Application of 3D Digital Modeling Technology in the Display of Marine Fish Science in the South China Sea

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Abstract. The richness of marine fish species in the South China Sea and the popularization of marine culture are beneficial to people's further understanding of the sea and can enhance marine awareness. With the rapid development of computer and information age, 3D scanning technology, 2D image digital recognition technology, AI artificial intelligence technology and other new technologies are combined into 3D digital modeling technology. However, 3D digital modeling technology is constantly updated, how to use 3D digital modeling technology to display the marine fish in the South China Sea, and how to use 3D next-generation technology to portray details and other technologies to more deeply express biological characteristics and restore science records is still a problem worth exploring.

Keywords: 3D Modeling, South China Sea Fish, Science

1. The Three-Dimensional Digital Modeling Technology at Home and Abroad

With the rapid development of the computer field, three-dimensional digital modeling technology has more common applications in the restoration and protection of museum relics, the construction of film and television animation scene characters, 3D printing technology and digital games.

In China, a large number of marine science materials need to be digitally modeled and preserved for future exploration of the ocean, protection of the ocean and development of the ocean [1]. With the development of emerging technologies such as virtual reality and 3D printing, the application range of future 3D digital modeling technology will be more common.

The innovation of technology has brought about the continuous upgrade of traditional 3D digital modeling technology, however, in the application context of the new technology, such as digital modeling technology combined with animation and culture, [2] digital modeling technology combined with clothing design, etc., the integration of cross-border and culture between different industries, so that technology and art can become the meaning of the future we need to think deeply and dig, bringing us new opportunities to be explored.
2. The Significance of 3D Digital Modeling to the Popularization of Marine Fish Science in the South China Sea and the Constraints Faced

2.1. The Significance of Three-Dimensional Modeling Technology in the Popularization of Marine Culture
In the South China Sea of China, marine fishes are rich within, more than 1500 species are known at present. Most of the species belong to tropical and subtropical nature. There are many kinds of fish and long growing seasons [3]. Science popularization of marine fishes in the South China Sea is conducive to enhancing people's marine awareness and having a more comprehensive understanding of marine species. From the original image described by pictures and words, etc., there is a more three-dimensional perception [4]. Secondly, the richness of marine resources in the South China Sea, a further understanding of the South China Sea creatures, provides a scientific basis for the development and utilization of marine fish resources in the South China Sea.

Three-dimensional digital modeling can further increase the feasibility of deep-sea fish viewing, and promote the development of marine exploration to a deeper level.

2.2. The Constraints Faced by 3D Modeling Technology in Marine Culture Science Popularization
Three-dimensional modeling technology in marine culture science popularization has a great demand, especially in the process of creating Hainan marine fish resources library, [5]digital fish creatures need a lot of three-dimensional modeling. But the conventional modeling technology is inefficient, and the efficiency of modeling still needs to be continuously optimized. 3D modeling technology and the process of modeling marine organisms, the production of more processes, in the link lack of certain standards and norms [6]. The process of 3D modeling is not clear enough for the performance of marine life fish characteristics in the South China Sea.

3. The Key Technical Path to Display the Marine Fish in The South China Sea by 3D Digital Modeling Technology

3.1. The Use of MAYA to Complete the Initial Coarse Model of Fish Shape Building Technology
First of all, the use of simple polygons to complete the initial large fish induction, in the use of MAYA software modeling process, focus on the performance of the basic structure of fish. For example, when we represent the South China Sea marine fish Guangdong bream, we need to capture the structural characteristics of the body is high and the sides are long and diamond-shaped. The head is small, the eyes are large, the mouth is small, the upper and lower jaws have thin cuticles, no beard, and the lateral lines are flat. These are the areas that need to be shown when the rough model is built. In the process of MAYA software specific coarse mold production, we can import the reference map in the side view [7].

In the side view, the polygon shape is adjusted and the number of segments is adjusted from the mouth to the tail along the edge of the fish in the reference diagram, and then the polygon points are adjusted in the 3D space (x, y, z) as close as possible.

3.2. Use ZBRUSH to Complete the Model Detail Sculpting Points
In the process of using ZBRUSH to complete the fine model, our main goal is to use the modeling software to restore the biological structure and detailed structure of the fish [8]. After we import the low precision fish model into the ZBRUSH software and enter edit mode, we usually determine the symmetry axis and enter the draw mode where we start carving the detail surface parts of the fish's
body with concave and convex details. The basic properties of the brush that we need to adjust when drawing details are usually: draw size (brush size), focal shift (focus degree), and Z intensity (brush strength). The ZBRUSH software allows us to create and shape details in the same way as clay, with a variety of brushes that allow us to sculpt all the details we want.

Figure 1. South China Sea grouper simple mold construction

3.3. Material Mapping Technical Identification and Specification

Material mapper gives the model surface color, texture, smoothness, transparency, reflectivity, refractive index, luminosity and other visual properties of the process [9]. In the process of mapping, the mapping needs to use the correct mapping representation and reasonable size.

| Map module ID | Chinese               | meaning                                           |
|---------------|-----------------------|---------------------------------------------------|
| Basecolor     | The color map         | A tile representing the color of the object       |
| Metalness     | Metallicity mapping   | A map used to distinguish metal from nonmetal     |
| Roughness     | Rough value map       | A rough effect used to control an object          |
| Normal        | Normal map            | Control the bump of the surface                   |

Table 1. Map module ID

In the specification of material mapping, first of all, the same mapping needs to be drawn at the maximum size when different precision is needed, and in reducing to different precision. The name of the texture should be consistent with the prefix of the model name as much as possible. In the material mapping coordinates, there should be no overlap of mapping on one material texture. We need to use the same mapping coordinates (UV) plane between the size ratio close to the ratio between the topology of the model.

3.4. Finished File Finishing and Optimization

In the process of displaying the Marine fish project in the South China Sea with 3D digital modeling technology, file sorting and optimization are conducive to the development of subsequent links. For example, we need to add animation to the fish and import it into Unity3D engine. Irregularities and defects in documents often lead to errors in document identification and process management. In the process of filing, we should fully consider the versatility of files and the removal of redundant data, which is a very necessary link in the production of the project.
In MAYA software for model finishing stage, we first need to hit the model group as a whole, press D key to set the center point of the model group. For example, in the fish modeling, the center point will be set in the middle of the fish. Then we need to freeze the model, execute "Freeze Properties" and delete the history of the model. Check that the wiring of the model is reasonable and that triangular surfaces should not be used. And there should be no extra points or unstitched points in the model. Finally, save the model.

![Digital model of grouper in the South China Sea](image)

**Figure 2.** Digital model of grouper in the South China Sea

4. The Future of Three-Dimensional Digital Modeling Technology on The Future of Marine Science and Trends

With the rapid development of various industries, especially virtual reality, 3D printing technology, cultural creation, museum industry, domestic animation, indoor effects and other industries, the involvement of three-dimensional digital modeling has become more extensive.

The display of marine science fish, the future will be more comprehensive, computer emerging technology's will become a cross-border and integration of the nexus [10].

The establishment of fish model database has laid a good foundation for the docking of fish science popularization and new technology in the future. The data collection of fish species and the preservation of fish model have provided valuable information for the conservation of biodiversity and the collection of resources in the South China Sea.

5. Conclusion

This paper takes the application of 3D digital modeling technology in the popularization of marine fish science display in the South China Sea as an example, analyzes the importance of 3D digital modeling to the popularization of science display, elaborates from the process of 3D modeling technology, analyzes the key technology of 3D digital modeling, and thinks about the future trend of 3D digital modeling technology.

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