AN UNIFIED FRAMEWORK FOR 3D FRAGMENTED OBJECT PATCHING

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ABSTRACT. *Computer aided digital patching of the fragmented object has the great advantages in efficiency, re-operation and avoiding of inadvertent damage, which is widely used in restoring and repairing of culture heritages. In this paper, we propose a unified framework for 3D fragmented object patching, and the contributions lies in: 1) a unified framework for 3D fragmented object patching consisting of 3D shape feature extraction, 3D surface region segmentation and 3D surface matching is proposed; 2) a novel geometry projection based 3D histogram model is proposed to extract the shape feature of 3D fragmented object robust to noise and sampling of 3D model; 3) a surface segmentation based on region dilation method is presented with the enough considering of the influence of surface coarseness on 3D surface region segmentation instead of handling the debris with regular shape, flat surface and few broken surfaces using the current algorithms; 4) a 3D surface matching based on height-map using 3D shape features directly instead of using curves of debris as match features as the current algorithms. The experiments are implemented on the simulation data and the real 3D scanning data of the fragmented object with a Roland LPX-250 3D laser scanner, and the results show that the proposed algorithm is feasible and effective.*
Keywords: 3D fragmented object patching, 3D shape feature extraction, 3D surface segmentation, Height-map analysis, Geometry projection based 3D histogram

1. **Introduction.** Culture heritages protection extracts much attention owing to its high historical meaning. The traditional and regular manual patching of the culture heritage aims to restore it to the original appearance with the text recording, which costs much time and endures irreparable damage of the culture relics with the possible operational errors, so it is necessary to develop an alternative method of restoring the fragmented objects instead of manual operation. With the development of computer graphics, pattern recognition and 3D information processing, cultural relics have been converted into digital