

Title: 3D Scan Registration Using Projected Fiducial Markers

Abstract: In the fields of computer vision and optical metrology, scan registration is a frequent and challenging task. For a set of RGB-D scans (e.g. 3D point clouds or meshes), the problem consists in finding a set of corresponding transformations to align them in a common (world-)coordinate system.

The multitude of approaches known in the state of the art can be classified into at least two categories: marker-assisted and markerless methods. Markerless methods purely rely on natural object features such as shape and texture. Doing so, they impose certain requirements on the object to be reconstructed, limiting application spectrum and robustness of such methods. Secondly, marker-assisted methods introduce artificial features in the form of fiducial markers. Such methods excel with respect to robustness and versatility, but they require a time-consuming and sometimes technically prohibitive step of marker attachment; besides, valuable object data lost in the marker areas.

The scope of this thesis is to explore a novel approach to scan registration which can be considered a hybrid of the above. Using projected fiducial markers, the time-consuming marker placement step is avoided, while robustness and versatility are maximized, because natural object features are not a requirement.

The thesis shall emphasize on the Computer Vision aspect of scan registration; however, the candidate should also be interested in the hardware/physics side of things, potentially being able and willing to address the optical challenges of marker pattern design and projection.

Best regards,

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