differentiated features such as lower power consumption and higher integration. Therefore, mobile chip design companies have launched chip products for wearable devices one after another. For example, Intel has released prototype reference design for wearable devices and Edison ultra-micro-computer based on ultra-small ultra-low power Quark processor. Junjong's JZ4775, the exclusive power-saving OS platform Newton's wearable intelligent device platform, and Broadcom's wireless connection platform WICED will effectively lower the development threshold for start-ups. At the same time, the rise of open source intelligent hardware, combined with the boom of wearable devices, mobile chips and their integration into the Internet of Things innovative applications have more possibilities, and will even have a profound impact on the entire integrated circuit industry.

3.2. Screens of wearable smart devices

The new display technology of wearable devices is the key technology that has the most direct impact on wearable devices, and it is expected to make a breakthrough within this year. Today's wearable display technology is mainly LCoS (silicon-based liquid crystal), which is used in smart glasses, and OLED display technology for smart watches. The former is more suitable for head-mounted wearable devices with enhanced display applications. It has the advantages of high resolution, high brightness and contrast, fast corresponding speed and low power consumption drive, but the standard is relatively inconsistent and the technical threshold is high. The latter is relatively mature in the field of small screen application, and is widely used by smartwatch manufacturers. However, watches using traditional OLED display are mostly identical in shape, and lack in product identification and aesthetics, which makes wearable devices have not been accepted by the public. However, following the pioneering use of flexible screens by Samsung and LG, many manufacturers have followed suit, such as In WatchX by China's Infun Technology, GalaxyGearfit by Samsung and EmopulseSmile, a crowdfunded project abroad. New display technologies led by flexible displays will significantly increase the user acceptance of wearable devices, effectively

changing the shape of the product through flexible bending display technology, thus changing the positioning of the product, so that it is no longer a "shrink" or cut down version of the smartphone. The flexible screen, which can be bendable, can alleviate the problem of insufficient display area of previous smartwatches to some extent. At the same time, the novel device modeling also makes the appearance design of wearable devices more flexible, more amiable, and easier to be accepted by the market and users.

3.3. Operating system of wearable intelligent devices

The operating system of wearable devices has been diversified, and the users of each body will make themselves feel in the actual environment in the sense of space. Forming different ecological systems. Currently, wearable operating systems typically take three different technological paths. The first is to adopt a mature embedded operating system. This type of system is mainly aimed at relatively simple wearable devices, usually using mature embedded real-time operating system (RTOS), with low power consumption and relatively single task characteristics, and is mainly used by Pebble smartwatches and some smart bracelet type wearable products. The second is based on the existing smartphone operating system tailoring. This kind of operating system is tailored and optimized in view of the large power consumption of mobile operating system and the large amount of system resources occupied by features such as video acceleration and 3D, so as to finally adapt to the lightweight demand of wearable devices. For example, most smartwatches on the market are tailored to Android and then adapted to the application. The third is the development of proprietary systems for wearable devices. This type of application mainly provides functional support for the application scenario requirements of wearable devices, such as new interactive interfaces, sports and health interface features. Android Wear, which recently launched, is one such revamp for multi-screen interaction and app ecology; It can provide convenient information interaction and service; Provide sports and health characteristics interface; The geographic location and data are analyzed. Android Wear is a further integration of the entire ecosystem, taking the virtual world one step further into the real world with its rapid growth in scale.

3.4. Energy management of wearable smart devices

Energy has always been an obstacle for wearables to achieve complex functions, and the solution to the battery life problem is to "open source" and "reduce cost". In addition to "throttling" solutions by optimizing mobile processing chips and operating systems, as mentioned above, there are "open source" solutions through technologies such as wireless charging. Wireless charging solutions represented by Apple and MOTO can be regarded as a way to solve the energy problem of wearable devices. Apple claims that the "near field magnetic resonance" technology can create a charging zone with an effective range of 1 to 3 meters, and any device that supports this technology can be charged wirelessly as long as it is placed in the zone. This technology mainly selects magnetic resonance for energy transmission, rather than electric field, so it can effectively reduce the damage to human body. Moto chose a similar technology to power its wearable device in real time, rather than the traditional wireless charging technology that can only be charged at extremely close range. Such technology could make wearables "open source" by ensuring they are always powered. In addition to wireless charging technology, the battery life of smart wearable devices can be enhanced by using flexible technology to improve the utilization rate of battery space, or by using fast charging technology to reduce the charging time and reduce the use gap to ensure the battery life. International companies such as SONY, Samsung and LG have also established themselves in this field.

4. Summarize

So far, wearable devices have been standing at the forefront of mobile terminal development, and its rise will greatly promote the prosperity of the existing mobile application system. As a new way for users to access the Internet and a new entry point, wearable devices provide more scenarios, more data and more capabilities for applications. On the one hand, wearables enhance users' ability to capture and process information, enabling more accurate decision-making. On the other hand, through the deep integration of wearables and terminals, users make the transmission and interaction of information more convenient and direct, accelerate the interconnection and sharing of information, and change the user behavior pattern and action efficiency. At present, a new wearable application ecological model is also being established. In addition to its own vigorous development, wearable devices are also fully integrated with the surrounding fields, profoundly transforming the traditional industry.

China's wearable device market has huge development potential, which is expected to continue to promote innovation and upgrading of the terminal industry. First, wearable devices can provide a full range of health indicator detection and early warning services through real-time contact with the human body, which will effectively improve the use efficiency of medical resources to meet the increasing health needs of users. Considering our country's demographic dividend and mature intelligent medical foundation, has some health care class intelligent dressing equipment fall to the ground, such as baidu plump hand ring, huawei Talk Band, etc. Second, the industrial chain of wearable devices is gradually improving, and key technologies such as display technology, energy consumption control and operating system are expected to make breakthroughs.

As the mainstream computing and communication equipment in the future, intelligent terminal will be used in all aspects of people's life. With the popularity of intelligent terminal, mobile applications are also growing explosively. Its performance, stability, user experience and security testing are an important research topic at present. In the context of massive terminals, applications and data, the cloud platform is the best solution for future mobile application testing. Our country should promote and develop cloud testing technology to achieve stability, reliability and security of mobile applications, and constantly promote the healthy development of the mobile application industry.

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References

[1] Yang Huan, Liu Xiaoling. Virtual reality system Review [J]. Software Guide, 2016,15 (04):35-38.

[2] Zhang Fengjun, Dai Guozhong, Peng Xiaolan. Review of Human-computer Interaction in Virtual Reality [J]. Science China Information Science, 2016,46 (12):1711-1736.

[3] ZHENG Ke. Overview of key technologies and applications of virtual reality [J]. Communications World, 2016(06):258.

[4] Li Min, Han Feng. Virtual reality technology review [J]. Software Guide, 2010, 9(06):142-144.

[5] HUO Yanyan. Review on the development of Virtual Reality Technology [A]. Chinese Society of Engineering Graphics. New Progress of Cartography in China 2007 -- Proceedings of the First China Cartography Conference and the tenth Annual Conference of Engineering Cartography in six provinces and one City in East China [C]. Chinese Society of Engineering Cartography: Chinese Society of Engineering Cartography, 2007:3.

[6] YAN Qiangdong. A Brief introduction to the application means of virtual reality technology [J]. Chinese and Foreign Entrepreneurs, 2019(21):90.