Graphical Cards

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Content:

1. Introduction

A graphical card is a component of the computer. The graphical card provides the monitor with the necessary signals/data so that the monitor can create frames. In the last 2 years the performance of graphical cards has increased by about 1600 %! The technology is getting more intelligent and it is hard to follow all the inventions especially the inventions concerning software and new 3D-Technology.

2. History

In 1982 the manufacturer “Herkules” introduced HGC (Hercules Graphic Card) and was the first manufacturer who was able to display graphics on a monitor. Before that invention, old IBM-Pc’s were only able to display text. One year later the display got colored with CGA (Color Graphics Adapter). CGA was able to display 4 colors. The next generation was the VGA-Card (Video Graphics Array), which was introduced in 1988. S-VGA and X-VGA followed and today graphical cards can display over 16.7 million colors with a resolution of 2048x1536 pixels.

3. Structure

Nowadays a graphical card consists of 4 main parts: GPU (Graphical Processing Unit), memory for frames, RAMDAC and the AGP or PCI interface. The AGP- or PCI-Bus is the interface between system memory, cpu and the graphical card. The actual standard for this interface is AGP, because it can transfer more data, which is needed for 3D applications like games and CAD-drawing.

New graphical cards have their own processor, because the CPU can not afford all the difficult calculations for every frame that is shown on the monitor. The GPU even has its own active cooler and some even have an extra power connection. The memory for frames is essential for the screen resolution and the color depth. It is important that such a memory has excellent access times so that enough frames can be generated by the GPU. After the data is processed and transformed into frames it is send to the RAMDAC. RAMDAC means RAM Digital Analog Converter and is responsible for converting digital signals into analog signals for the monitor.

In the near future the RAMDAC surely won't be essential any more, because TFT-Screens need digital signals and the convertion isn't needed any more. Some graphical cards are currently supporting this direct connection with a digital interface (three standards available: P&D, DFP or DVI). Old TFT-Screens are converting the analog singnals back to digital signals, which is double work for nothing and there is the risk that the quality of the frames decreases.

4. Which one is needed?

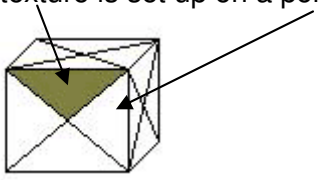
With a new graphical card you can do lot of things. Normally, for office use, you can use a simple one, but for 3D games and CAD-Drawing you need high-performance cards, which supply 3D-Accelleration and all the things. An example for a modern graphical card: The NVIDIA GeForce 6800 Ultra (NV40)! This card costs about 500 €, this is as much as an office pc for normal use! This card has a GPU with 400 MHz and 222 million transistors on it! The memory is the new GDDR3 with 256 MB and a frequence of 550 MHz. Also this card needs two power connections and two DVI interfaces. I think you need this card only for playing games which need high 3D-performance.

5. 3D-Technology

As I mentioned before, nowadays the GPU is responsible for the calculation of the frames. Now I will go a bit more into detail:

In the early times of the graphical card, the CPU did all the calculations and had to "tell" the graphical card: "draw a pixel there and a pixel there" and this for every pixel. Nowadays the CPU only tells the graphical card: "Draw a triangle at the coordinates XY XY XY". This is an enormous reduction in work for the CPU. Also there are methods for "3D accelleration" used to raise the performance of your graphical card.

If you want to create a 3D object you need polygones – mostly triangles. With these polygones you can create 3D obejcts. To give these objectes a surface you need textures. A texture is set up on a polygon as shown on the picture below.



And now some methods for 3D acceleration:

Shading. Shading provides the displaying of the different colors on 3D areas.

Texture-Mapping. This gives a 3D area a surface structure so that the 3D area lookes realistic.

Supersampling. Supersampling offers the smoothing of 3D objects.

These are only three of many methods for displaying 3D on a monitor. All this is much more complicated than I explained it. It would require much more space if I would go into details. Hope you have got a little overview now.