WG3: Registration processes (acquisition, filtering and view integration)

Tracking for the registration of 3D and multispectral datasets

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Our registration technique is based on the optical tracking of the 3D and multispectral acquisition systems in use. This tracking is based on photogrammetric techniques: A set of cameras observes the acquisition systems while they successively digitize the surface under study. The relative position and orientation of the acquisition systems can then be measured for each acquisition. The calibration of the intrinsic and extrinsic properties of all objects and optics in play then enables the projection of the multiview and multimodal datasets in a single coordinate system. Each acquisition system is placed in a cubic frame of side 0.5 m side covered by 80 targets. The use of such a frame increases the tracking accuracy.

We present a series of laboratory experiences performed both on a cross stich canvas of size 450 mm × 360 mm and on a varnished plaster bas-relief of size 500 mm × 800 mm. The first object was chosen to enable an easy visual assessment of the registration accuracy, while the second object has very similar characteristics to one of the cultural heritage objects that motivated this work. A fringe projection digitization system and a multispectral camera are successively placed in the target frame and tracked with four cameras.

This technique was developed for the registration of featureless datasets that describe cultural heritage objects. The technique is particularly advantageous when studying open surfaces, such as paintings or frescos. In this setup, registration errors usually add up instead of compensating each other, introducing deformations in the final model. In our case, the registration accuracy is independent from the quality of the data acquired. The method is transportable and can be used in situ. It is adapted for the registration of data from any set of 3D digitization systems and multispectral cameras.

Biographical statement

I am currently finishing my PhD on the integration of 3D and multispectral datasets for the study of cultural heritage under the supervision of Franck S. Marzani from the University of Bourgogne (France) and Frank Boochs from the Fachhochschule Mainz (Germany). Defense is planned in Mainz on March 26th. Starting February 18th I will be working as a post-doc at the Cité de la Musique (Paris, France) on the in situ analysis of varnishes of musical instruments using spectral techniques (multispectral imaging, IR spectrometry, Raman spectrometry, UV spectroscopy, etc.)