STSM Report

Review on acquisition and fusion of heterogeneous data

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Beneficiary: Fröhlich Róbert, University of Szeged, Szeged (HU),
frohlich@inf.u-szeged.hu
Host: Alain Trémeau, Université Jean Monnet, Saint-Etienne(FR),
alain.tremeau@univ-st-etienne.fr
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Place: Laboratoire Hubert Curien UMR CNRS 5516, Saint-Etienne(FR)

Abstract

The purpose of the STSM was twofold. First, we have proposed to make a short investigation of the different methods used by recent CH publications in heterogeneous data fusion, this resulting in a general overview of the different methods and algorithms, the different steps used in such a processing chain. Second, we have proposed to concentrate on only one such method, namely the one developed by the research group in which the STSM beneficiary is working, and try to extend it to be usable in different CH applications as well. In this process we aimed to identify the key advantages and disadvantages of this method, to conclude with some general recommendations for anyone who might want to use our method for documentation purposes. Furthermore to accomplish this task we also proposed to try the acquisition process ourselves, this way we could work on our own dataset, and also we obtained some essential knowledge (what devices to use, what setup works best for some objects), that should be useful when preparing for the next acquisition task.

While most of the work use either laser or structured light based 3D scanners, or photogrammetry to obtain the 3D model of an object, these techniques have their own disadvantages, like the need to capture hundreds of images of a single object to be able to reconstruct it, or the need to use markers to register different views. In contrast our method uses a novel approach to the problem, it uses regions instead of matching key-points, which can be more trivial to detect in many cases. We only need one or two regions on the surface of the object, which is visible on both the 2D image and the 3D pointcloud. In 2D this region can be easily segmented out using standard segmentation methods, while in 3D, it can usually be segmented out based on some surface parameters that describe that region (like surface normal, curvature, smoothness) or based on color information if it is available. This means that we don't necessarily need color information stored with the 3D pointcloud, so an inexpensive device could also be used for acquisition.

Our final results show good potential in our method, it could be a future alternative in cases where the use of markers is not possible, but enough detail can be observed on the surface of the object/artifact. Mainly we can think of man-made objects, with strong paint, colors, strong edges, well visible surfaces with clear edges or maybe bigger structures like walls as well.

Fig. 1: Original and fused 3D textured meshes

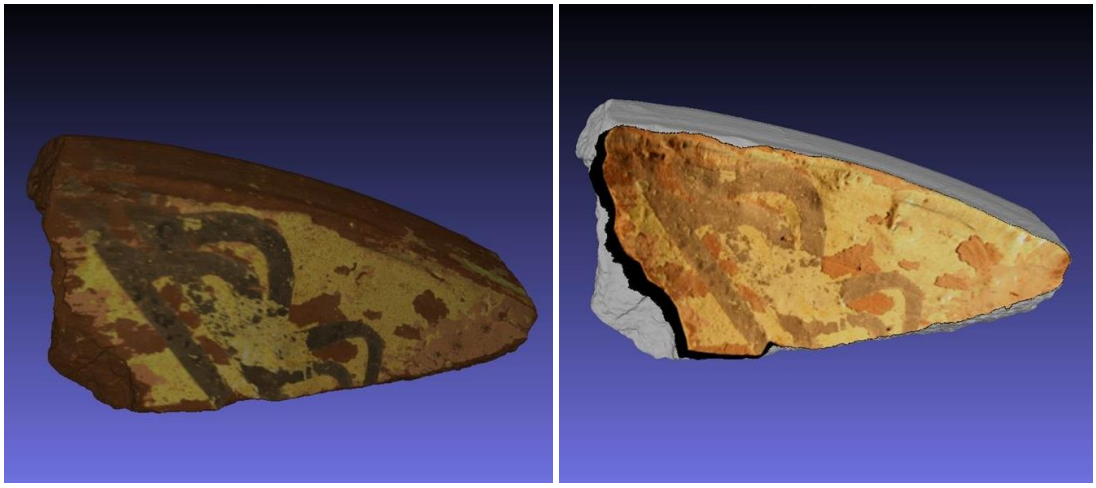

Fig. 2: Original and fused 3D textured meshes