


# Automatic image processing – fast-forward with GPUs



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**News photos are benefiting directly from the huge advances that are being made in digital image processing technology. Digital cameras and automatic image processing (AIP) programs are improving their remarkable speed, quality and consistency because of the widespread investment in industrial research in imaging and computer science, fuelled by a vibrant cross-exchange of information and technology.**

Five years ago, computing hardware centred on driving the CPU at increasing frequencies up to 3.5 GHz. Even “over clocking” the hardware was possible. However, problems of heat generation, cooling and power consumption signalled a change of strategy was needed.

Two years ago, dividing the CPU into multiple cores and using parallel processing produced more efficient processing power but it meant developing new programming techniques and re-writing large sections of software for the new processors.

Today, parallel processing using multiple cores is still the way forward but utilising the architecture of the Graphics Processor Unit, the GPU, for the bulk of any repetitive data processing. Driven by the computer games market, GPUs and parallel processing have reached a much higher state of development than the CPUs. The speed gains naturally depend on the types of algorithms and operations involved but a conservative estimate of 5 – 8 times increase in productivity can be expected in image processing using the best commercial GPUs and re-worked AIP software. That’s a dramatic increase in computing power over multi-core CPUs in just two years.

Some AIP suppliers argue that their programs are already fast enough and they would prefer to use their resources to add features. While their overall speed meets the requirements of printed newspaper deadlines, there is another more subtle advantage. Algorithms that were too computationally intensive to use on slower hardware, now become viable. Faster processing can lead to the successful application of a wider range of algorithms to a broader range of images, to even better quality and to more multimedia news publishing activities.

The prognosis for more video clips, increased colour data bandwidths, high dynamic range imaging, audio processing, more sophisticated image data compression, panoramic pictures, searching for pictures by face recognition or scene content, multi-format conversions and multimedia encoding can quickly ramp up the processing time needed by a newspaper. Indeed, one forecast is that video will account for about 90 percent of all consumer Internet traffic by 2013<sup>1</sup>. If you want to see what a GPU can do for video productivity, look at Adobe's demo of their new Mercury playback engine in Premiere Pro CS5<sup>2</sup>.

Already some and perhaps many AIP programs can use parallel core CPUs effectively. Fewer can extend that to installed GPU hardware. Arcadia's PhotoPerfect software is one program that can access CPU and GPU cores. Re-working an AIP program written for older serial-processing single core CPU computers is time consuming and expensive. But there is no alternative. Computer operating systems, such as Microsoft Windows 7 and Apple Mac Snow Leopard, have parallel processing software routines to take advantage of parallel processing in silicon, regardless of whether it's multiple- or multi-core CPUs and GPUs.

Until recently, GPUs were regarded as niche hardware for moderate bandwidth video and gamers. Not anymore. The GPU manufacturers are now including more general purpose computing instructions in their opcodes and optimised routines to handle more computations within the GPU, without transferring data to a slower CPU and memory. nVIDIA's Processing Primitives NPP 3.2 library, for example, has about 300 image processing routines and about 100 digital signal processing routines. The nVIDIA GTX 580 GPU has 512 cores, 1.2 billion transistors and the same processing power as a decade-old supercomputer – all for the price of \$499. The nVIDIA GTX 560 GPU has almost the same processing power for \$256. Even the most powerful supercomputer today, China's Tianhe, is now based on nVIDIA Tesla GPUs<sup>3</sup>.

Image processing can be given a dramatic increase in processing speeds by installing the latest high speed GPUs and upgraded software. In the immediate future, computers will be a combination of reduced instruction set computer, RISC, architecture CPU cores controlling a large number of GPU cores with integrated data buses and controllers, perhaps on a single silicon die. Automatic image processing software using parallel processing technology in CPU and GPU architectures is no longer an option. It's becoming a necessity.

<sup>1</sup> [www.nytimes.com/2011/01/04/technology/04chip.html]

<sup>2</sup> [blogs.adobe.com/genesisproject/2009/11/technology\_sneek\_peek\_adobe\_me.html]

<sup>3</sup> [www.zeit.de/digital/internet/2010-10/china-supercomputer?page=2]

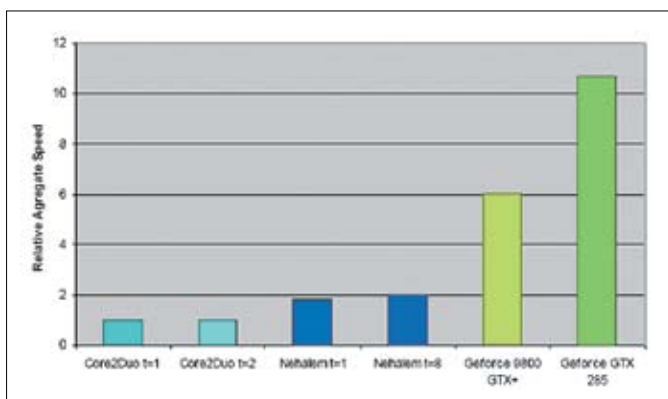


**Intel pays nVIDIA US\$ 1.5 billion for licensing fees**

nVIDIA announced that Intel will pay ---- an aggregate of US\$1.5 billion in licensing fees payable in five annual installments, which began on 18 January 2011. Under the new agreement, Intel will have continued access to nVIDIA's full range of patents.

**Windows support for System on a Chip architecture**

Also in January, Microsoft announced that the next version of Windows will support System on a Chip (SoC) architectures, including ARM-based systems from partners nVIDIA Corp., Qualcomm Inc. and Texas Instruments Inc. SoC architectures will fuel significant innovation across the hardware spectrum when coupled with the depth and breadth of the Windows platform.



Left: An 'old' nVIDIA GTX 285 GPU outperforms Intel's Core Duo and Core i7 (Nehalem) CPU processors.

Right: Newer GPUs are even more productive (Source: AnandTech.com).

