

COMPARATIVE STUDY OF THE COMMANDS FOR "PATTERN" DUPLICATES WITH MISCELLANEOUS DESIGN SOFTWARE

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ABSTRACT

The paper aims to present a comparative study of the multiplication command of "Pattern" type or its equivalent that is found in the following design software packages: Mechanical Desktop 6 and Autodesk Inventor 2011. In other words, all variants of the commands that will produce duplicate entities are comparatively approached highlighting the features of each of them.

KEYWORDS: CAD, Mechanical Desktop 6, Autodesk Inventor 2011

1. GENERAL CHARACTERISTICS OF 3D FEATURES MULTIPLICATION COMMANDS

Multiplication of 3D geometric entities has emerged as a necessity along with the development of three-dimensional design software.

This new ability to work in 3D space should not be confused with copying multiple solutions in two-dimensional space offered by any drawing software. In this connection one can mention the command "Array" within AutoCAD [2] which in the 2D space allows for a multiplication of selected entities by either in matrix or polar variant.

Basically this command means to copy multiple selected entities and their arrangement either on a matrix consisting of a preset number of columns and lines, or along a circle of preset radius and center. Multiple copying results can be modified in the sense that each entity can be resized by quotas. Unlike this case, the variant of multiplication by creating duplicates prevents editing each entity separately, resulting in the end, because they automatically assume the original entity size selected. This is the main advantage of the commands of

"Pattern" type plus the possibility offered by some software to perform a multiplication along a curve or around an axis defined in space. It should be noted that this dimensional dependence between the 3D resulting features and the initial one is maintained in the execution drawing too, meaning that if one change the original entity parametric quota/size, this change is transmitted automatically or after an update applied to all orthogonal and axonometric projections.

2. STUDY OF COMMANDS MAKING DUPLICATES OF "PATTERN" FROM MECHANICAL DESKTOP 6

Multiplication ordering by creating duplicates can be made only after the initial three-dimensional geometry was made by one of the commands "Extrude", "Revolve" and "Loft". So far none of the versions of the command "Pattern" is active in the "Browser" or pull-down menu denoted „Part“.

Ordering the command for making duplicates shown in Figure 1 is made by clicking the right mouse button on the geometric feature to be multiplied and

subsequent selection by mouse left button of one of the following multiplication variants: rectangular, polar or axial multiplication.

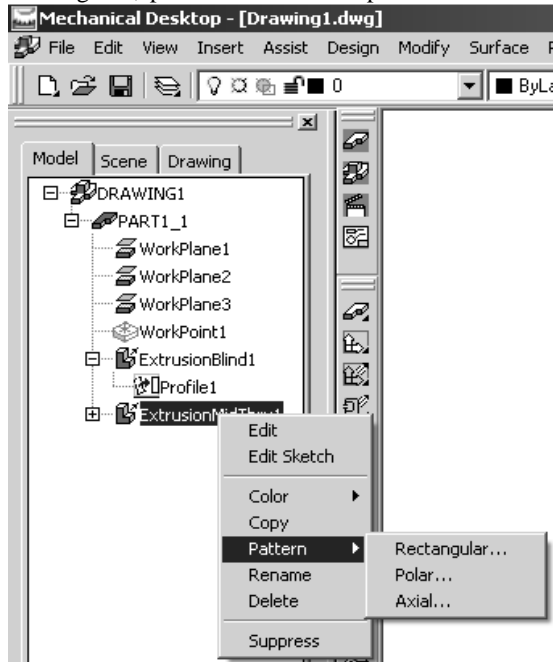


Fig. 1 Launching command "Pattern"

As shown in Figure 2, the window which opens to rectangular multiplier option has two labels, one "Pattern Control" and the second "Features". The first option is the most important and allows the geometrical configuration parameters to be set as follows: set the number of columns or rows, the carrier matrix lines, set the number of entities arranged on the matrix axes and the angle between the axes. One can also choose to preset the distance between columns or rows and the number of entities arranged over a certain length, one can also change the layout sense by one of the following buttons:



It should be noted that the application of the command allows suppression of a multiplied feature, in the sense that the matrix structure obtained may be incomplete. The last consideration I would like to underline about the window "Pattern Control" refers to the possibility to select the direction of axis alignment called „Rows" by selecting an edge that belongs to the entity already modelled, when accessing the command. If it is found that initial selection was not done correctly in that not all desired entities have been selected, the second label of the above mentioned window is accessed, namely "Features" variant, in which the user can add new entities, or delete the entities initially selected.

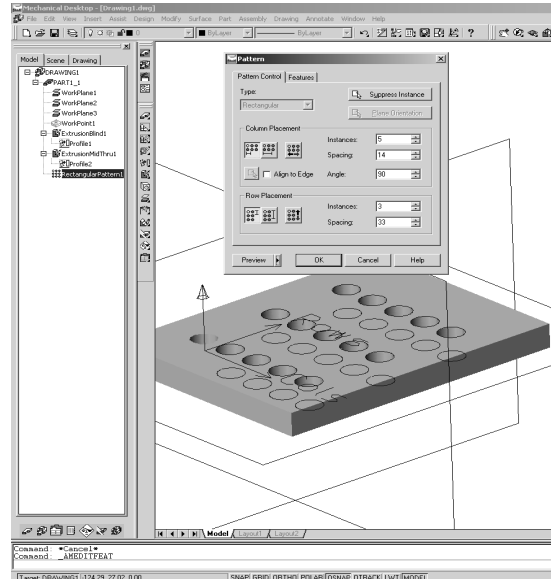


Fig. 2 The rectangular multiplication window

Additionally this command allows real-time preview of the result to obtain if checked the "True Preview" and "Dynamic Preview" options that are hidden behind the "Preview" button.

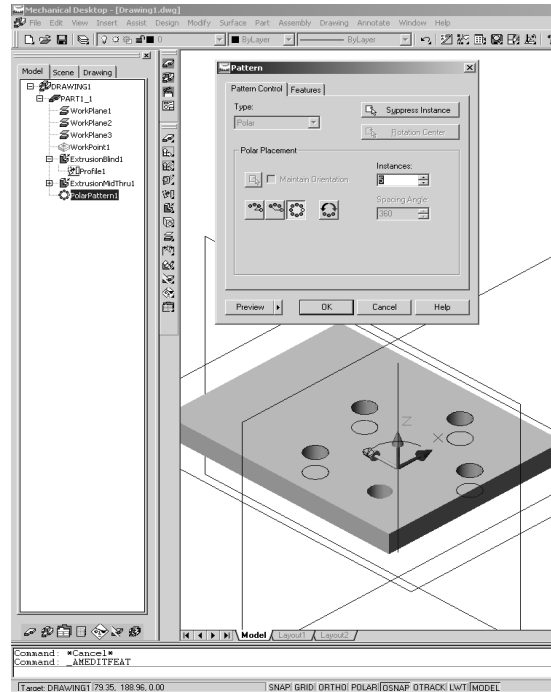


Fig. 3 The polar multiplication window

As regards the polar multiplication window, shown in Figure 3, it must be said that the dialogue on the command line starts with choosing the axis around which multiplication is performed (or choosing a work station), then a window is opened where the user determines either how many entities must emerge and

among which there should be a set center angle, or determines the number of entities that will result in the end extend a random angle at the center or an angle of 360^0 . It should be noted that the launch of one of the variants of multiplication (rectangular, polar or axial) allows for changing the original option and choosing a new one.

From my point of view the most spectacular version of the multiplication command of "Pattern" type is the axial multiplication because it is based on polar multiplication adding the distribution of the entities selected on a cylindrical helix, as shown in Figure 4.

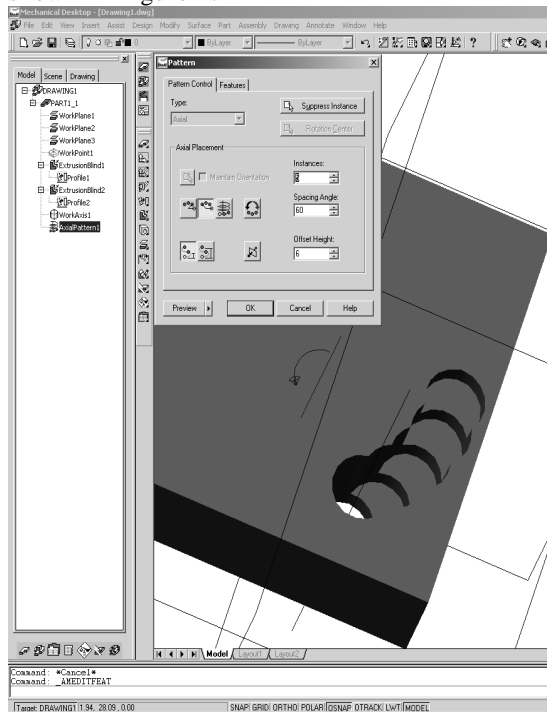


Fig. 4 The axial multiplication window

3. STUDY OF THE COMMANDS MAKING DUPLICATES OF "PATTERN" TYPE FROM AUTODESK INVENTOR 2011

The 2011 version of Autodesk Inventor software, as compared to its predecessor, Mechanical Desktop 6, contains a multiplication variant as early as in the sketches generation stage that actually achieves a similar effect to the traditional command "Array" from AutoCAD. Therefore it can be said that the results of applying the options of "Pattern" type are contextual by depending on the stage of the file being worked at. Launching the rectangular multiplication is done directly from the ribbon and opens a window like the one shown in Figure 5.

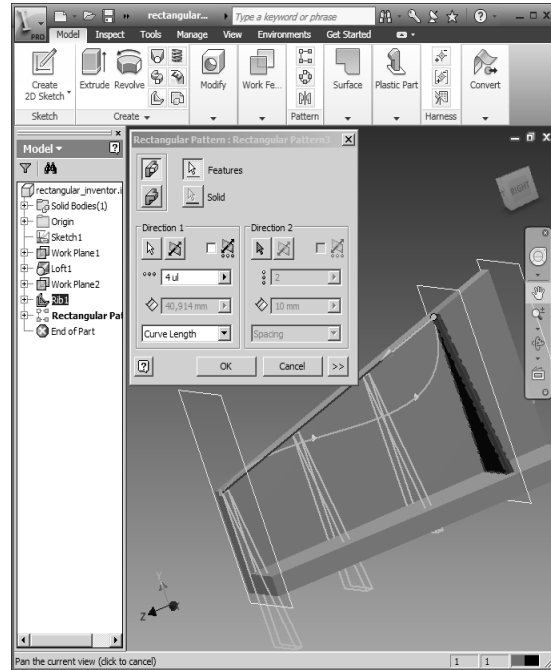


Fig. 5 Rectangular multiplication window

The related setting window is different from the one related to the Mechanical Desktop in that:

- ✓ It has different buttons to select both a geometrical feature and the solid body as a whole, as generated until a certain moment.

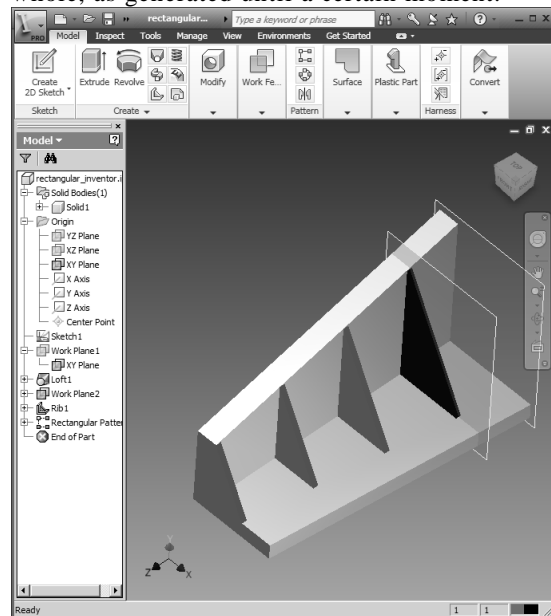


Fig. 6 Result of the multiplication of ribs

- ✓ It provides a much more efficient control of the two directions defining the multiplication matrix.

- ✓ It has the ability to multiply along a predefined segment length either by arrangement at equal set distances or by arranging a number of entities over a certain

length or multiplying the number of times along the entire length of a previously outlined segment.

✓ Depending on the selected item, the software also has certain amount of intelligence, meaning that if a rib is selected for multiplication along a single direction, equal, reduced or enlarged ribs will be obtained but which are similar to the original. This can be seen in Figure 5, where, even if the previewed ribs go beyond the horizontal wall of the bracket, at the end ribs are limited in space by both walls as illustrated in Figure 6.

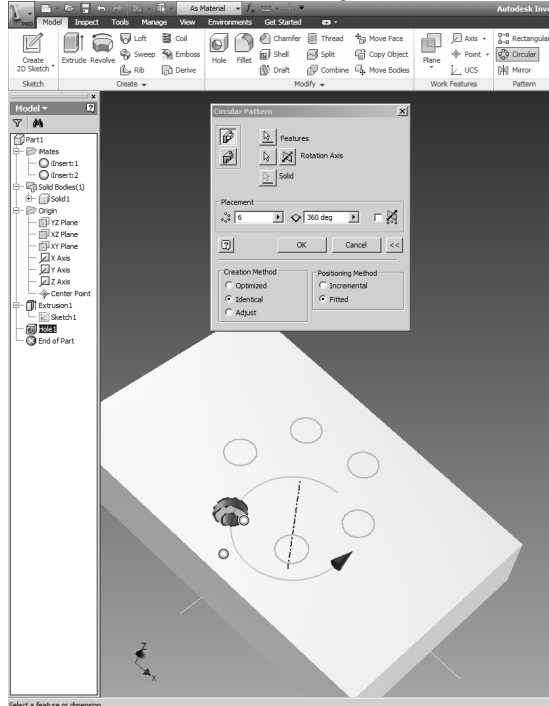


Fig. 7 Circular multiplication window

As regards the circular multiplication, this is similar to that in Mechanical Desktop 6, in the sense that, as shown in Figure 7, in the specific multiplication parameter setting window, the designer is able to establish the following:

- ✓ To select for multiplication either a 3D feature or the entire solid generated so far.
- ✓ To choose the rotation axis around which to perform the multiplication.
- ✓ To determine the number of entities resulting by the command "Circular Pattern".
- ✓ To establish the center angle subtended by the entities mentioned in the previous paragraph.
- ✓ To choose the method of generation and method of positioning of the elements finally reached

4. CONCLUSIONS AND FUTURE CONCERNS

Comparative studies conducted up to date [1], [3], between the two software packages, Mechanical Desktop and Inventor 2011, shows clearly the performance of the latter but in some sections to which belongs this study, one must admit that Mechanical Desktop has some options that make it superior to its own successor. Although multiplication command of Inventor are much more optimized than those of Mechanical Desktop, the second one, due to the axial multiplier option, which the former does not have, has an advantage on this issue. In the future, possibilities of multiplying other design software such as Solid Edge, Siemens NX or Solid Works shall be pursued.

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