

A Case-Based Reasoning Framework for Assembly Part Design in the Early Design Stage

Dr. Guanghsu Chang

Manufacturing Engineering Department
Georgia Southern University

Abstract

A key phase in product design and development is to acquire and apply knowledge of the product design expertise. Shortages of design expertise and experience often result in a low level of assemblability and manufacturability. Also, expertise is hard to disseminate to novices. To effectively disseminate and reuse this valuable knowledge, product design departments need effective and efficient design support mechanisms such as design for manufacture and assembly (DFMA), case-based reasoning (CBR), and decision support systems. A conceptual expert CBR framework is introduced in this presentation to form a coherent basis for the provision of practically suitable product design and development expert models. The objective of the presentation is to propose a transferring and sharing knowledge based web platform using Case-Based Reasoning methodology to improve product design, especially in the early design stage. The CBR methodology will allow the designer to reuse previous design experiences to rapidly design an assembly, evaluate the assemblability and manufacturability and share individual expertise based on the web-based intelligent decision support mechanism. The proposed framework outlines knowledge entities and their relations in the product design reasoning process. The model benefits from the CBR approach to handling uncertainties in the evaluation phase of the methodology. Also, a web-based program is devised, based on the proposed framework. Experimental results of the research show that CBR methodology is suitable for imparting expertise, managing experience and executing reasoning in assembly part design.