Integration in CAD Software for Design, Automation and Analysis of Bearing Review

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Abstract—Rolling bearings are one of the most important and frequently encountered components in domestic and industrial rotating machineries. Use of CAD software since reduces very much time in whole lifecycle of product. Most of the industries use the different kinds of CAD software according to their need. They were facing so many problems while designing the part also there can be possibility to introduce automation for the particular process. And also helpful to visualize the model before it is produced the parametric nature of any component design makes the effective implementation of the design concept with ease and simplicity using Pro/Engineer due to the availability of different features directly within the software. CAD software provides ease to prepare model virtually

Key words: Automation, Creo, Pro/Engineer, Visual Basic, Ms-Excel

I. INTRODUCTION

Bearing is a mechanical component used to provide relative positioning and rotational freedom while transmitting load or motion between two parts. Bearing is used wherever relative motion between two parts occur especially in automobiles, textile machineries, power plant equipment, agriculture machineries, etc. Ball bearings are mainly used in automobile engines, driveshaft, heavy machinery, sewing machines and many others. Cre-o, Pro-Engineer and ANSYS of the most widely implemented CAD package in Industry. It enable creation of complex three dimensional models of a product which can be used for analysis purposes to optimize the design and then put into introduction Cre-o is the industry’s first successful parametric 3D CAD modelling system. The parametric modelling approach uses parameters, dimensions, features and relationships to capture intended product behaviour. It’s provides a complete set of design and manufacturing capabilities on one, integral, scalable platform. A parametric model is defined by its attributes which could be input parameters, an input parameter is a variable or relationship that defines a key dimension parametric model is re-usable model because modification can be implemented on model. The model can be updated from a common, hared parameter data. Once the ProModel has been defined parametrically, the user allows the system to regenerate model with new values Generating a part model for bearing includes model generation of inner ring, outer ring, cage and ball and appropriate analysis for the same is done by this appropriate cad software.

II. LITERATURE SURVEY

A. Ashish M. Thakkar et al. [1]:
The C-Language interfacing with Pro/Engineer is also carried out here, which improves the product design capability significantly. Method for pro/engineer interface with c program. Using 6 parameters and its relationship; one can use modular approach with significant reduction in designing time. These reduce time required to perform the operation to a great extent compared to traditional method. Using parameters and its relationship mention the advantages of interfacing of Pro-e. Iterative process, through iteration in parametric design parameter, is required to obtain & the value of parameter is required & this value of parameter will be updated automatically in Pro/E after execution of C-program. Reducing time to make ProModel Provide feedback (alert the user if invalid or incompatible values are entered) Present values in an easy-to-read format (display inputs and outputs clearly.) Design Automation is possible. Reduce designing cost very much compared to Traditional method.

B. Rachik D. Trivedia et al. [2]:
Pro/Program reflects all parameters and geometric data of the part in a text data form. This data can be modified to add new feature, delete existing feature, suppress the feature and change the dimension of the feature, Results are they found that it comparatively very less time to generate complex part models with respect to generating them individually. This study demonstrates the modeling automation technique for the inner ring of spherical roller bearing. A generic model and a related database sheet in Microsoft Excel have been generated. Then Excel data have been transferred into Pro/E by Excel Analysis tool. All these transferred data are related to the respective features of the part by Relations tool. Thus at the end Excel datasheet is linked with the Pro/E model. User can update the model just by modifying the sheet. This takes comparatively very less time to generate complex part models with respect to generating them individually. The present study demonstrates the Modeling automation technique for the inner ring of spherical roller bearing. This technique is more suitable and simpler than any other techniques like VB interfacing, Pro/Toolkit, etc., when the relations between features of a part are of constant fashion. This automation can further be proceeded by exporting this model to the Analysis package or CAM package. Analysis task and NC program generation for manufacturing would be made easy by using 3D parametric modeling in combination with the Analysis package or CAM package respectively.

C. Nirav Rathod, et al. [3]:
The standard relations between the parameters of worms have been used to develop the parametric model of single start worm using Pro-E Wildfire 5.0. Relations and Parameters are first introduced in Relations table. By using different Pro-E tools, worm has been modeled. Regeneration is done by relating different dimensions of model with the
standard equations. A large variety of worm models can be created using the parametric model developed here by modifying the values of user defined parameters. The individual regenerated models can then be directly imported for the finite element analysis as well as kinematic and dynamic analysis.

D. C. Machado et al. [4]:
In their work they describe the dynamic behavior of ball bearing using analogies with stiffness gives good result with hertz’s model also describe that load distribution of the ball bearing is determined by the choice of the mechanical model and there future scope they represent that simulation result will be compared with experimental measurements.

E. Randy H. Shih [5]:
In their work main objective of that to create simple extrude solid models give the basic understandings of the parametric modelling process. He also focus on how to create 2D sketches and also represent different techniques to create 3D sketches. He enclosed the idea of ‘shape before size approach’. He also give the idea of dynamic viewing commands and how to create and modify parametric dimensions.

F. Zhuming Bi [6]:
In this paper the experience of incorporating parametric modelling methodologies in a computer aided design course are introduced and he focus on fundamentals of solid modelling incorporate design intense in modelling process effectively and basic skill of create solid modelling by CAD Software. Main key feature of this paper are parametric modelling, design intent, intelligence of CAD software tool and simulation and finite element analysis.

G. K.C. Sabareesh et al [7]:
Mainly shows that how to create 3 dimensional model of product which can be used for analysis purpose to optimize the design and then put into production and their area of research automation of this feature creation operation on cad package by integrating it with a programming language using and application programme interface(API). This will helps in reduction of modelling time compare to traditional method. The interface develop for this paper was for pro engineer wildfire 5.0. And he shows that through c programming using the API pro tool kit which comes standard in pro engineer.

H. Deshukh Akshay Vagantrao et al [8]:
Give the knowledge on creo elements customization and also use pro tool kit for the many operation and give idea about how to using parameters and the relationships in the modelling in CAD modelling pacakges and give the function of c programming for modelling. In the paper they have decided to implement the customization of CAD software Creo Elements/Pro, formerly known as Pro/ENGINEER, an integrated 3D CAD/CAM/CAE solution created by Parametric Technology Corporation (PTC).This will beneficial to reduce the time of designer while assembling a product.

I. R. K. Abdel et al [9]:
He is working on CAD system for building a Die – set. They discuss and give ideas about how to build system using visual basic (VB) interfacing with AutoCAD . It shows how integrated between selection of die set of the blanking die and the automatic design of the die set to be useful. The proposed CAD system is prepared to work as a standalone or as a subroutine for a blanking die design CAD system. It saves time in Die-Set design operation from hours to minutes.

J. J Sankar et al [10]:
In this paper they describe how to customization (automation) of design task in solid modelling with pro engineer can be approached by means of MS-Excel macros under the windows operating system & with basic visual programming. They also use the parameter and the relationship for the designing different model using pro engineer software through different interface for automation. Data from Excel is transferred to Pro/ENGINEER via Excel Visual basic, Component trial file, and Pro/Program to update the solid geometry, which improves the Automation of Product design.

K. Peipei and Lufeng [11]:
Represented the development of parametric design of gear shaft based on Pro/E's designing concept and visual C++ 6.0 as a developing environment. For parametric design of gear shaft, 3D model is created first and corresponding model’s database is generated then a visual interface is built by using visual C++. Finally using dynamic link, the system will regenerate the model according to new parameters by Pro/Toolkit.

L. Pandiyarajan et al. [12]
Determined contact stress of large diameter ball bearings using analytical and numerical methods. In analytical method stress was found out using the Hertzian elliptical contact theory. A MATLAB code has been generated based on the Hertzian equation in analytical method. Then bearing has been analyzed in ANSYS for contact stresses which gives the location of maximum stress and both the results are compared.

M. Stefan et al. [13]:
The bearing model was employed to create a static structural analysis used to deter- mine the size of stress between the components of a rolling bearing by. Based on this analysis the maximum load the bearing can repeatedly endure could be determined. The aim was to detail a method allowing the stress analysis of rolling bearings under equivalent loads higher than 0.5 times the basic dynamic load capacity. Stress distribution analysis, coupled with knowledge of operating conditions, inner construction of the bearing and load conditions can help to predict the service lifetime of the rolling bearing and can subsequently be used to optimize construction thereof. The combined study of taper roller bearing along with supporting structure has been done by Patrick. The lamina method, as implemented by spring elements in a finite element model of a crowned cylindrical roller, provides contact distribution results within 1:7% of theoretical values.
N. Kutlay Aksoz [14]:
gives details of theory on dynamic analysis used in ANSYS. They present the moving load problem on beams which forms the basis of the hydraulic cylinder dynamic analysis. They also represent the vibration response of the simple supported beams with and without elastic foundation to a moving single point load for finite element vibration analysis. They provides the details of the dynamic modelling of the hydraulic cylinder and enclose the basic knowledge on geometry and finite element model of the cylinder.

O. Michael D. Ernst et al [15]:
He works on two sets of observation relating static and dynamic analysis and give the idea of how to researcher need to erase the boundaries between static and dynamic analysis and create unified analysis that can operate in either mode or in a mode that blends that straight the both approaches. This paper has listed some widely-recognized distinctions between static and dynamic analysis, notably soundness versus precision

P. R.K.Purohit et al [16]:
In this paper the radial and axial vibrations of rigid shaft supported ball bearing are studied also focus on the formulation the contacts between the balls and the races are considered as no linear springs whose stiffness are obtained by the elastic contact deformation theory. They develop analytical model of the rotor bearing system to obtain the nonlinear vibration response due to varying the number of balls and pre load.

III. CONCLUSION

All research paper are in the direction of how to implement the CAD packages for the modeling and analysis of complex geometry and concept of parametric modeling by interfacing MS Excel, the C Programming and Visual Basic”(VB). From all the paper I conclude that the concept of interfacing is easier and time consuming as compare to traditional method. Analysis task and NC program generation for manufacturing would be made easy by using 3D parametric modeling in combination with the Analysis package or CAM package respectively. Bearing automation can further be proceeded by exporting this to the Analysis package or CAM package.

REFERENCES

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