What's Next for Interactive Rendering Research?

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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."

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 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