

Conception and Preliminary Exploration of Virtual Reality Construction of Geological Cognition Practice

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Abstract: This paper explores the feasibility and operability of the combination of virtual simulation technology and geological cognition practice, and solves the problems of poor geological outcrop, the influence of terrain and weather, and the lack of enthusiasm of students in practice. The combination of virtual and real can improve the teaching effect and form a good complement with the theoretical calculation of the course.

1. Introduction

Geological cognition practice is one of the indispensable practical teaching links in undergraduate teaching. Through the field geological observation, the students can further consolidate and digest the knowledge about rocks, structures, strata, etc; master the basic method of integrating theory with practice, and learn some basic skills of field geological work [1]. According to the requirements of new engineering and professional certification, the training objectives of students have changed to some extent. More and more students will be engaged in professional related scientific research or broader technology or social services. Therefore, in the limited time, the field geological teaching should not only enable students to have a thorough understanding of geological knowledge, master geological work skills, but also develop independent scientific thinking, which puts forward higher requirements for the course design of field geological practice and the teaching level of the instructor.

However, with the acceleration of urbanization in recent years, the field geological outcrops have been damaged to a certain extent [2], and the practice team needs to prepare some new observation points in advance every year. In the process of team practice, affected by the terrain, weather and the familiarity of observation points, it is easy to get lost or miss the observation points. In addition, the newly opened observation points are often limited in teaching space, resulting in some students cannot see the geological phenomenon or listen to the explanation.

In order to solve these problems, virtual simulation technology can be introduced into geological cognition practice. Compared with the traditional two-dimensional paper map data source, the three-dimensional visual landscape has many characteristics, such as more intuitive, more image and so on [3]. The use of remote sensing data to continuously record the real information of the

surface, can more truly reflect the geological landscape, which is unmatched by photography and other means, so it can be used as an important source of virtual landscape texture mapping. Visualization technology provides students with the opportunity to observe the natural geological entities and their evolution, understand the overall regional geomorphic distribution, and repeatedly experience the scene entities.

2. Objective

Through the virtual reality construction of geological cognition practice, the following objectives can be achieved:

2.1 In the virtual simulation system, students can participate in the whole process of geological cognition practice through interactive operation mode, and intuitively observe and analyze the phenomenon representation of rock, structure and stratum;

2.2 In the virtual simulation system, students participate in the observation of all the feature points through the interactive operation mode, understand the whole practice link, and improve the students' ability and consciousness of team division and cooperation;

2.3 In the virtual simulation system, the operation time of students is reduced, and it can be repeated. A single person can complete the whole process, which greatly reduces the dependence on the instructor and improves the ability of students to solve complex engineering problems independently.

3. Construction Content

In order to give full play to the role of field geological cognition practice in the cultivation of students' working skills and their comprehensive analysis and research ability, a virtual simulation learning system for geological cognition practice is developed by using virtual reality technology [4]. The system can be used for students' preview before practice, practice and recognition after practice. Online learning resources are provided in the practice base and non-practice base, which greatly extend and expand students' learning time and space. At the same time, the perfect combination of field macro geological phenomena and indoor microscopic thin section observation is realized through information technology, which greatly enriches the practice content of field geology. The integration of multi technology also greatly improves students' learning enthusiasm and passion.

The virtual simulation resources of field practice in typical geological disaster prone areas are obtained, which enables students to observe geological characteristics personally in close range with high resolution. Thus, students can obtain learning resources to the maximum under the conditions of limited resources of practice base and limited time of field practice.

The virtual simulation teaching system of geological cognition practice has good visibility, and can provide three-dimensional visualization scene for field geological practice points [4]. It supports the import and display of field geological information. For a geological point, it supports the import of multimedia information such as text, video, photo, remote sensing image, geological map, contour map, 3D laser scanning data, and provides reasonable storage mode for management. The system provides multi form expression of 3D laser scanning data. For 3D laser scanning data, it provides the display of original formation texture mapping form, formation division form and reservoir configuration unit division form. At the same time, it can also integrate a large number of field geological information, covering minerals, rocks, strata, structures, sedimentary facies, reservoirs, geological disasters and other aspects of all-round teaching information. It is not affected by weather, late outcrop damage, weathering and other adverse factors. Students can more intuitively understand the teaching content of geological practice.

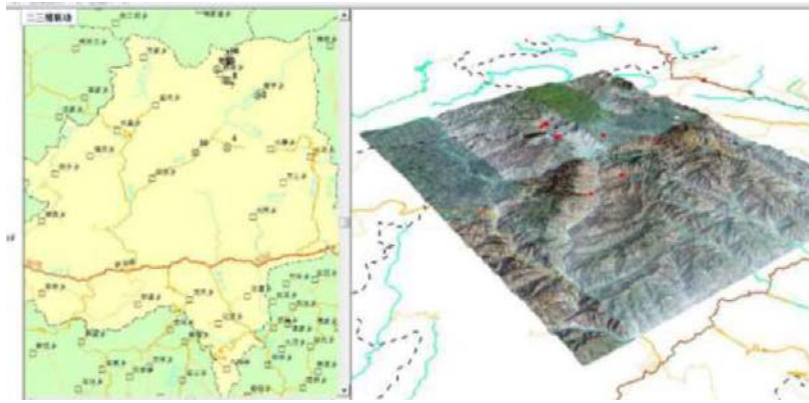


Fig.1 Route and 3d Map

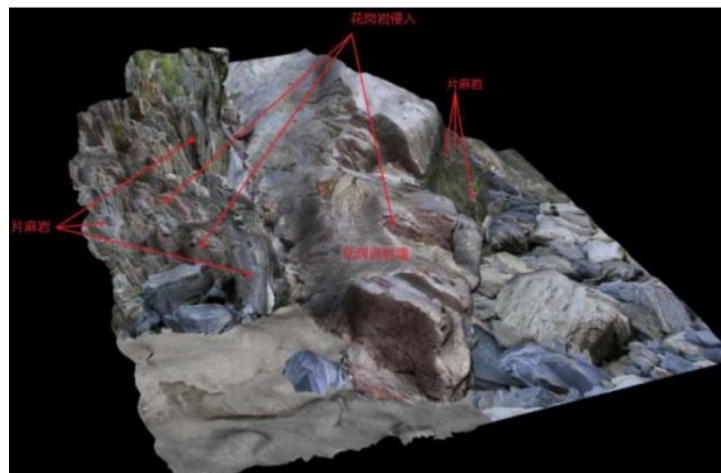


Fig.2 Simulation of Rock Characteristics



Fig.3 3d Virtual Simulation Scene Based on Oblique Photography

4. Implementation Plan

At first, the Research on the field of virtual simulation teaching will be investigated, the data will be collected and sorted out, and the construction ideas will be clarified;

Then, complete all the original data collection, as the background data of virtual simulation

practice model;

In the end, complete the development of three-dimensional interactive system of virtual simulation practice, and apply the system to related courses, and make evaluation and summary.

5. Conclusion

The virtual reality construction of geological cognition practice led to following breakouts:

(1) Through the whole path teaching process of geological cognition, so the students can participate in the whole process of geological cognition practice in a limited time;

(2) Teaching methods: using interactive technology to achieve multi task, repeatable operation, enhance students' experimental participation, and achieve the teaching goal of “everyone hands-on, full participation” in the virtual environment;

(3) Evaluation system: build a hierarchical modular structure, train practical ability in multiple directions, and comprehensively meet the requirements for the training ability of innovative civil engineering talents [5];

(4) Extension and expansion of traditional teaching: highlight the “combination of theory and practice”, effectively guide the cultivation of students' innovative thinking, and promote the cultivation of students' practical innovation ability.

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