

Augmented Reality

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An Analysis of Feature-based Rigid Object Tracking

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The subject of the research is an analysis of feature-based rigid object tracking. Feature-based rigid object tracking employs natural, distinguishable keypoints of rigid objects to facilitate position and orientation tracking of these objects. The tracking function relies on matching keypoints from training images with keypoints obtained from a run-time video stream. Usually, all training keypoints are stored in one database, and the query set is matched against this database. The fidelity and performance of the feature-based tracker depends on multiple parameters (i.e., the training data and its type, the feature descriptor, the matching algorithm, computer vision parameters etc.). The parameters and their effects are widely understood in the area of 2D image tracking. Nevertheless, there is a lack of knowledge in the field of rigid object tracking.

The objective of the research is an analysis of the effects of different parameters on the tracking performance of a feature tracker. The students will work with a feature tracker that is based on OpenCV, a computer vision programming framework written in C++. They will systematically change the keypoint types, matching algorithms, and their parameters to study the effect on tracking performance. The indicator for performance is the computation time and the tracking robustness. To maintain the analysis, the students will work on a training database that keeps the tracking data of all objects to track. The effect of different training data (i.e., resolution, perspective etc.) will also be investigated. The database and the feature-based tracking algorithms are written in C++; the students have to work with MS Visual Studio to collect their data and with MS Excel to analyze it. The preparation of the training database involves the usage of Adobe Photoshop.