

Cross-platform Model-independent Geometric Modification

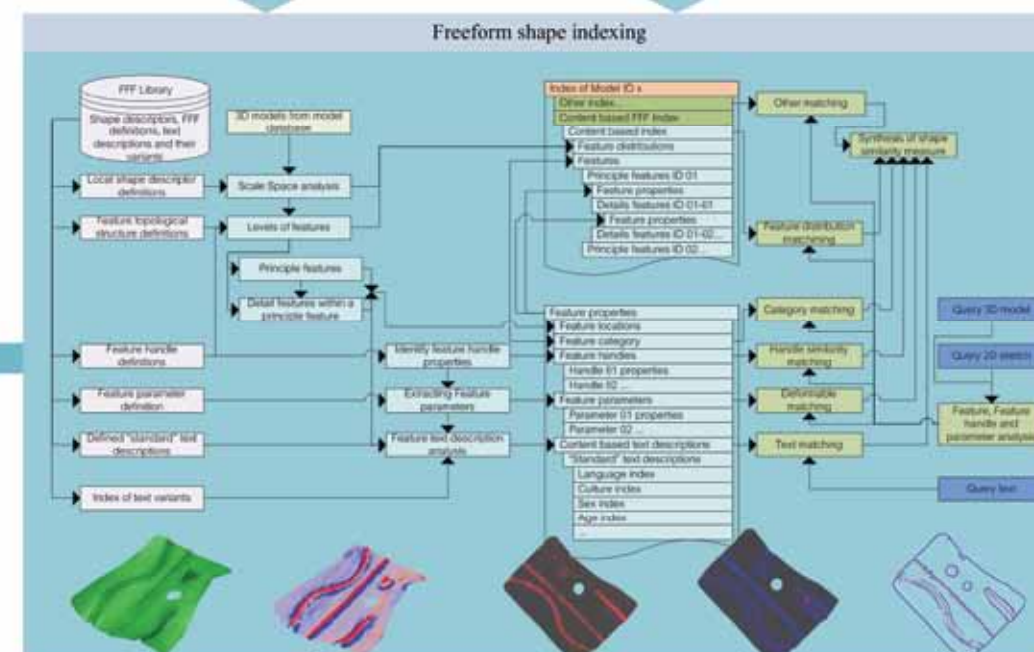
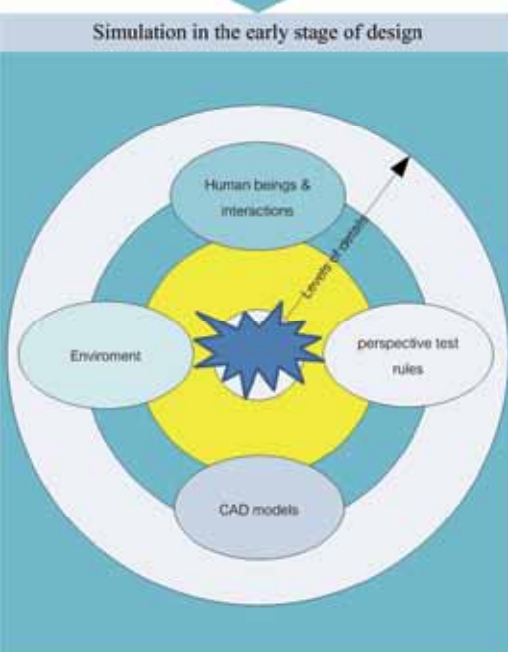
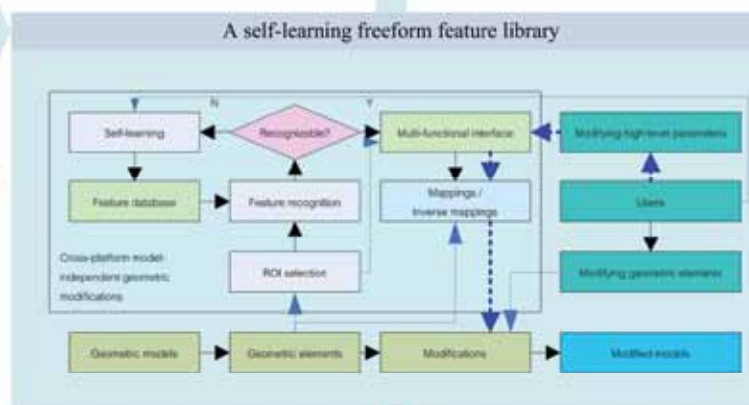
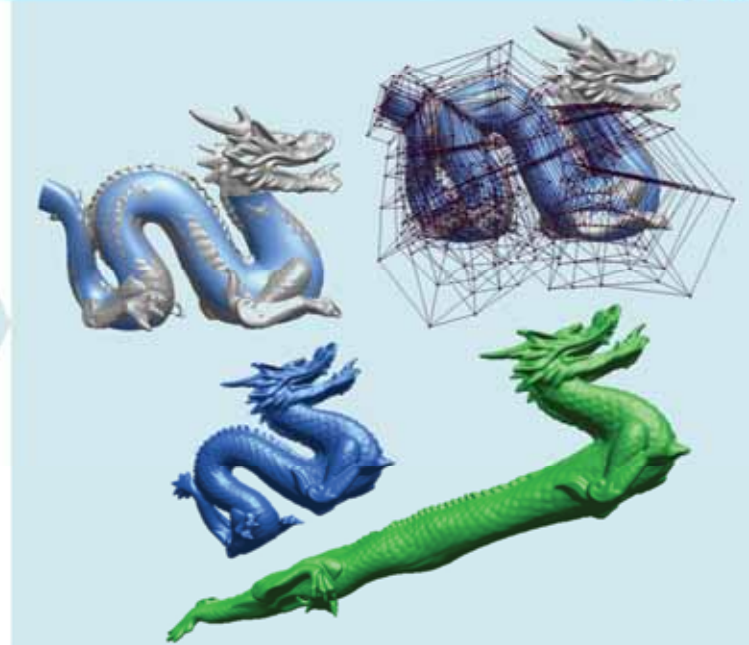
The target of this project is to develop a cross-platform model-independent geometric modification method in order to achieve more effective and efficient interactions between the user and the geometric shapes, especially for those with freeform representations.

Instead of using a particular type of software to completely rebuild a full CAD model based on the geometric information at hand, this method gives the user a reasonably easy and fast way to manipulate existing geometric models, disregarding their geometric representations. For this, shape features, both mechanical and freeform, have been introduced and developed as the basis of the proposed method.

Given a geometric model, the proposed numerical algorithms can identify and locate features in 3D space. The recognition techniques involve shape matching algorithms and pre-defined features in the feature database. Furthermore, a built-in self-learning algorithm helps the feature database extend its contents to optimally adapt to "unknown" geometries. The results of recognition are then provided to the multi-functional interface, where they are associated with the original geometric model by mappings. Using the multi-functional interface, the user can modify a set of geometric elements in an intuitive manner with the defined high-level parameters of geometric features.

Based on the self-learning feature library, by considering the variations of local shape descriptors as footprints of freeform features in a given 3D model, a feature-based freeform shape partial indexing method is developed as an extension of the project to help designers find desired shapes with the emphasis on partial shape matching.

Furthermore, using shape manipulation methods developed in this project, research on simulation & optimization of 3D scanning shapes in the early stage of design is also being conducted to accelerate the reverse design process.



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