

Notes from the Mindavenue Site, Spring 2003

AXEL Information Sheet: Results of Hardware Acceleration Tests on PC Graphics Cards

In AXEL, you can specify whether you want your projects published with Hardware acceleration. Hardware acceleration takes advantage of a surfer's graphic card to speed up performance of AXEL content. To turn on Hardware acceleration for published content, select the Publish Settings in the Project Manager, then turn on Hardware acceleration in the Parameter Editor.

MindAvenue has performed some tests to see how Hardware accelerated AXEL content performs with different cards on Windows.

tests were performed on:

- nVidia based
- ATI
- Intel
- S3
- Matrox
- Voodoo
- 3D labs

Note: The tests were not yet performed on Macintosh. This is because fewer cards are available, and in general, Hardware acceleration works well with these cards.

The results show which features do not work well on different graphics cards and how you should adjust your content if you want to take advantage of Hardware acceleration. Our general advice, currently, is to publish without Hardware acceleration unless:

- Your content will be viewed primarily on the Mac
- Your content will be viewed primarily on machines with a well performing graphic card, such as those used by gamers and content developers. The results below give an idea of well performing cards. It is worthwhile for you to invest some time to get an idea of the kind of hardware your audience has, and to proceed with or without Hardware acceleration according to your own more educated estimation.
- You provide both Hardware accelerated and Software accelerated versions of your AXEL content. This can be especially useful for larger projects where you want to allow those with equipped machines to use the power that they have available. For a good example of this, see the First-person Sprayer which is a part of KrazeeBob's Used 3D Games on the MindAvenue Showcase.

Antialiasing:

AXEL performs antialiasing using a technique called "edge antialiasing", i.e. antialiased lines are drawn on top of the edges of the 3D models. When hardware acceleration is turned on, AXEL relies on the graphic card capability to draw antialiased lines. This feature is faulty on many graphics cards. In some cases, it is not supported at all.

On nVidia cards, antialiased lines on textured models are so slow that hardware accelerated content that uses textures is slower than software accelerated content. On other cards, antialiased lines are not supported, so non-textured lines are drawn on top of textured 3D models.

RECOMMENDATIONS:

- Apply antialiasing only on selected models of your world when using hardware acceleration, instead of using the WebCam to apply antialiasing to the whole World.
- Do not use antialiasing on models that have textures when using hardware acceleration.
- The tendency with gamers' graphic cards is to support full-scene antialiasing, which is a much nicer way to perform antialiasing. Turning on AXEL antialiasing for these types of graphic cards slows down rendering and reduces image quality. For hardware accelerated content targeting gamers, then, do not to use AXEL antialiasing.

Clip box:

The AXEL clip box relies on an OpenGL feature that is poorly supported by some Matrox and S3 cards. The region outside of the clip box is not properly refreshed.

RECOMMENDATIONS:

- Do not use the clip box for hardware accelerated content.
- A clip box is crucial to the performance of windowless content, but because windowless content never uses Hardware acceleration even if you turn it on in your Publish Settings, you simply do not have to make any decision.

2D text (Text Layer) & Tooltip Text:

Text Layers and Tooltip Text is inconsistent when rendered with graphic cards.

RECOMMENDATION:

- You can either replace these types of texts with 3D text surfaces for Hardware accelerated content, or publish this content without Hardware acceleration. Since Text Layers and Tooltip text are better for more explanation oriented content - for example having to do with a process, or the working of a piece of complex machinery - the kind of graphic effects that are most dependent on Hardware acceleration could be avoided in these types of projects.

Texturing:

Certain graphic cards have trouble displaying textures on accelerated AXEL content:

- Decal mode is not supported on S3 cards, nor is it on some Matrox cards.
- Texturing does not work at all on the Voodoo cards.
- Setting the position, orientation and scale of the texture from the Texture settings did not work on the Matrox G400.

RECOMMENDATION:

- Be aware that textures on accelerated content may not display properly, and proceed from there by either publishing without Hardware acceleration, removing the textures, publishing two versions - one Hardware accelerated, the other without - or doing the necessary research to understand your audience and decide what's more important, a faster performance or a content rich with textures. Perhaps you can have your cake and eat it too if you perform some tests and find out your target audience have cards which display textures well with Hardware acceleration!

Details about cards with particular trouble displaying Hardware accelerated content:

Diamond Savage4:

- Textures in Decal mode are not displayed (Replace and Multiply modes work well).
- Horizontal clamping of the texture does not work when texture filtering is turned on. (Clamping is what happens when you project a texture onto an object and it does not cover the entire object. If you repeat the texture then no clamping occurs because the repetitions cover the entire surface of the object, but if there is no repeat, then the last line of pixels on the texture is repeated to cover the remainder of the object not covered by the single instance of the texture).
- Curves with too many subdivisions disappear.
- Text Layers disappear when clipped to the right.
- The top 10 pixels of AXEL content windows are clipped, even without a clipbox.

Matrox G400:

- The colors of video textures are inverted.
- Clipping does not work.
- Texture matrix not supported. This means that while textures are displayed, the changes you may have made to texture's position, orientation or scale values in the Texture Settings will not take effect with accelerated content on this card, as these values require a texture matrix in order to map the texture correctly.
- Decal mode not supported.

Stay tuned for more information on Hardware acceleration as it becomes available.