Panel: From Publication to Product: How Recent Graphics Research has (and has not) Shaped the Industry

BILL MARK (START-UP COMPANY)
My Experience:
Two cycles of academia -> industry

• GPU Real-time programmable shading
  – Stanford & UNC -> NVIDIA

• Real-time ray tracing
  – Univ. of Texas at Austin & Stanford -> Intel
History of GPU Real-time programmable shading

• Academia: Stanford Real Time Shading Language
  – High level language & compiler
  – Clean abstractions

• Industry:
  – NVIDIA Cg
  – Microsoft HLSL
  – OpenGL GLSL
Primary impact was on language

• Industry already planning programmable HW
• But, interface was lower level
  – Focus on assembly-level interfaces
  – HLSL initially vertex-only, not fragment/pixel
• Academic impact:
  – Accelerate high-level language, esp. for fragment/pixel
  – Better abstractions in industry systems
  – Enable and accelerate GPGPU
History of Real-time ray tracing

• Academia:
  – Fast traversal algorithms
  – Dynamic scenes
  – Systems (esp. Utah RTSL)

• Industry:
  – NVIDIA OptiX
  – Intel Embree
  – Autodesk/OptiCore, RTT, etc.
Impact different than anticipated

• Minimal use of ray tracing in games (so far)
  – Adoption likely to be incremental
  – Value shift: Emphasis shifting to device portability

• Significant impact on professional graphics
  – Autodesk, RTT, Mental Images, …
  – Better economic argument
    • Games: create once, view millions of times
    • Professional graphics: create once, view once
Recommendations for academia

• Don’t compete with industry
  – Lead in time, and/or
  – Cooperate & complement

• Focus on fundamental ideas & system abstractions
  – Prove new ideas and reduce risk
Future graphics systems research

• General strategy
  – Develop a vision of how things will be in 5-10 years
  – Identify problems that need to be solved
  – Solve problems and build prototype systems

• Specific topic: What does client+cloud system look like?
  – How is data and compute partitioned?
  – Most open area is image/video input and analysis
  – Metrics: ! / Watt and ! / wireless_byte
  – Leverage cloud benefits: multi-user & infinite data storage
Acknowledgements - collaborators

• Programmable shading
  – Academia: Kekoa Proudfoot, Pat Hanrahan, Tim Purcell, Marc Olano, …
  – Industry: NVIDIA team – Steve Glanville, Kurt Akeley, Mark Kilgard, …

• Real-time ray tracing
  – Academia: Warren Hunt, Peter Djeu, Gordon Stoll @ Intel, Don Fussell, …
  – Industry: Intel team – Sven Woop, Manfred Ernst, Ingo Wald, Carsten Benthin, …