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A Medical Device That Can Be Used for Psychotherapy in the Metaverse

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Abstract. In 2020, a new coronavirus swept the world, and the advent of this disease has a huge impact on our social and economic development. Due to the limited medical resources and regional differences, this model of virtual medicine becomes more valuable. In this paper, we create a virtual medical space based on a metaverse in order to investigate whether the medical model can be freely transformed between virtual and reality. In this process, I first describe different scenarios of virtual medical care in mixed reality, and then we use one of them as an example to develop a medical device. Then we designed the software and hardware of the product and performed the user experience, it includes the interaction and usage scenarios that affect the user. Finally, this medical device will be demonstrated by user experience and feedback.

Keywords. Virtual, Healthcare, Metaverse, Medical Services,3D/MR

1. Introduction

Before the emergence of the metaverse and VR, people would go to the hospital to register, queue up and then start the examination. If the examination items are too many, they need to queue up constantly. Later, with the emergence of online medical APP, we are more convenient. But there are also many drawbacks, such as user trust and limited use by doctors. In the context of the epidemic, cough and cold have become a word that makes people feel afraid. We are affected by the epidemic and need to check nucleic acid and body temperature. Especially during the period of lockdown and quarantine, we are not allowed to go out at will. We need to report and wear masks to prevent infection, which affects both our mental and physical health.

At present, the development status at home and abroad mainly includes virtual medical teaching, virtual customized fitness, virtual psychotherapy, virtual medical nursing, virtual rehabilitation training, virtual disorder treatment, virtual clinical assistance and so on. Virtual medical treatment has attracted the attention of scholars at home and abroad. Researchers at the University of Texas and Harvard University have developed a variety of scenarios for treating depression in teenagers to help them better control themselves. It relies on a tool called COVID-19 Disease Diagnosis (CDD) [1],

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which uses AI deep learning AI technology to provide users with automatic symptom detection and medical services [2]. Through investigation and study, we found that the low cost, small cost model not only can quickly to provide users with solutions, at the same time can also provide some cannot afford the high medical expenses of the poor medical advice and services, even if there is an emergency problem also can in this virtual health asked even solve intractable diseases.

In related work (Section II), we introduce a virtual medical space based on the meta-universe, and show that most psycho-medical patients are more reluctant to disclose their illness. We provide an overview of the design process (Section III). Then we create the conceptual framework and the development of the hardware and software (Section IV). Then we conduct user research, showing the user interaction app and user usage status (Section V). Finally, we discuss the limitations of the product design and our ideas for future work (Section VI).

2. Metaverse psych Ward

The most relevant work for us would be the design research of virtual medical space. In real life, mental health problems may be something that many people have, and it is hidden in people's minds that they are not willing to reveal. Many people would be shy to go for such counseling, but in fact, counseling is a very normal thing to make our psychology healthy and sunny-minded. At this stage, virtual reality technology has been used in medical fields such as autism [3], and also APP for depression and anxiety in adolescents [4]. As our economic development level is getting higher and higher and the overall quality of people is rising, psychological problems are getting more attention and the need for spirituality will be increasing. The emergence of this technology gives the possibility of virtual medical treatment in the metaverse, and we build on this aspect by constructing a virtual space in the metaverse, similar to our realistic hospital, a scene that offers you a choice of different scenarios according to your ideas and moods, a gamified medical experience, and completely private medical services. To build this virtual space, we went to the hospital together to conduct research and study the prototype. To understand the users' perception of the product, we conducted an initial field survey. It turned out that users were keen to be able to use virtual health care to provide the quickest possible medical care and solve problems quickly, both at home and in emergency situations when they were away. Our work focused on (1) developing the appearance of the headset, (2) creating several different medical scenarios, (3) and creating an interactive system to serve as a medium for applications and virtual medical services.

3. Design Process

In order to design and create this meta-universe medical space, we first discussed its rationality with experts, secondly discussed the design options with our mentors, and then presented the process and goals of our design. And before we develop and implement it, we have to understand the different types of psychological patients before we can design the applicable products accordingly.

3.1. User Survey

We conducted a preliminary survey with three psychological research experts with more than 5 years of experience at the Guangzhou Psychological Counseling Research Center in Guangdong Province, China, (mean age = 45, SD = 9.58, M1, M2, M3) for about an hour to exchange and discuss with them, share their experiences, and then share with me their views on my research topic: they believe that the metaverse is a future Internet and that building a virtual medical room in this new They thought that the metaverse is a future Internet, and building a virtual medical room in this new Internet is a feasible solution. They also made some suggestions: (i) M1 and M3 suggested that there should be user evaluation and user feedback to adjust the structure of the medical service after the user service; (ii) it is important to maintain an immersive and undisturbed space.

3.2. Design Objectives

Our focus is not on medical devices, but on the meta-universe medical space. Therefore we are more concerned about whether users are willing to use this approach for medical treatment. Based on preliminary research and discussions with psychologists, we its constructed several goals to support users of psychological counseling: (1) the need for timely feedback during practice (2) consider a safe and private space that is not disturbed.

4. Design Process

Based on our preliminary design research, we designed a textual model which describes the conceptual framework of metaverse therapy. Where hardware refers to the private virtual medical space that allows doctors and users to establish in a variety of modes, and software refers to the credentials of users to access medical services and the vehicle through which we get feedback from users, the software and hardware are connected via Bluetooth.

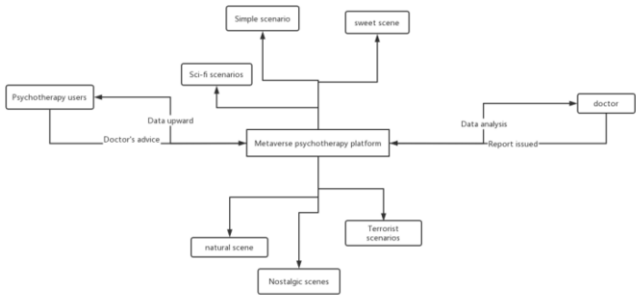

Figure 1. Meta-Universe Therapy Platform Conceptual Framework.

4.1. Software Design

Users can use the app as a medium for virtual medical consultation and then enter the medical service. At the same time, users can apply for virtual medical consultation through the app, and after successful application, they can wear the virtual headgear to enter the virtual medical room, where they can feel the warm and caring feeling, which is very different from the usual medical space we have. Users can interact and then independently select a variety of medical scenarios and medical services such as psychological counseling, health care guidance, medical care and so on. Then put on the hardware device, in the virtual space to choose. Users first need to be in an undisturbed environment, and then use the software program to select the medical scenario and then start to enter the medical services. In addition, the application will follow the user in a form of virtual reality until the end of the treatment, in the process, the user can put on the body suit to feel the real sense of touch, in the home can also feel the global medical services, this virtual health care can improve our current resource imbalance.

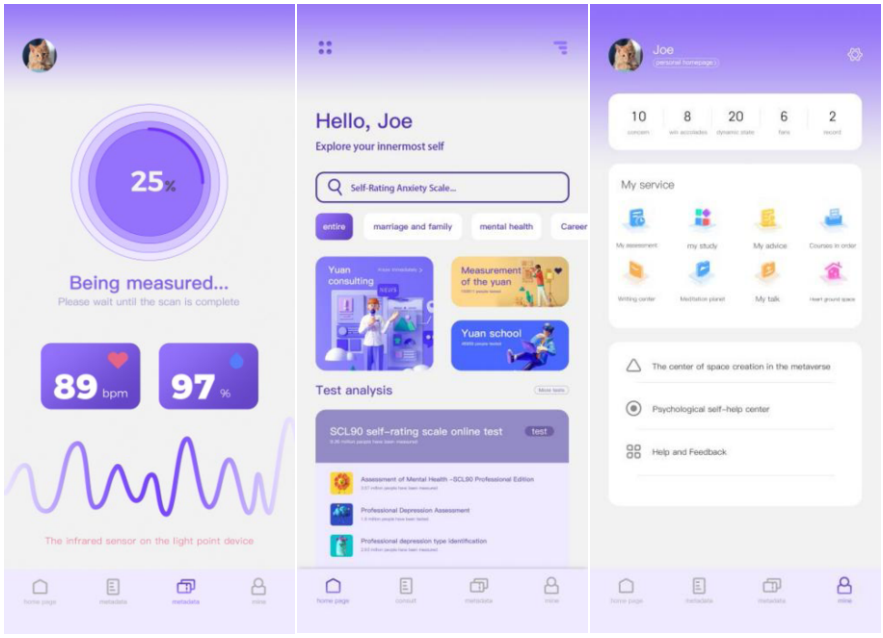

Figure 2. APP interface treatment options and user feedback.

4.2. Hardware Design

The hardware device mainly consists of a VR headset to enter the meta-universe, while combined with a sensing suit to simulate the realism in the meta-universe. And VR virtual reality technology that is through the computer and software and database and other highly simulated realistic scenes, and then through virtual equipment to enable users to interact with the virtual scene. It includes the design of somatosensory suits, and its implementation requires the assistance of sensors like Kinect, Psmove, etc. [5]

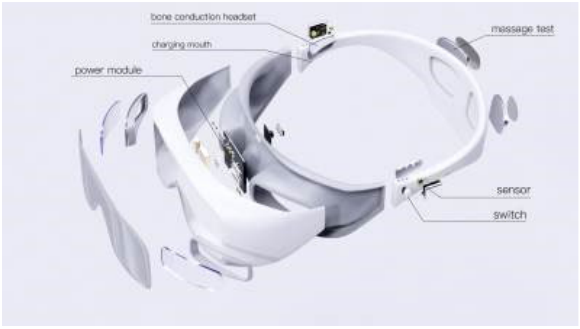

Figure 3. Hardware design and structure design drawings.

Figure 4. User Experience Scenario.

4.3. Function and Principle

The product uses pancake technology, using the polarization characteristics of light, so that the light to collapsible thus reducing the burden on the headset and enhance the user experience. Product sensors through real-time acquisition of scene information and other depth information of the camera, and then through the software development kit we can directly identify and track the skeletal point information of the human body. In the process of virtual psychotherapy, a relatively safe and quiet environment is required, and the system initializes the overall state of the user in the scene before conducting psychotherapy, and then records the user's state. The recognition of the user's body movements is mainly performed by tracking the key points of the human skeleton, and then interacting with the 3D objects in the virtual scene.

5. Initial user research

In order to demonstrate that users can access the metaverse for virtual psychotherapy through VR technology and the user's sense of experience and feedback, we conducted some preliminary user studies. We found several users from the internet who needed

psychological counseling as M1, M2, M3, and M4 (average age 24.8) All participants were given virtual psychological counseling experience through VR devices and the whole process was recorded with the consent of the participants. When we asked questions to the users, M1 looked at me and said, "I used to learn about the metaverse a lot, but now I finally have the opportunity to experience a real application in a metaverse instance, and it feels pretty good." M3 said, "I feel it is like to my personal doctor, I can get the best service for the least money." And M1 and M3 are looking forward to more improvements in the future, such as the sensing of the body suit and waiting for appointments. m1 added: "What if I don't have a safe environment." After a while M3 also followed: this should be the main problem of virtual reality technology."
The difference is that M2 said, "I think virtual health care is more convenient than going to the hospital to register in line, but also I am a person who does not like to communicate with people face to face, with this virtual interaction, I may be more able to show their real side, so that the effect on my treatment should also be better." At the same time we also went to visit the producers of VR virtual equipment, they said the product can have timely feedback is very good.

Table 1. User Survey Results.

question	M1	M2	M3	M4	average
1. Are you willing to perform medical treatment in a virtual setting? (1: willing-6: unwilling)	5.7	6	6	5.8	5.9
2. Is it easy for you to use the Doctor? (1: easy-6: not easy)	5.2	5.5	6	5.3	5.5
3. Are you willing to buy this product after experiencing "medical envoy"?	6	5.4	5.8	5.7	5.7

5.1. Research Process

These processes are conducted in home interviews and then in the respective bedrooms. First, we briefly introduce how to use the product with the user. Then, the user can try to use the device for himself. During the experience, we observed and recorded the whole process and filled in the record sheet. During the interview process, we mainly interviewed: (1) views on virtual medical treatment .(2) expectations for the future development of psychological counseling.(3) the difference between traditional psychological counseling and virtual medical treatment.

5.2. Research Process

According to the above chart we can see that all the participants who participated in the use of the experience expressed their high willingness to use the device to enter a personalized scenario for the experience. VR virtual reality application in the metaverse virtual medical has many advantages: 1. the user can be very relaxed to interact with the virtual object and show their real side. 2. the treatment can be customized according to the actual situation of the user; 3. It is possible to get multiple forms of feedback.4. It facilitates remote treatment and facilitates the time work schedule of both parties.

6. Limitations and future work

Since the metaverse is a virtual reality environment, the uncertainty of the environment in real life is large and very susceptible to the influence of the surrounding environment or the user's own influence in reality. At the same time, the data is also prone to missing due to somatosensory acquisition jams and the limitation of the data collection range of the sensors leading to little immersion in virtual reality. Second, the data samples collected are insufficient due to epidemic factors. In the future, we will update and iterate the product and further improve the multiple functions of psychotherapy and expand the medical field such as virtual rehabilitation training. In addition, based on user reviews and feedback, we will continue to optimize the application system to make the user experience better.

7. Conclusion

In this article, we introduce the Metaverse Medical Space for psychotherapy, which allows users to perform medical services in a virtual environment. The "medical ambassador" can provide a variety of scenarios for users and collect data and feedback from each user after the service is completed. Through user research, we can know that "Medical Ambassador" can provide users with medical services well, allowing users to realize face-to-face communication and services without leaving home. In short, although VR virtual reality technology has broadened the service channels for medical services, there is still a lot to go for our current technology implementation. The development of this technology can definitely play a very important role in the development of medical care and promote the development of medical care in the world.

8. Grateful

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