

COMPARATIVE STUDY OF ADVANCED MODELLING CONTROLS PRESENT IN DESIGN SOFTWARE

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ABSTRACT

The paper aims to present a comparative study of "Loft" control command or equivalent controls that are found in the following design software: Mechanical Desktop 6, Inventor 2011, Solid Edge and NX 7.5 SIEMENS v. 20. In other words, all variants of the command are studied comparatively and the features of each of them are highlighted.

KEYWORDS: CAD, Mechanical Desktop 6, Inventor 2011, Solid Edge v. 20 si NX 7.5

1. INTRODUCTION – DESIGN SOFTWARE

The evolution of the design software widely applicable in the world of PC users had a great boom after 1987 when the hardware made a great jump by shifting to Pentium I and Pentium II. Early versions of the design software were merely drawing software, which replaced the pen with various drawing controls. From a personal point of view, true design software should allow for parameterized work, meaning allowing for changes to be made in a very short time and also the ability to integrate file formats into other complementary software to perform finite element analysis, simulation of production and why not, follow the entire product life. For example, AutoCAD has become the most popular software worldwide, but this does not mean it is the most powerful as well. It became so popular because it was designed to run on PCs of weaker configuration and also it has not taken additional anti-piracy measures, which allowed for its "spreading" on all continents of the Earth. Unlike this software, other software were oriented to graphics station users, which were much less used to develop more complex projects and also enjoyed the ability of this software to provide three-dimensional parameterized models. Over time, major differences in performance between a PC

and a workstation graphics were much reduced, which made software design adapt to this new situation, in that current versions are addressed both to PC users and to fixed and mobile graphics station.

With the development of computer systems, there has emerged a range of software dedicated to the design and manufacture which significantly shortened the time required for these operations. But it was not enough, in addition to direct activities related to product design and development, there are many other activities that relate to the production process (planning, quality, information management, etc.) for which concepts and software tools had to be developed. Thus the concept of PLM - Product Lifecycle Management emerged, which includes all information and elements involved in product development [1].

For better information management, the design applications have reached a certain level of complexity that allows them to track the product throughout product life, which entitles us to conclude that some of these applications do comply with the concept of PLM - Product Lifecycle management. In this fierce competition between software companies, some of them managed to cover a multitude of stages in the evolution of a product, starting with geometric modelling, through simulation of processing on CNC machines and ends with the documentation management over the product

lifetime.

Business factors such as ever-changing product requirements, increasing competition by smaller and faster competitors and fewer resources, require companies to continuously adapt their business strategies. In the past, companies focused primarily on product innovation, but in the current environment of global competition, under unprecedented pressure in terms of cost, successful manufacturers employ digital manufacturing technologies to optimize their manufacturing operations in terms of time, cost and quality.

2. PRESENTATION OF "LOFT" CONTROL IN MECHANICAL DESKTOP 6

Mechanical Desktop is a 2D/3D design software developed by company Autodesk Ink in 2002 that deserves special attention because it works on PCs of lower configuration but providing remarkable modelling results. I say this because it is one of the few types of software at this point able to make bi-univocal correspondence between the spatial modelling and drawing. The "Loft" control requires in an earlier stage two sketches located in different planes of "Work Plane" type. The working window shown in Figure 1 highlights both the previously defined two sketches, one of a circle type and the other of rectangle type, and set all the parameters that define the control.

One can easily see that the parameter "Type" controls the generation of solid state. Selection of "Cubic" option will produce a body of the type shown in Figure 2 while selection of "Linear" variant will result in the body shown in Figure 3. The third option involves the selection of three sketches in different planes. It should be noted that despite the software age, graphical results are notable. First the control enables advanced settings even with current software and last but not least, benefit from opportunities to redefine quick preview, without requiring significant resources from the graphics card.

Also of particular importance is the secondary window on the right side of the general window, which indicates in a simplified manner the geometric shape of the body to be generated, depending on the parameters imposed by the designer. In case the result is not the expected one, it should be made double click in the browser of the left windows shown in Figures 2 and 3 and reopen the window with the settings for "loft" control which allows for modification of input data.

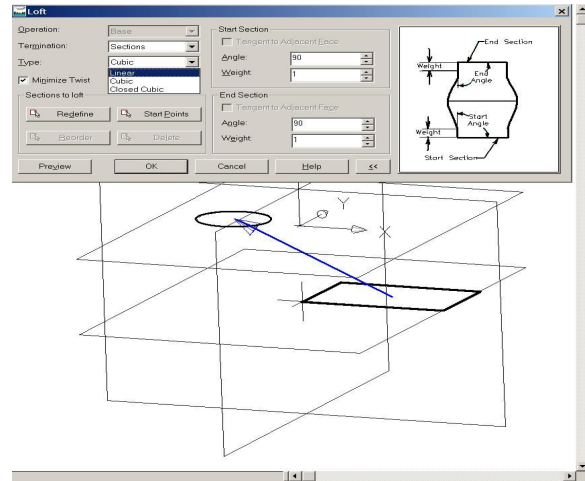


Fig. 1 "Loft" control defining parameters

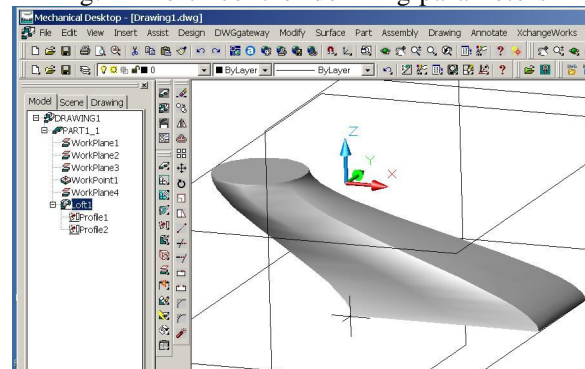


Fig. 2 "Loft" result with "Cubic" setting

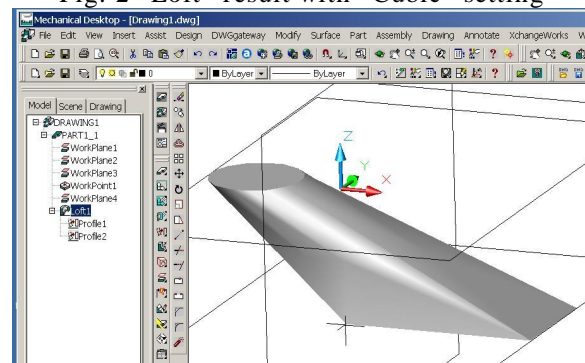


Fig. 3 "Loft" result with "Linear" setting

3. PRESENTATION OF "LOFTED PROTRUSION" CONTROL FROM SOLID EDGE V. 20

Although Solid Edge version 20 software is more recent than version 6 of the Mechanical Desktop, it is clear that the possibilities of setting the start and end parameters of the "Lofted Protrusion" control are more limited. First, in the case of Solid Edge, it is not provided a window to suggest for beginners the final form taken by the body being generated based on the parameters imposed [3]. As shown in Figure 4, setting possibilities are presented as buttons, in a horizontal row, which can be accessed in order from left to right. It should be noted that the button which is active at a time is

orange. As regards the start or end section, it cannot be set the distance where those ends can observe a certain angle to the drawing plane as with Mechanical Desktop. In Figures 5 and 6 there are variants of bodies which can be obtained from normal or natural end sections. As a preliminary conclusion, I can say that application of "Loft" control in Mechanical Desktop as compared to "Lofted Protrusion" in Solid Edge provides more possibilities of setting parameters that define the three-dimensional model being generated.

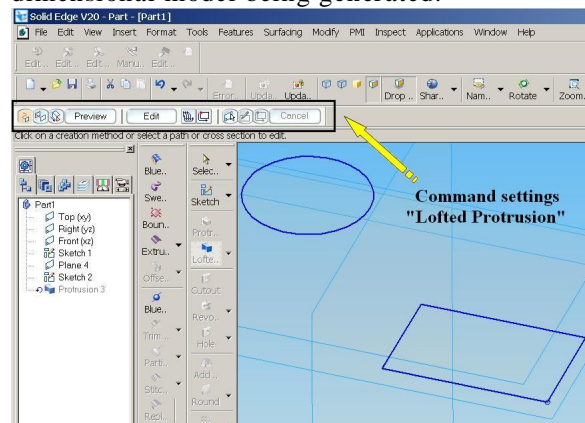


Fig. 4 Set order "Lofted Protrusion"

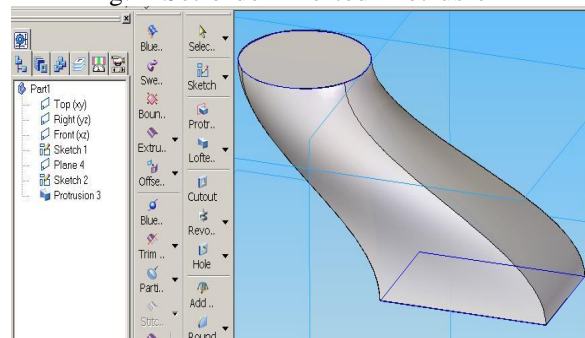


Fig. 5 Result sections for "Normal"

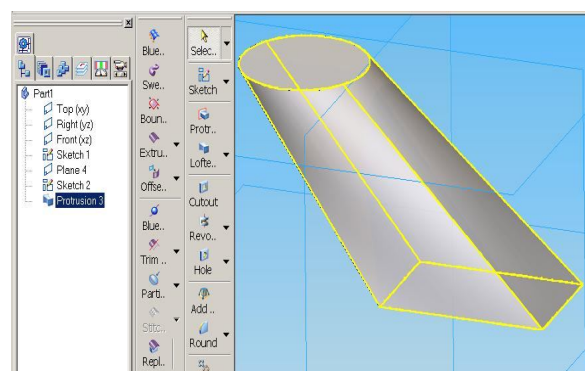


Fig. 6 Result sections for "Natural"

4. PRESENTATION OF "LOFT" CONTROL IN AUTODESK INVENTOR 2011

Analyzing the application of "Loft" control in the Autodesk Inventor software reveals a high similarity with Mechanical Desktop

software since both are created by the American company Autodesk Inc. Inventor seems superior chronologically; "Inventor" is more recent. Also in case of Inventor the control is better structured by related settings and allows much easier definition of the plans containing the two sketches referred to earlier in this work. Figure 7 illustrates the result for the home version of both normal start and end sections complying with the normal length of 5 units.

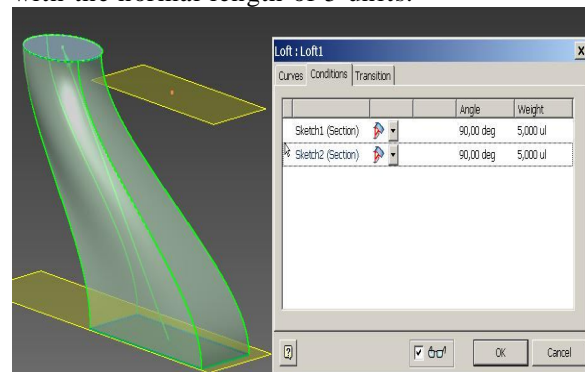


Fig. 7 "Loft" in Inventor

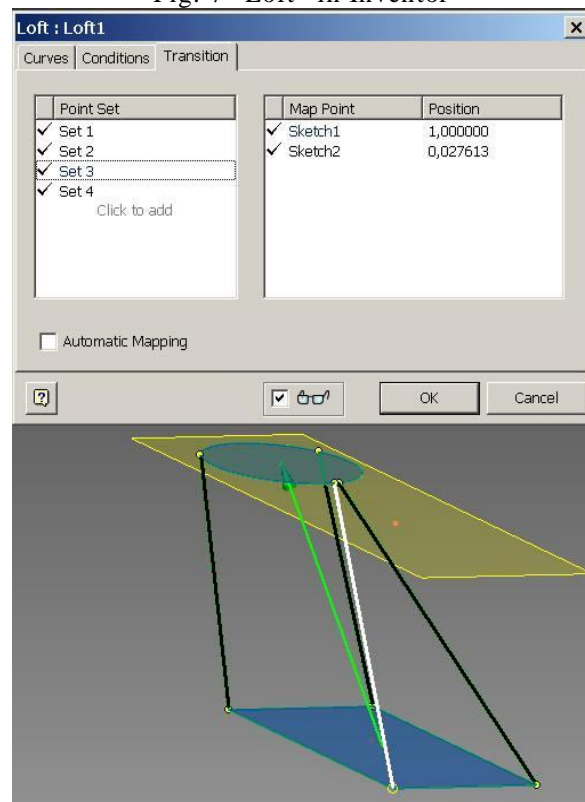


Fig. 8 Point modification of network

2011 Inventor's superiority is due to the fact it allows to modify the shape by editing the points defining the wire network of the resulting three-dimensional model. In Figure 8, the label "Transitions" shows four sets of points that define the network of wire that has been modified manually. The final result is shown in Figure 9 which, when compared to Figure 7, shows a totally different geometry.

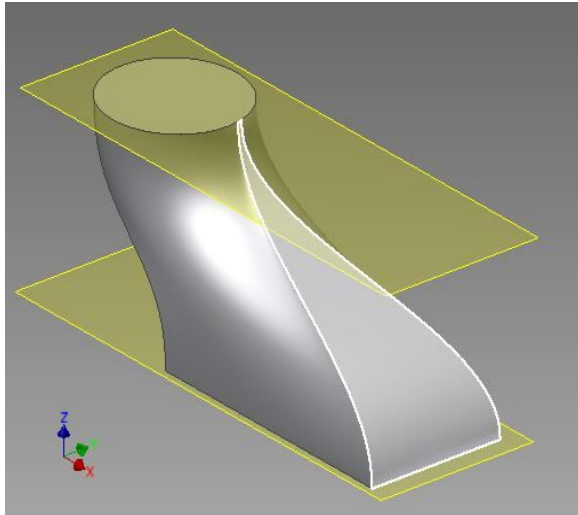


Fig. 9 Point modification result

5. PRESENTATION OF “THROUGH CURVES” CONTROL IN NX 7.5

The set of NX 7.5 design solutions allows for simulation of the entire manufacturing process, while maximizing the efficiency of individual steps that make up this process [2]. Among such solutions, which include several stages of design, NX provides the best functionality for CAD, CAM, CAE, PDM, for all lines of product development.

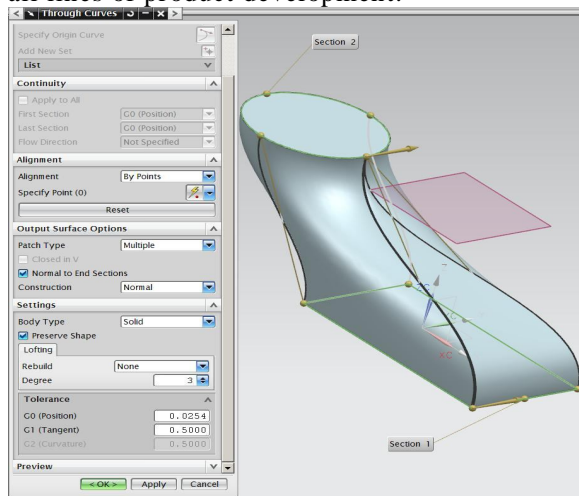


Fig. 10 “Through Curves” control setting in NX 7.5

In the framework of this software the equivalent of “Loft” control is “Through Curves” whose dialogue box presented in Figure 10, contains the following sections: “Sections”, “Continuity”, “Alignment”, “Surface Output Options”, “Settings”, “Preview”. Just as with Inventor, designers can select whether the 3D object is solid or of “Sheet Metal” type.

6. CONCLUSIONS

The comparative analysis of “Loft” control to generate solid bodies indicates very clearly, from the results presented so far, that NX 7.5 version allows for the setting of many parameters and also multiple opportunities for the rapid selection of points that define the wire network. We should not forget though the purchase price of such design solutions as it strongly attenuates the differences in performance between NX 7.5 and Inventor 2011. Finally we should mention that the analysis remains open for other controls specific to the mechanical design.

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