Customization of 3D CAD Model For Piston Fixture Using NX Software

Mr. Pratik.S.Koli, Dr. S. K. Patil

Abstract- Parametric modeling(customization) involves variation of parameters. Parameter variation for simple object does not pose problem, but as model becomes complex it responds irrationally with parameter change. Parametric modeling is well developed technology to utilize previous design to develop new design by varying parameters. It is design reuse technique. Parametric modeling has made product development phase quick and efficient.CAD feature command i.e. extrude, revolve, slot etc. are itself parametric entity which accelerated design process. Nowadays, advancement is that industries are using the customized CAD software's for their products. Here also provided a detailed literature review about parametric modeling.

Keywords- 2D drawing,3D CAD modeling ,flowchart, journaling, NX open API, visual studio

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1 INTRODUCTION

In current competitive environment, it is very important that time to market for any product must be shorter and which is dependent upon design of product. Enterprises over the world are using CAD software's according to their product instead of using pencil, drafter, eraser and large sheets. Nowadays, advancement is that industries are using the customized CAD software's for their products. For industries it is necessary to launch innovative products or existing products as quick as possible to sustain in the global competitive world. Generally 80% of time is wasted in design process in overall product development cycle. Lot of time can be saved in the design stage. Modeling of parts is widely used for generation of manufacturing drawings. Modeling is midway between product concept and manufacturing. During the creation of 3D model user is impatient to do repetitive task and thousands of mouse clicking, also draftsman require large skill of modeling software. To avoid these problems and to speed up cycle time from product design to manufacturing automation of part modeling CAD software is required. CAD software is required for the modeling the part, but instead CAD software can use parametric modeling concept. Piston is used for each and every vehicle. There is requirement of different sizes and shapes of Pistons.

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Fig.1 Piston Spigot And Clamping Pin

Jorge D. Camba[1], an analysis of formal CAD modeling strategies and best practices for history-based parametric design:

Delphi's horizontal modeling, explicit reference modeling, and resilient modeling. Aspects considered in our study include the rationale to avoid the creation of unnecessary feature interdependencies, the sequence and selection criteria for those features, and the effects of parent/child relations on model alteration. We provide a comparative evaluation of these strategies in the form of a series of experiments using three industrial CAD models with different levels of complexity. We analyze the internal structure of the models and compare their robustness and flexibility when the geometry is modified. The results reveal significant advantages of formal modeling methodologies, particularly resilient techniques, over non-structured approaches as well as the unexpected problems of the horizontal strategy in numerous modeling situations.

MonedroJ.[2], Basically two type of research started for development of this field. One is variant programming by using programming step becoming absolute now. Second is graphic generation/interactive method in which user has freedom for modification of dimension & constraint after the

model has been created. Describe the evolution of parametric design technique. Terms related to parametric modeling like constraints, relation & their usefulness to form the feature of model are discussed. Macros are recording script of a command & data values used

create model. By editing the script one can change the model/redesign in the same model.

YannickBodeinet. al[3], Today parametric associative CAD systems must help companies to more efficient virtual development processes. While dealing with complex parts (e.g. the number of surfaces of the solid) no CAD modeling methodology is exists. Based on the analysis of industrial designers' practices as well as student practices on CAD, He identified key factors that lead to better performance. His objective in that article is to propose a practical method for complex parts modeling in parametric CAD system. An illustration of the performances and the results obtained by this method are presented comparing the traditional method with the proposed one while using an academic case and then an industrial case.

2 3D CAD MODELING AND CUSTOMIZATION PROCESS FOR PISTON SPIGOT BY USING NX SOFTWARE

NX Modeling application allows us to perform both the tasks of parametric modeling and 3D free-form surface modeling. Parametric Modeling Under the NX Modeling application, a variety of tools are available for the creation of 2D and 3D wireframe models, and associative feature-based solid models.3D Free-Form Surface Modeling We can also perform more complex-shape modeling tasks, such as the creation of complex surface and solid models..

The Sketch Curve toolbar provides tools for creating and editing of the basic 2D geometry, construction tools such as Line and Circle, and editing tools such as Trim and Extend. The Profile tool allows us to create lines and/or arcs that are joined together.
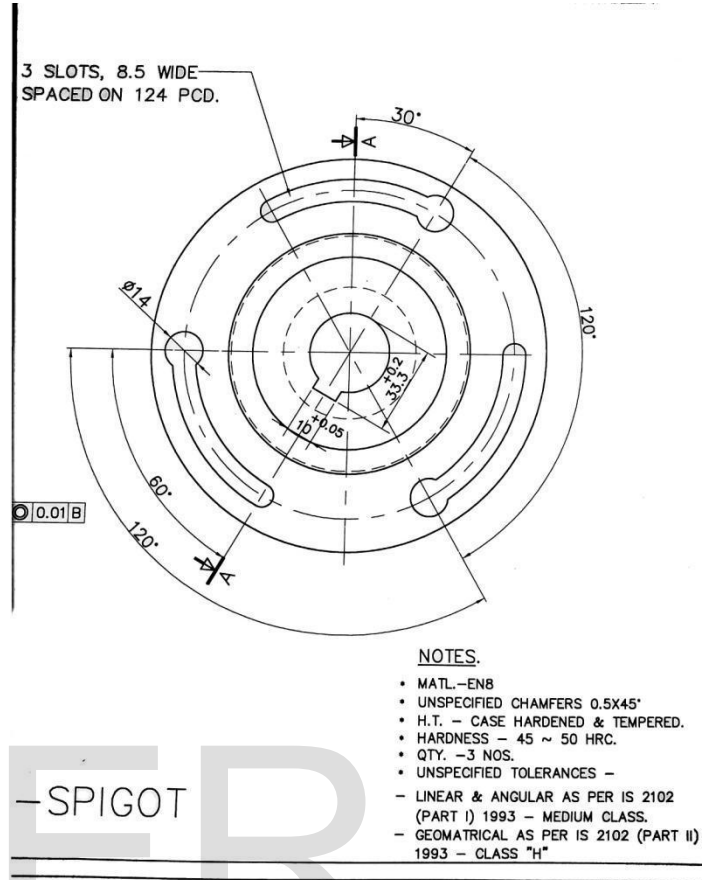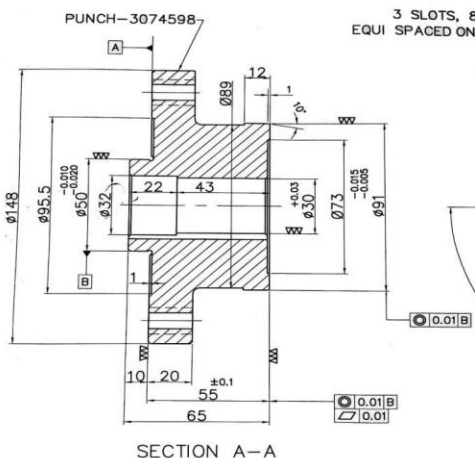
2.1 2D Drawing Of Piston Spigot:

Fig.2 2D drawing of piston spigot

The feature-based parametric modeling technique enables the designer to incorporate the original design intent into the construction of the model. The word parametric means the geometric definitions of the design, such as dimensions, can be varied at any time in the design process. Parametric modeling is accomplished by identifying and creating the key features of the design with the aid of computer software. The design variables, described in the sketches and described as parametric relations, can then be used to quickly modify/update the design.

2.2 3D CAD Model of Piston Spigot:

UGS NX provides many powerful modeling and design-tools, and there are many different approaches to accomplishing modeling tasks. The basic principle of feature-based modeling is to build models by adding simple features one at a time. In this chapter, the general parametric part modeling procedure is illustrated; a very simple solid model with extruded features is used to introduce the UGS NX user interface.
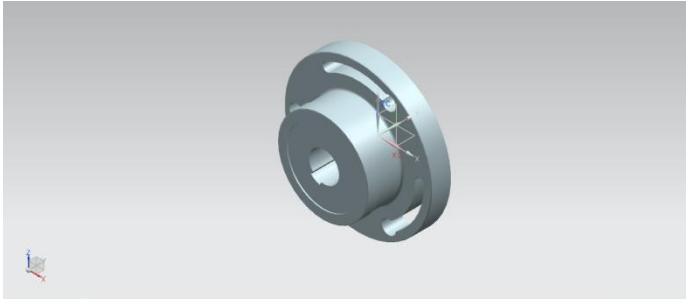
Fig.3 Piston spigot (Isometric)

The approach of creating two-dimensional sketches of the three-dimensional features is an effective way to construct solid models. Many designs are in fact the same shape in one direction.. Most engineers and designers can relate to the experience of making rough sketches on restaurant napkins to convey conceptual design ideas. This method also conforms to the design process that helps the designer with conceptual design along with the capability to capture the design intent.
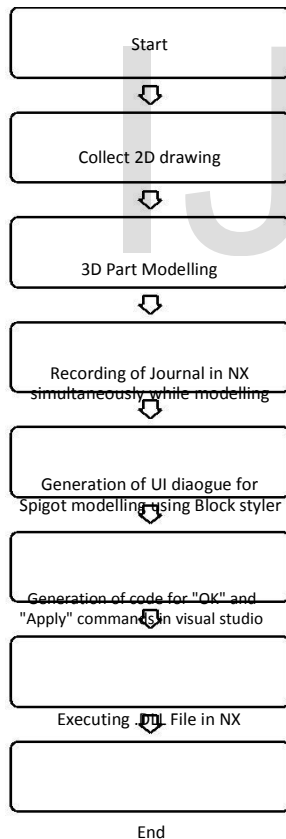
2.3 Algorithm

Fig. 4 Flowchart for spigot customization

• *Journaling:*

The Journal capability is a rapid automation tool that records, edits and replays interactive NX sessions. Based on the programming language Visual Basic .NET and C#, it produces a scripted file from an interactive session of NX which can be run at a later time to replay the session.
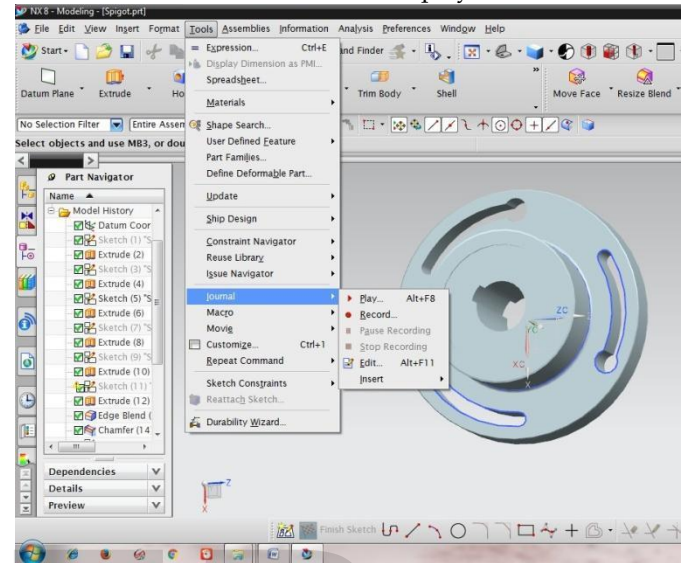

Fig. 5 journal recording in NX

These sessions can be edited and enhanced with simple programming constructs and user interface components to produce a rapidly generated customized program. Journal files can be used as a basic technique for automating repetitive workflow. Because journals are based on the Common API, they can be used as a template for working automation code in any of the supported automation languages.
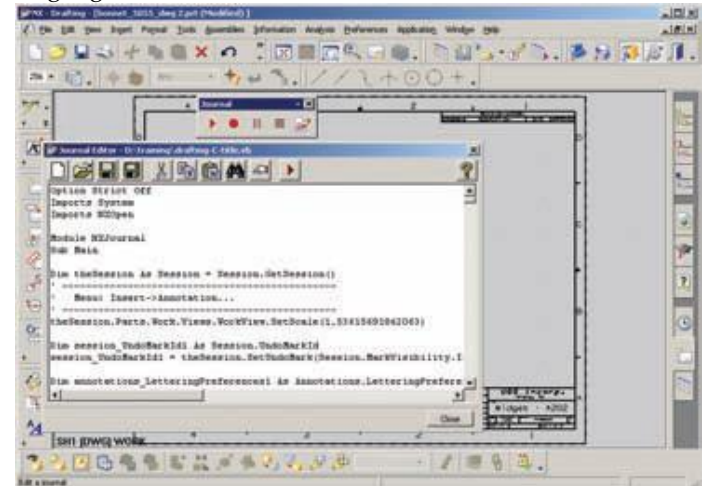

Fig. 6 Journal editor

☐ NX Open Common Application Programming Interface (API):

The new Common API offers the following features:

Language support– Provides a native.NET API that supports VB, .NET and C#. The Java and Open C++ APIs support the full range of Common API capabilities.Custom programs using NX Open for Java API can utilize any of the industry standard Java IDEs for application development.
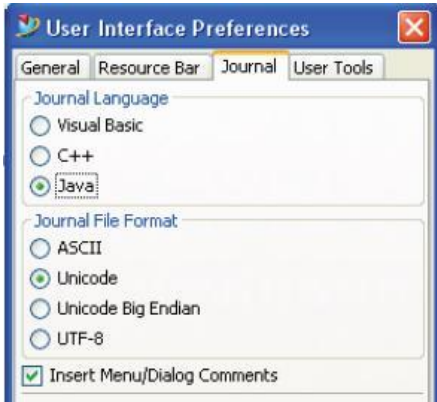

Fig. 7 User Interface Preferences

The NX Open API is very rich and deep — it has thousands of available functions. This richness sometimes makes it difficult to find the functions you need. Fortunately, if you know how to use the corresponding interactive function in NX, the journaling facility will tell you which NX Open functions to use, and will even write some sample code for you. You choose Tools -Journal -Record -to start recording, run through the desired series of steps, and then choose Tools - Journal -Stop Recording. The code generated by journaling is verbose and is often difficult to read. But it's worth persevering, because hidden within that code is an example call showing you exactly the function you need. You can indicate which language should be used in the recorded code by choosing Preferences - User Interface -Tools -Journal. The available choices are C#, C++, Java, Python, and Visual Basic.

- User Interface Styler

The User Interface Styler lets Unigraphics users and third Ć party developers generate Unigraphics dialogs. The User Interface Styler is a development tool that:

- Provides a visual builder that allows a developer to correctly build Unigraphics dialogs and generate a User Interface Styler file (with a.dlg extension) that encapsulates the code associated with creating a dialog without requiring comprehensive knowledge of the underlying Graphical User Interface (GUI). The User Interface Styler API insulates the application programmer from the specifics of GUI programming while providing the look and feel of Unigraphics dialogs.

- Reduces development time because of the visual builder and automatic User Interface Styler file generation.

- Allows you to rapidly prototype a dialog by selecting objects such as pushbuttons, toggle buttons, etc. from an object palette list.

- Allows you to select your own user defined bitmaps.

- Provides an attributes editor that allows you to set or modify the attributes of a particular object. For example, thestate of a toggle button is an attribute. The attributes editor enables you to specify a valid state for the toggle button (on or off). All of the attributes are conviently listed when you select an object from a list window.

 Provides context sensitive help for objects located on the User Interface Styler dialog. The bottom of the dialog window has an area that displays context sensitive information when you position the cursor over an icon. The User Interface Styler is compatible with UG/Open Menu Script and can be associated with an action in a UG/Open MenuScript • .men" file. Thus, User Interface Styler dialogs can be launched from a MenuScript menubar.
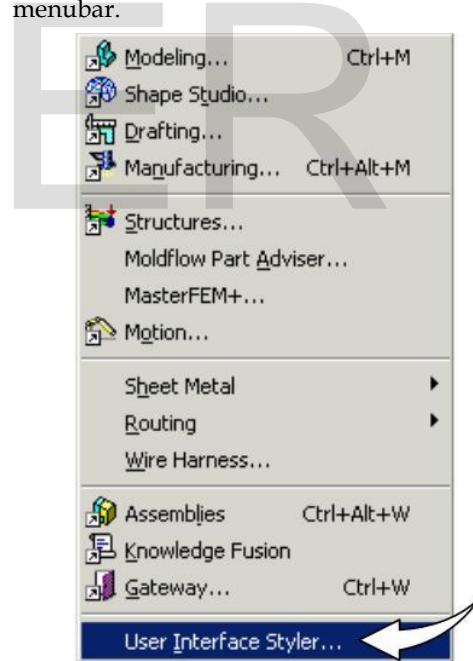

Fig.8 Accessing The User Interface Styler

Some Open API functions provide a programmatic interface to the User Interface Styler. These functions will be discussed later in this chapter. The functions are also described in the Open API Reference manual and prototyped in the uf_styler.h header file.

You can access the User Interface Styler directly

from the
Unigraphics. Application Pulldown menu
(Application→User
Interface Styler...). You are not required to have an open part.

- • Visual C++:
- • Creating a Project:

1. To create C++ programs in Visual C++, you have to first create a project. A project is like a holder that ties all the files together. Here are the steps to create a project:

2. Choose File, New, Project to display the New Project window.

3. Choose C++ under the Template and select Win32 Console Application in the middle column. Type book example in the

4. Name field and c:\smith in the Location field. Click OK to display the Win32 Application Wizard window.

5. Click Next to display the application settings window.

6. Select Console application in the Application type section and check Empty project in the Additional options section. Click Finish to create a project.
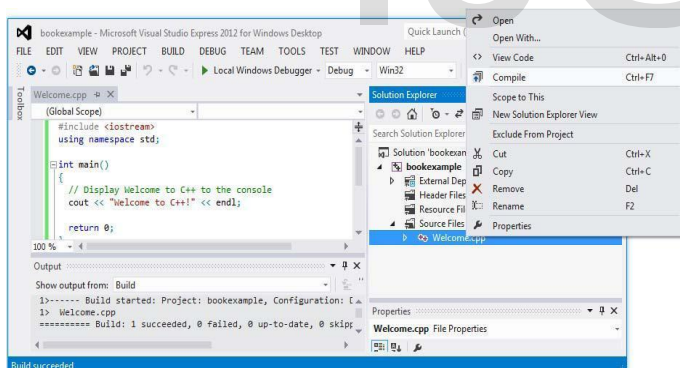
- • Creating a C++ Program:

Fig. 10 Compiling C++ program in VS2012

After you create a project, you can create programs in it. Here are the steps to create a C++ program for Listing 1.1:

1. Right-click the book example project in the Solution Explorer to display a context menu. Choose Add, Add New Item from the context menu of the book example project to display the Add New Item window.

2. Choose Code under Visual C++ on the left column and C++ File (.cpp) in the middle column. Enter Welcome in the Name field and c:\smith\bookexample\bookexample in the Location field. Click Add to create the file.

3. Enter the code for Welcome.cpp exactly from Listing 1.1.

4. You can open the Add New Item window from the project's context menu.

3 RESULTS
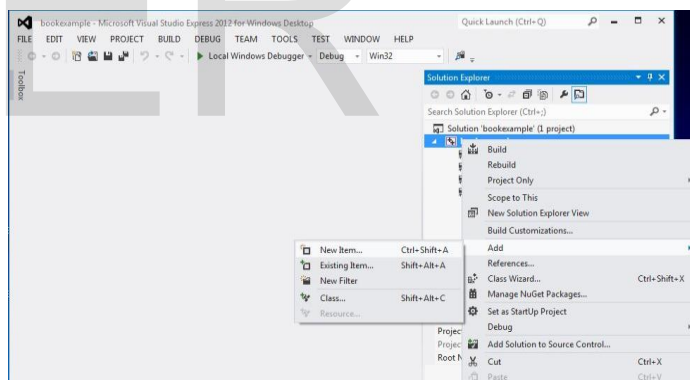**Input parameters required for piston spigot**

Fig.9 Creating new project in VS2012

- • Compiling a C++ Program:

After you create a program, you can compile it. You may do so by choosing Build, Compile, or press Ctrl+F7, or choose Compile in the context menu for Welcome.cpp. Choose the Compile command to compile the program.

Modeling time comparison for piston spigot

	Piston spigot	Time req. After customization(s)	Regular Time (s)	Time saving(%)
1				
	Expert Person	20	210	90
	New Person	40	250	87
	Average time (s)	30	230	84

4 CONCLUSION

From above paper we can conclude that the use of customization in designing product is fast and helpful way because of the changing market condition and customized requirements from customer. The product can be customized as per the requirement of customer in various ways depending upon suitability of the design application(software) being used. T his customization also helps in reduction of product design cycle time and also redesign time based on manufacturing requirements in some cases. customization allows product designer to design products by defining parametric relationship and then use of parametric modeling.

ACKNOWLEDGMENT

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