Martin Green post about RasterSpeed platform

Hi all,

It's really quite interesting reading about techniques for Doom-engines, as we've developed an arcade system based on similar technology over the last couple of years.

(FYI: ATD is a technology company working in games development, hardware design and Windows business software. We wrote *Morph for the Atari Jaguar, and are working on a number of new products for Jaguar and other new * systems.)

A few years back we decided that over-plotting was a complete waste of time, as DRAM bandwidth was so lousy. So in conjunction with a UK Arcade Machine company - Bell Fruit Manufacturing - we designed a system which used sorting techniques to eliminate over-plotting. This technology is being used in the arcade versions of Zool and Rise of
the Robots. (BTW: ATD & BFM are looking for more games to port to the arcade using the technology).

At the moment, the system is primarily aimed at 2D. 3D is being tackled by the big-boys, so we've kept away.

The system is based on 386 / 486 CPUs - initially we aimed to use a Cyrix 486SLC, but availability is restricted so are considering moving to a real 486. We deliberately targeted a minimal hardware implementation for the first system - it fits in a single 4010 FPGA. However, it handles object scaling in X and Y, pixel depths of 8 or 16 bits and up to 32 different 256-colour palettes in 8-bit mode. One of the most interesting features is that all object attributes are defined on a per-object basis, not a per-pixel basis. Resolution is currently 320 x 240 pixels. The PCB also includes a sample-replay subsystem and a separate Texas DSP, plus various I/O chips. It uses standard DRAM SIMMs.

Interestingly enough, we implemented two completely different sort algorithms - all in assembler of course. The first is frame-based, front-to-back, the second scan-line based. The second algorithm shows a 15% improvement in performance on the Cyrix, and a 100% improvement on the Intel 486SX-33 because of the larger cache.

Performance is difficult to measure, as it isn't actually related to the number of pixel displayed - rather, it's object heights that count. On the new sort system, we can easily do 40 100-pixel high objects per 50hz frame. Or 20 full screen objects. Critically, performance of the line-sort is more related to on-chip clock speed than to off-chip speed. One of the main advantages of the system is that we've written a large library of 'C' functions which allow people to easily create programs. It includes multi-channel MIDI-based sound sample replay, video movie replays (including our own lossy compression).

The programmer working on the port of Rise from the PC has been very pleased with the productivity improvement. Most * APIs suffer from over-generality - but this one doesn't have the problem because it never over-plots, so the cost of a hidden object is much reduced. (Ok - we know there are limitations, but it has worked pretty well so far).

Note that this technology is actually quite different from Doom - but the principle of avoiding over-plotting is consistent. The hardware originally had rotational capability, but we ran out of space on chip. It also lacks perspective at the moment.

This type of display technology has some serious limitations when compared with ordinary blitters - but it also has the major advantage of reducing the bandwidth required for the display. We're hoping to move on to create a hardware version of the sorting algorithms which will boost performance, add features and reduce cost. (Don't set small goals!). Although the arcade market is moving pretty fast, we reckon there might be applications in set-top boxes or even PC graphics cards.

I'm posting here for two reasons:

1) to just inform people of what were doing, which seems strongly related to a lot of the items in this group

and

2) to see if anyone has suggestions on companies / people to approach to help develop the next stage. I know that advertising is probably outside acceptable use - and we are a commerical company. But we're still a small guy, and we're not trying to over-exploit the net.

Any help will be much appreciated.

Martin Green