Techsofts Perspectives

Alf Yarwood reports on a new 3D CAD package with a novel feature.

Techsoft, which has produced some excellent Computer Aided Design (CAD) packages for the BBC Master and for the Archimedes range, has recently published a three-dimensional (3D) wireframe drawing package for the Archimedes called Perspectives. Perspectives is the ideal tool for teaching the elements of orthographic projection and the basis of the co-ordinate geometry applied to CAD.

This package makes full use of all the usual Desktop features, and is fully multi-tasking. All drawing operations are performed under the control of the mouse from within the Desktop in the usual way.

PERSPECTIVES STANDARD SCREEN DISPLAY

When Perspectives is first entered, four views appear providing front elevation, side elevation and plan view in first angle orthographic projection, together with a perspective view in the fourth window. When required, this can be changed into a third angle layout, or any one of the four views can be enlarged so as to occupy the whole screen area. In addition, the perspective view can be changed from the menu to show isometric, cabinet, cavalier or oblique views. The scale of the views can be altered progressively by clicking on the Zoom Pictorial icon in the Toolbox, or by using the Zoom option in the main menu. Most of the Toolbox functions are duplicated via the menu system so that removing the Toolbox from the screen does not inhibit the choice of function available.

Fig. 1 shows the parts of the drawing screen when Perspectives is first started, with the two windows - Cursor Coordinates and Toolbox moved to positions on screen where they will not hide the drawing under

construction. Note that each view has a drawing origin central to the box formed by the three orthographic planes. The

Figure 1. Perspectives' four-view layout with Coord and Toolbox windows

drawing origin determines the position of the co-ordinate point X,Y,Z at (0,0,0). Co-ordinate units are not based on any particular unit of measurement, but will allow the user to determine a position in 3D space with respect to the central drawing origin.

Possibly the most interesting feature of Perspectives is its full-screen stereo image which is obtained by selecting the Stereo view icon of the Toolbox (or Stereoscopic option from the menu). When a 3D model has been constructed, it can then be viewed in true 3D with the aid of a pair of stereo viewer spectacles provided with the software package. The stereo view can be rotated around its axes on screen, and can

be zoomed in or out using the mouse. The stereo image can be further controlled with the function keys.

PERSPECTIVES TOOLBOX

Drawing constructions in any one of the four views, or in a full screen view, are carried out with tools, selected from a range of tool icons, arranged in the Toolbox window (see Fig. 2). As with all

Figure 2.
The Toolbox
functions

windows in the Desktop, the Toolbox can be moved to any convenient position on screen, can be either hidden behind the main screen or removed completely. As can be seen, most of the icons in the upper row of the Toolbox are drawing tools. Those in the central row are for processes. Three of the icons in the bottom row relate only to the pictorial view. However, the parameters for the process tools must be set by using the menu system (see Fig. 3).

To help in the accurate construction of a 3D model there is a Grid pattern (size selectable by the user) which can be invoked when required), and a Snap system which can be set from 1 unit upwards allowing objects to be locked on to Snap points.

The Select tool is probably the most important. Any part of a drawing, in any view, can be selected and acted upon by any one of the processes - Rotate, Scale, Mirror, etc. In Select mode either a single vertex may be selected, or a group of vertices by dragging a box around them. However, this process does seem to lead to excessive redrawing of the object in its four views.

When a process icon is selected, only those parts of the object which have been selected are acted upon. In this manner, parts of a drawing can be Erased, Rotated, Scaled, Mirrored, Swept (to form a solid of revolution), Copied or Extruded. After completion of a process, the Select highlights are removed by clicking within any view. If an error has been made with any process, its effect can be cancelled by selecting the Erase icon from the Toolbox.
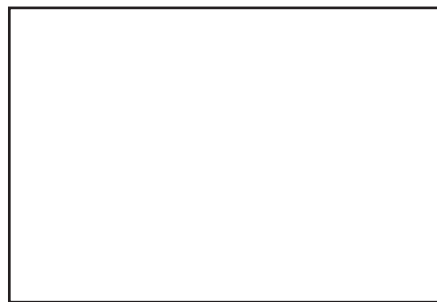

Figure 3.
Typical menu system showing parameter
setting for a process

The plane in which any drawing takes place is determined by the position of the drawing origin, which can be moved in any of the views. As the origin is moved in one view, its position in other views is adjusted, showing the operator the precise 3D position of the origin. Note that the X,Y,Z co-ordinate positions of

any points in 3D space are not changed by this movement. The position of X,Y,Z at (0,0,0) is always at the centre of each view. Failure to position the origin properly may result in some parts of a drawing being constructed in the wrong position.

Once the origin has been determined, care is needed to ensure that processes are carried out in the correct direction. For example, if an Extrusion is performed in the wrong view, the part may be incorrectly extruded in an X or in a Y direction (say), rather than in an intended Z direction. Similarly, a part being acted upon by Copy, may end up above (in the Z direction) the part being copied rather than to one side (in the X or in the Y direction) as intended.
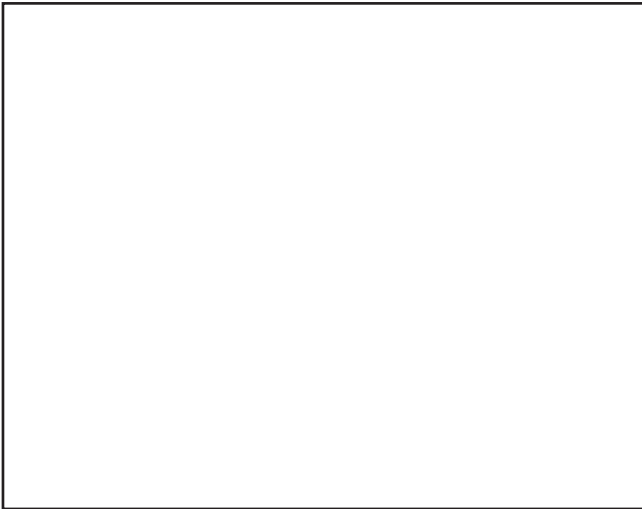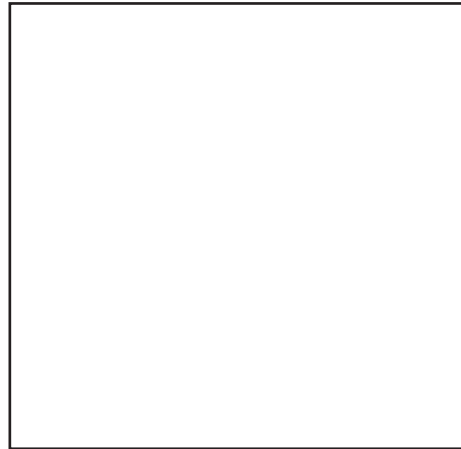

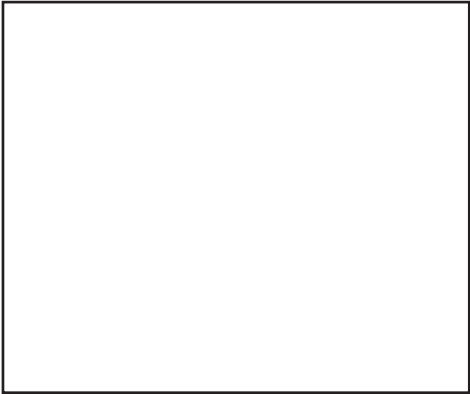Figure 5. Single-view display showing an isometric pictorial view

position of the floor on which the legs would stand. The plan view was then selected for the next stage and the square of the base of one leg drawn with the aid of the Rectangle tool. The Extrude Size was then entered as 35 units. This was followed by windowing the square base of the leg with the Select tool, and then using the Extrude tool in the Toolbox, the leg was extruded to a height of 35 units. The whole leg was then windowed with the Select tool and copied with the Copy tool to obtain the other three legs. The Copy distance had previously been set by entering 40 in the Copy sub-menu box.

Perspectives makes plotting and/or printing of drawings very easy. Select Print (or Plot) from the Misc menu and a window appears seeking parameters from the user. For example, when plotting, a choice must be made between A3 and A4 size plots and the plot origin set (the 2D default setting of 0,0 can usually be accepted). Selecting the OK button in the window will then start the plot.

Figure 4.
Four-view display of first angle projection and a perspective view

USING TOOLS

Take as an example of the re-positioning of the drawing origin, the 3D view of a very simple furniture arrangement given in Fig.4. First Snap was set to 5 units from Grid/Snap in the menu. To draw the four legs of the table, the drawing origin was first moved in the front elevation view to the

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