Research and Development of Knowledge Based Intelligent Design System for Bearings Library Construction Using SolidWorks API

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Abstract The traditional design method of bearing is mainly based on the manual design process which invites numerous calculations. The small change in shape or size of assembly component will cause massive chain reaction like revision of blueprint because of many interrelated design issues. Hence, the bearing design needs to be changed in order to match the altered component. Advanced design methods such as CAD/CAM provide solutions for these issues by using of parametric modeling technique. This paper presents a typical knowledge based engineering system for rapid design and modeling of bearings based on operating conditions by integrating commercially available CAD package SolidWorks with Microsoft Access. An inference engine and proper user interface was developed for bearing design for assisting the engineering designers. The developed system proved itself as better application of engineering by utilizing the reuse of the design knowledge.

Keywords Knowledge Based System · Intelligent Design System · Parametric Modeling · SolidWorks API · Computer Aided Systems · Bearing · Macro · Access
1 Introduction

Bearing is a widely used general machinery part in almost every industry. Developing the part model for bearing includes the modeling of inner ring, outer ring and rollers by considering the parameters like width, inner diameter, outer diameter, number of rollers. Owing to similar structure attribute of those of the same kind and diverse specifications, suitable bearing can be modeled by parametric modeling technique. Even though CAD became as the inevitable design practice in the recent decades, modeling is a time consuming process because of lack of skilled CAD modeling professionals. Parametric modeling technique rise above this issue as it regenerates the task in very less time in comparison with human. As the parametric modeling technique is dimension driven it facilitates automatic re-use of existing design process based on the results on engineering analysis. Moreover, parametric modeling technique is quick, efficient and interactive in comparison with conventional 3D modeling techniques. So, it is required to research and develop a knowledge based intelligent design system for the modeling of bearings by developing a library.

1.1 Secondary Development Tools for SolidWorks

SolidWorks is a three dimensional parametric solid modeling software developed based on windows. Any programming language supporting OLE (Object Linking and Embedding) and COM (Component Object Model) can be used as development tools of SolidWorks, such as Visual Basic (VB), Visual Basic Application (VBA), VC++ , C# etc. VBA is the simple tool for secondary development as it manages the secondary development during recording and editing macro.

1.1.1 SolidWorks API

API (Application Programming Interface) is a software development tool which enables integration between different applications by providing a code in a programming language within another application [1]. SolidWorks provides lot of API functions based on OLE automation which are the interfaces of OLE and COM to make the secondary development easier to the designer. API facilitates to develop windows based custom stand-alone executable files. Similarly, with the help of specific codes, SolidWorks API offers the automation of modeling, assembling of components. SolidWorks API covers all the functions of the software. Uday Hameed Farhan et al. [2] introduced an automated approach for assemblies of modular fixtures with SolidWorks API with the help of VB. Abhishek et al. [3] developed software application for product design and its CAD model updating with the help of SolidWorks API. Similarly, Tian et al. [4] established, the methods and steps for developing standard parts CAD system based on software re-use with the help of SolidWorks API.