

# (Optimizing) Realistic Rendering with Many-Light Methods

An ACM SIGGRAPH 2012 course presented by

**Jaroslav Křivánek**

*Charles University in Prague*

**Miloš Hašan**

*UC Berkeley*

**Adam Arbree**

*Autodesk*

**Carsten Dachsbacher**

*Karlsruhe Institute of  
Technology*

**Alexander Keller**

*NVIDIA Research*

**Bruce Walter**

*Cornell University*

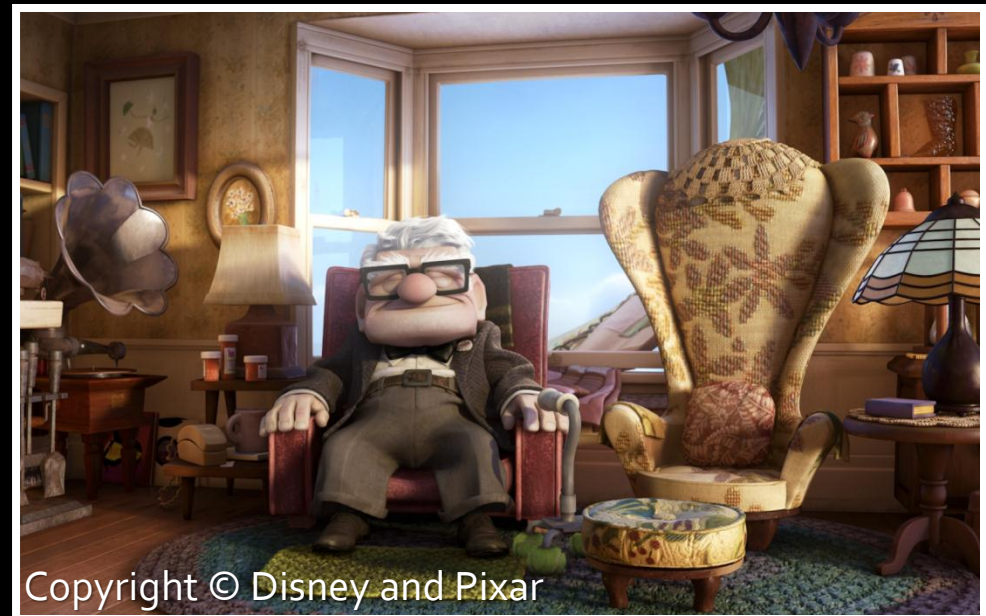
(Optimizing) Realistic Rendering with Many-Light Methods

# Introduction

**Jaroslav Křivánek**

*Charles University in Prague*

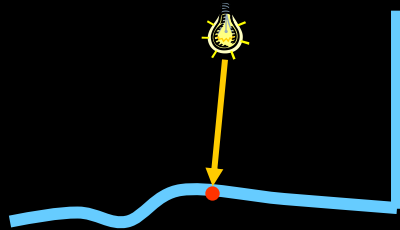
# Global illumination



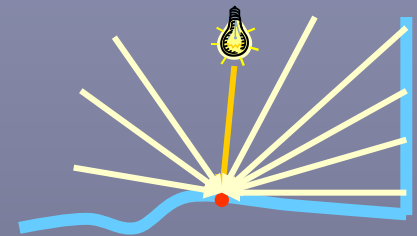
# Global illumination



Direct-only



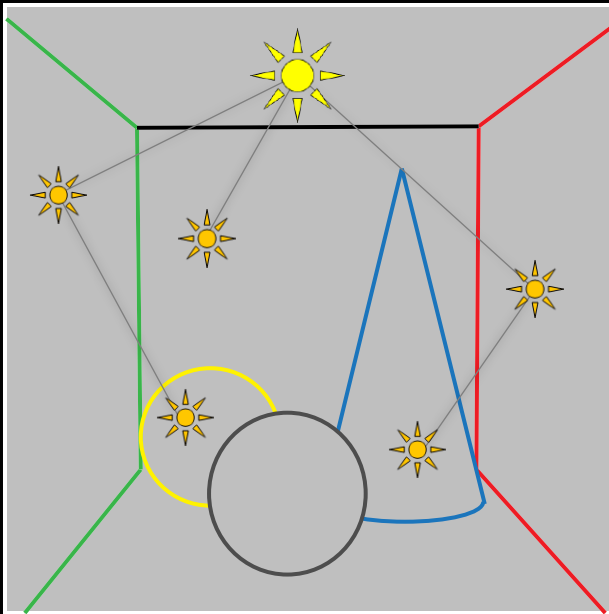
global =  
direct +  
indirect



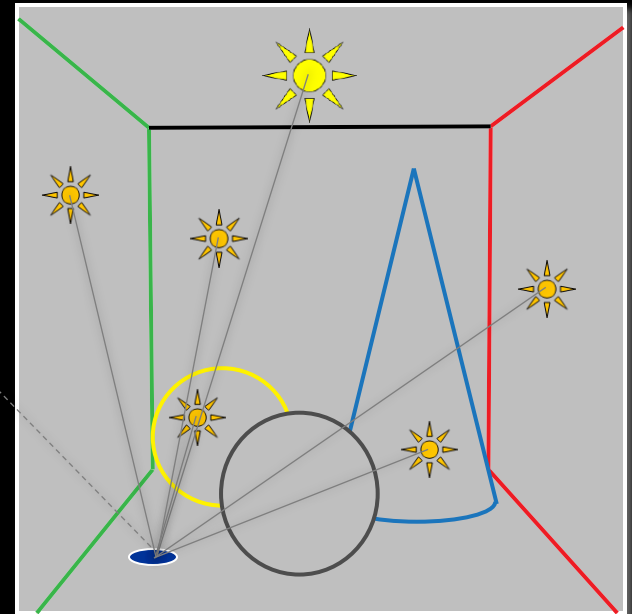
# Many-light rendering

- Based on Instant Radiosity [Keller 1997]
- Approximate indirect illumination by **Virtual Point Lights (VPLs)**

## 1. Generate VPLs



## 2. Render with VPLs



# Many-lights: Advantages

---

- Spans a wide range of quality/cost ratios

## Interactive rendering

16k VPLs, 5.5 fps



5.5 fps, 256<sup>2</sup>, 16k

from [Ritschel et al., SIGGRAPH Asia 2008]

## High-fidelity rendering

1M VPLs, 64path/pix, 30 min



from [Walter et al., SIGGRAPH 2012]

# Many-lights: Limitations

---

- Ineffective for caustics from curved objects



# Main technical issues

---

- Making it fast (as usual)
- Making it "asymptotically fast", i.e. scalable
- Making it accurate



# Course lecturers

---

- (in the order of appearance)
- Jaroslav Křivánek, *Charles University in Prague*
- Alexander Keller, *NVIDIA Research*
- Miloš Hašan, *UC Berkeley*
- Bruce Walter, *Cornell University*
- Carsten Dachsbacher, *KIT*
- Adam Arbree, *Autodesk, Inc.*

# Course Overview

---

- 2:00 (05 min) ... **Introduction & Welcome** (*Křivánek*)
- 2:05 (30 min) ... **Instant Radiosity** (*Keller*)
- 2:35 (30 min) ... **Handling difficult light paths** (*Hašan, Křivánek*)
- 3:05 (25 min) ... **Scalability with many lights I** (*Walter*)
  
- 3:30 (15 min) ... **Break**
  
- 3:45 (20 min) ... **Scalability with many lights II** (*Hašan*)
- 4:05 (35 min) ... **Real-time many-light rendering** (*Dachsbacher*)
- 4:40 (30 min) ... **ML in Autodesk® 360 Rendering** (*Arbree*)
- 5:10 (05 min) ... **Conclusion - Q & A** (*All*)