



SIGGRAPH2010

The People Behind the Pixels



What's Next for Interactive Rendering Research?

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The Wheel of Reincarnation

Gradually the processor became more complex.... Finally the display processor came to resemble a full-fledged computer with some special graphics features. And then a strange thing happened. We felt compelled to add to the processor a second, subsidiary processor, which, itself, began to grow in complexity. It was then that we discovered a disturbing truth. Designing a display processor can become a never-ending cyclical process. In fact, we found the process so frustrating that we have come to call it the "wheel of reincarnation."

- Myer and Sutherland "On The Design of Display Processors",
Communications of the ACM, **1968**



Will There Be Another Turn of The Wheel of Reincarnation?

- Is “the rise of SW graphics” a temporary (5-10) year window as we go around the wheel of reincarnation or has the wheel stopped turning?
- If it has stopped turning, why?
- If it hasn't stopped turning, what will be the next fixed-function?
- **Great time to be a graphics researcher because the killer-app SW rendering pipelines/capabilities created now may define future fixed-function hardware**



There is no single graphics pipeline

- There is no single workload to optimize
- Moving forward, interactive rendering is an inseparable mix of
 - Task- and data-parallel algorithms
 - Standard, extended and custom graphics pipelines



Interesting Research Directions

- Abstractions to make it easier to write software pipelines
- Programming models to combine task, data, and pipeline parallelism to C++ in a way that is elegant, minimalist, but effective
- Killer-apps and abstractions for real-time SW graphics
 - SW rendering pipeline research needs to demonstrate higher-quality rendering that is also adoptable by game developers (“authorable performance”)
 - The best ideas that come of the of this SW graphics era may define the next generation of fixed-functionality (if the wheel is still turning)



Conclusions

- Software + hardware graphics is here today (
 - Graphics programming is no longer simply a single pre-defined pipeline
 - Research is ablaze with software rendering research on GPUs and CPUs
- Future real-time rendering programming will consist of
 - A pre-defined (Direct3D/OpenGL) rendering pipeline
 - User-defined software pipelines
 - User-defined data- and task-parallel code tightly coupled to graphics pipelines
- Is the wheel of reincarnation still turning?



Course webpage and slides:
<http://bps10.idav.ucdavis.edu>