

# RECENT ADVANCES IN LIGHT TRANSPORT SIMULATION

**SOME THEORY & A LOT OF PRACTICE**

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Next Limit  
Technologies

- Good afternoon everyone, welcome to the course entitled “Recent advances in light transport simulation, Some theory & A lot of practice”.

# INTRODUCTION



**Jaroslav Křivánek**

Charles University in Prague

- My name is Jaroslav Křivánek and I'll give a short into to the course.

## Course evolution

- **Last year:**

“Recent advances in LTS: **Theory** and practice”

- **This year:**

“Recent advances in LTS:  
Some theory and **a lot of practice**”

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- This course is an evolution of a course that we presented last year, which was mostly about the theory with only a marginal focus on the practical aspects.
- This year, based on the feedback we got, we decided to shift the focus a bit away from the theory toward the practical side of things.

# Light transport – Global illumination

## Archviz



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## Movies



PDI DreamWorks 2006



Sony Pictures Imageworks, 2006

Image courtesy of Columbia Pictures.  
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- Before we start, let me give a bit of a motivation for the topic of the course.
- Physically-based light transport simulation is an essential component of rendering realistic images with global illumination.
- It's been a standard tool in architectural and product visualization for many years now.
- It has now picked up in the movie industry too and the entire industry is now shifting to physically based light transport.
- This shift really underlines the importance of research and development in this area. It is also one of the important motivations behind this course.

## Recent research advances

- Too numerous to mention all of them
- This SIGGRAPH
  - **Light Transport (technical papers)**, Wed 10:45 – 12:15
  - **Sampling (talks)**, Tue, 10:45 - 12:15
  - **Scattering (talks)**, Thu, 9:00 - 10:30

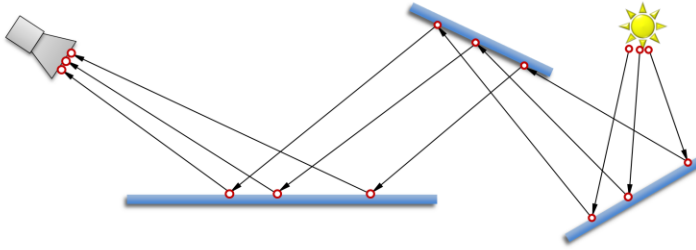
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- And indeed, recently there have been some significant research advances on improving light transport simulation algorithms.
- In fact, the recent results are too numerous to list them all, so I'll just point to some of the sessions here at SIGGRAPH.
- We will also review some of the recent advances in this course.

## Common denominator

- **Path integral formulation** of light transport  
[Veach and Guibas 1995], [Veach 1997]



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- But the important thing is that common to most of these techniques is the view of light transport as an integral over a space of light paths.
- This is why we will put a significant emphasis on this view of light transport in the theory part of the course.

## Issues in light transport simulation

- **Efficiency**
- **Robustness**
- **Usability**

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- The presentations in this course revolve around three main topics.
- Next to the overall **efficiency**, one of the important aspects to focus on is the algorithm **robustness**, the ability to handle many different scenes.
- Last but not least, physically based rendering presents the users with a new type of work-flow, new controls and new constraints that they may not be used to.
- For this reason, the **usability** aspects are just as important as the raw performance of the underlying algorithms.

## Course outline

- **2:05 ... Path integral formulation of light transport** (*Jaroslav Křivánek*)
- **2:25 ... Combining bidirectional path tracing and photon mapping** (*Iliyan Georgiev*)
- **2:45 ... Path space filtering** (*Alexander Keller*)
- **3:05 ... Comparison of light transport methods** (*Anton Kaplanyan*)
- **3:30 ... Break** (15 minutes)



## Course outline

- **3:45 ... Efficiency = Good importance sampling** (*Marcos Fajardo*)
- **4:05 ... PIXAR's fast lighting preview** (*Danny Nahmias*)
- **4:25 ... Corona Renderer: It's all about usability** (*Ondra Karlík*)
- **4:45 ... Advanced light transport in the VFX/archviz industry** (*Juan Cañada*)
- **5:05 ... Q & A** (*All*)