

Feature-Based Reverse Engineering of Mechanical Parts

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Abstract

Reverse engineering of mechanical parts requires extraction of information about an instance of a particular part sufficient to replicate the part using appropriate manufacturing techniques. This is important in a wide variety of situations, since functional CAD models are often unavailable or unusable for parts which must be duplicated or modified. Computer vision techniques applied to 3-D data acquired using non-contact, three-dimensional position digitizers have the potential for significantly aiding the process. Serious challenges must be overcome, however, if sufficient accuracy is to be obtained and if models produced from sensed data are truly useful for manufacturing operations. This paper describes a prototype of a reverse engineering system which uses manufacturing features as geometric primitives. This approach has two advantages over current practice. The resulting models can be directly imported into feature-based CAD systems without loss of the semantics and topological information inherent in feature-based representations. In addition, the feature-based approach facilitates methods capable of producing highly accurate models, even when the original 3-D sensor data has substantial errors.

Keywords: reverse engineering, surface fitting, feature-based CAD