

Application of virtual reality (VR) technology in health and quarantine skills training of entry and exit ships

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Abstract: When carrying out the training for health quarantine personnel of inbound and outbound ships at the port, the port is limited by the number of cases of health quarantine events at the port of ship inbound and outbound means of transport. New staff or transferred staff mainly reserve theoretical knowledge and operation skills through document learning and case desktop deduction, which is difficult to achieve practical results. The on-site drill needs to coordinate many port departments, which consumes a lot of resources, and the trainees cannot repeat the training in a short time. Under the background of increasingly serious international epidemic, there is an urgent need to improve the ability of port health quarantine personnel at the port of entry and exit ships. Through virtual reality (VR) technology, one or more scenes of quarantine and monitoring infectious diseases at ship traffic ports can be simulated. By simulating the real scene, trainees can quickly master the disposal methods and operation skills of various types of quarantine and monitoring infectious diseases, enrich their experience in handling public health emergencies, and achieve safe and effective training objectives.

Keywords: port, health quarantine, virtual reality, skill training

1. Introduction

Virtual reality (VR) technology^[1] is a computer simulation system that can create and experience a virtual world. It uses computers to generate a simulation environment. It is an interactive three-dimensional dynamic scene and entity behavior system simulation of multi-source information fusion. It enables users to immerse themselves in the environment. It is an important direction of simulation technology. It is also a combination of simulation technology and computer graphics, man-machine interface technology, multimedia technology Sensor technology, network technology, and other technologies. Virtual reality technology (VR) mainly includes simulation environment, perception, natural skills and sensing equipment. Simulation environment is a real-time and dynamic three-dimensional realistic image generated by computer. In addition to the visual perception generated by computer graphics technology, there are senses of hearing, touch, force, motion, and even smell and taste. Natural skills refer to the human head rotation, eyes, gestures, or other human behavior actions. The computer processes the data corresponding to the participants' actions, responds to the user's input in real time, and feeds back to the user's five senses respectively.

2. Application background and significance

The health quarantine of entry-exit ships is an administrative law enforcement act carried out by the General Administration of Customs of the people's Republic of China in accordance with the law of the people's Republic of China on the prevention and control of infectious diseases and the frontier health and Quarantine Law of the people's Republic of China in order to control the spread of quarantinable infectious diseases through entry-exit ships and their passengers and materials, prevent the prevalence of quarantinable infectious diseases and protect human health, This behavior not only requires the on-site quarantine personnel to have the corresponding theoretical knowledge, but also requires the quarantine personnel to have the ability of on-site emergency disposal, which puts forward requirements for the experience of front-line quarantine personnel in dealing with public health emergencies. Limited by the number of cases of health and quarantine incidents at the port of entry-exit means of transport of ships, new staff or transferred staff mainly reserve theoretical knowledge and operational skills through document learning and case desktop deduction, which is difficult to achieve

practical results. The method of on-site drill also needs to coordinate with many port departments, which consumes huge resources, and the trainees cannot repeat the training in a short time. Through virtual reality (VR) technology, one or more scenes of quarantine and monitoring of infectious diseases at ship traffic ports can be simulated. By simulating the real scene, trainees can quickly master the handling methods and operating skills of various types of quarantine and monitoring infectious diseases, enrich their experience in handling public health emergencies, and achieve safe and effective training objectives.

3. Application method and route

Relying on the actual needs of the health quarantine of entry-exit ships, the research object is the selection of boarding materials, wearing of protective clothing, epidemiological investigation, blood sample collection, throat swab collection and other work scenes involved in the health quarantine of entry-exit ships, with virtual reality technology as the main body, artificial intelligence and industrial design as the auxiliary, and supporting mainstream VR interactive equipment for immersive quarantine scene simulation, According to the practical problems that often occur in the daily quarantine process, set up different scenario interaction scripts, use professional software such as unity3d and Maya to simulate various characteristic scenarios of health quarantine, consolidate the training effect in the human-computer simulation interaction, and create a digital and professional new concept intelligent training system;

Meanwhile, with webvr technology and mobile Internet 5g technology, mobile phones, remote PCs and other devices can be used to carry out handheld remote training and pocket training, so as to improve the intelligent training system from online and offline dimensions.

The R & D and implementation of the project can fill the domestic gap in relevant fields, and based on the actual needs of the inspection and quarantine field, it has the feasibility of popularization and application.

It can be divided into the following three steps:

(1) VR intelligent training digital modeling

Study the cases of ship health quarantine, and investigate the actual needs of current training; According to the results of the case study and actual investigation, the system needs to be analyzed. According to the requirements and characteristics of the needs analysis, a new generation of information technology based on VR is selected and adopted. According to the technical requirements of standardization and modularization, the training scene VR data acquisition module, VR scene interaction module, NPC artificial intelligence module, protagonist control module, network data transmission module, cloud service data processing, VR terminal streaming module, etc. are taken as the benchmark, Build a digital model.

(2) Develop a comprehensive solution for ship health and quarantine skills training

Taking the specific scene of ship health quarantine as the object and the digital model as the implementation template, the specific environment of the specific object implementation scene is studied. According to the scene requirements, training scripts, interaction requirements and training efficiency summarized by the unit, the specific adaptability requirements proposed by the digital model are technically adjusted, and the corresponding software is developed by using professional software such as unity3d and Maya, Cooperate with the hardware to realize a basic scenario demonstration application.

(3) Large scale application of the project scheme in the field of ship health quarantine training

The comprehensive solution integrated with a series of exemplary applications of training scenarios can be modified and customized for other specific institutions in the inspection and quarantine industry, determine the reuse, modification and customization of modules according to the actual needs of the training target units, and gradually realize the large-scale application in the industry based on this comprehensive solution.

4. Discussion

As early as the 1970s, virtual reality (VR) technology was applied to the training of astronauts

abroad. As it is a cost-effective, safe and effective training method, it has been extended to the training of all walks of life. At present, virtual reality has been widely used in different fields. Relevant domestic application research can be seen as early as 2000, which was applied to personnel training in coal preparation industry [2]. In recent years, the application of virtual reality (VR) technology in personnel training can be seen in medical, electric power, education and other fields [3-5]. However, in the aspect of health quarantine of ship type inbound and outbound means of transport, personnel skill training is carried out through VR technology. At present, there is no similar research at home and abroad.

At present, the main problems are as follows: first, there is a large gap in the number of medical professionals at the entry-exit ship port health quarantine post, most of the staff have not passed the systematic medical education, and generally have poor medical skills and operation ability; Second, there is a lack of convenient, safe and effective training methods for non-medical staff to "practice" their abilities.

At present, there is no relevant report on the training of health quarantine personnel of entry-exit vehicles of ships by virtual reality (VR) technology at home and abroad. Exploring the application of virtual reality (VR) technology in this field is conducive to rapidly improving the ability of port health quarantine personnel and providing technical support for port health quarantine administrative law enforcement.

5. Conclusion

The outbreak of novel coronavirus (2019 ncov) in early 2020 has now evolved into a global pandemic respiratory infectious disease. In this context, the General Administration of Customs of the people's Republic of China, which is responsible for port health and quarantine, determines the level of its ability to guard the country. Exploring the application of virtual reality (VR) technology in personnel training is conducive to the improvement of the capacity-building of health quarantine teams of entry-exit ships.

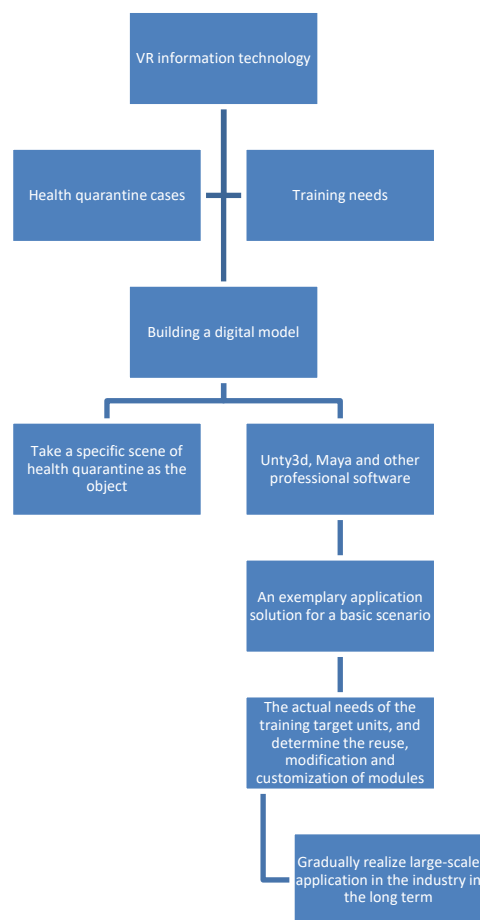


Figure 1: Technology Roadmap

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