摘要

随着计算机CPU和GPU的运算能力的大幅提升，三维模型不但变得越来越复杂，细节信息越来越丰富，并且在在动画、机械、医疗等领域应用更加广泛，三维模型数量也越来越多，三维模型的分类与检索已经成为一个重要的研究方向。虽然现在有很多学者对三维模型检索技术进行了多种研究，并且提出了许多不同的模型检索算法，但目前仍有许多问题亟待攻克。

本文通过对现有的三维模型检索技术进行研究和分析，发现三维模型内在的复杂性和高维度的计算量严重影响了模型的检索。本文采用三维模型降维的方式，利用二维视图作为三维模型的检索条件以此来降低检索成本。提出一种基于手绘草图的三维模型检索，本文主要研究了以下内容。

为了提高检索的准确性，首先对三维模型进行合适的空间位置变化，进行渲染，然后按照固定投影的方法获取二维视图集。每一个模型选取6幅二维视图作为三维模型的特征视图集。然后对手绘草图和二维视图集提取特征向量，以Zernike矩和Fourier描述符来构建全局视图特征和D2描述符的加权集合作为集成特征描述子。利用集成特征描述子对手绘草图和二维视图进行相似性评估来检索三维模型。实验结果表明该方法能够有效地对三维模型进行分类。

With the rapid development of CPU and GPU, 3D models are not only becoming more and more complex and rich in details, but also widely used in animation, machinery, medical and other fields. The number of 3D models is also increasing. The classification and retrieval of 3D models has become an important research direction. Although many scholars have done a variety of research on 3D model retrieval technology and put forward many different model retrieval algorithms, there are still many problems to be solved.

In this paper, through the research and analysis of the existing 3D model retrieval technology, it is found that the inherent complexity of 3D model and the high-dimensional computation seriously affect the model retrieval. In this paper, 3D model dimension reduction method is adopted, and 2D view is used as the retrieval condition of 3D model, so as to reduce the retrieval cost. This paper proposes a 3D model retrieval method based on hand drawn sketch.

In order to improve the accuracy of retrieval, firstly, the 3D model is rendered according to the appropriate spatial position change, and then the 2D view set is obtained according to the fixed projection method. Each model selects 6 2D views as the feature view set of 3D model. Secondly, feature vectors are extracted from sketch and 2D view sets, and weighted sets of global view features and D2 descriptors are constructed by Zernike moments and Fourier descriptors as integrated feature descriptors. The integrated feature descriptor is used to evaluate the similarity between sketch and 2D view to retrieve 3D model. Experimental results show that this method can effectively classify 3D models.

3D model retrieval; Freehand sketch retrieval; Zernike moment; Fourier descriptor; D2 shape descriptor; Integrated feature descriptor