Abstract

This thesis improves the point pair feature registration algorithm by introducing a new GPU-based clustering algorithm based on spatial hashing. Compared to the CPU-based agglomerative clustering algorithm used in current point pair feature registration implementations, the spatial hashing clustering algorithm has a significantly lower run time and little to no reduction in accuracy. The new clustering algorithm also allows for a completely GPU-based point pair feature registration implementation, as the clustering step is the only remaining CPU-based component in existing GPU-based implementations. Along the way, we develop the parallel hash array, an associative array data structure with support for parallel operations that can be used as an alternative to hash tables on GPUs. We provide open source implementations of both of these algorithms and, along with them, the first open source GPU point pair feature registration implementation. The source code for this project is available at `https://github.com/nicolasavru/ppf-registration-spatial-hashing` under a BSD license.