Photon Mapper

Final project presentation

Presented by: Bernhard FRITZ
Mathias HÖLZL
Florian TISCHLER
Supervisor: Univ.-Prof. Dr. Matthias Harders
Group: Interactive Graphics and Simulation

Problem description

- Path tracing does not produce significant caustics in a reasonable amount of time
- Small probability that a ray starting from camera, hits a surface that actually reflects incoming rays directly through a transparent object to the light source

Solution

- Collect additional information about light photons being emitted from the light source
- Photons carry energy which can be transmitted whenever an object is hit
- The process of storing photon→object interactions is called photon mapping

How does photon mapping work?

- Basically there are 2 steps involved:
  - Construction of the photon map
  - Rendering

Construction of the photon map

- Shooting photons from light in all directions
- Whenever a photon intersects with a surface, save intersection point and incoming direction in photon map
- Decide if photon gets reflected, transmitted or absorbed by chance
- The photon will not be traced any further once it has been absorbed

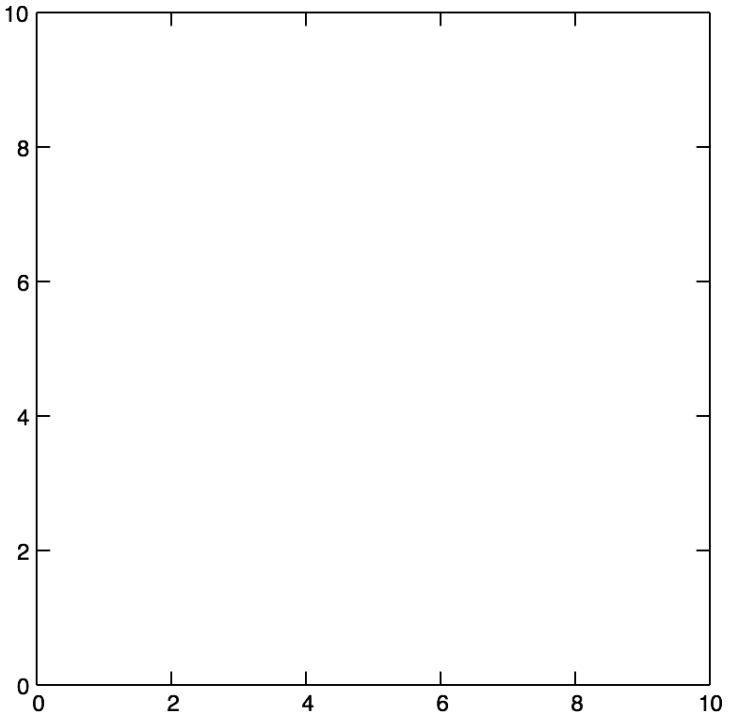
Rendering

- Conventional photon mappers use ray tracing to determine direct illumination and extend it by adding indirect illumination on top
- At each intersection point that results from a ray hitting a surface during ray tracing, the nearest N photons will be determined
- Summing up the direct and indirect portions of illumination at all intersection points results in a globally illuminated scene

Implementation details

KD-Tree

Inserting 2D (x,y) coordinates:
(7,2) (5,4) (2,3) (9,6) (4,7) (8,1)



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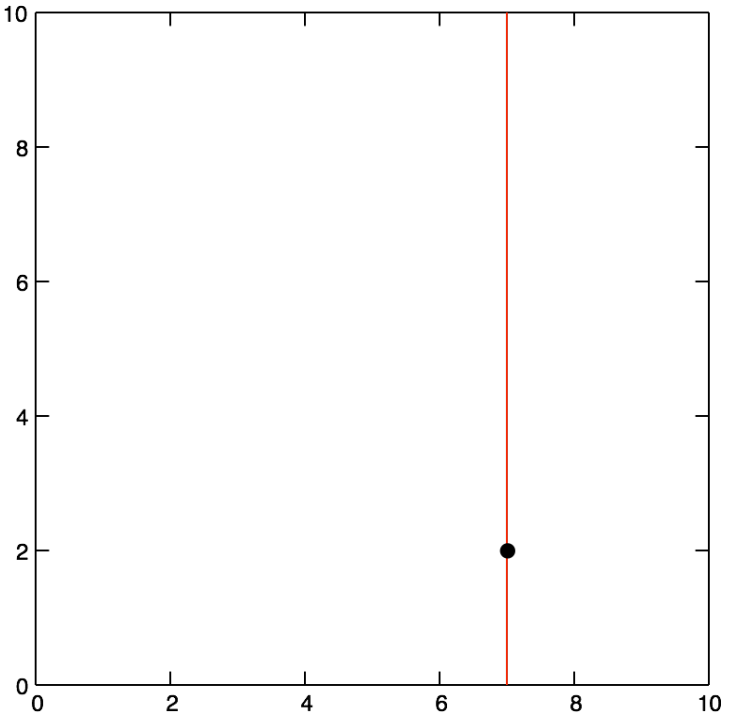

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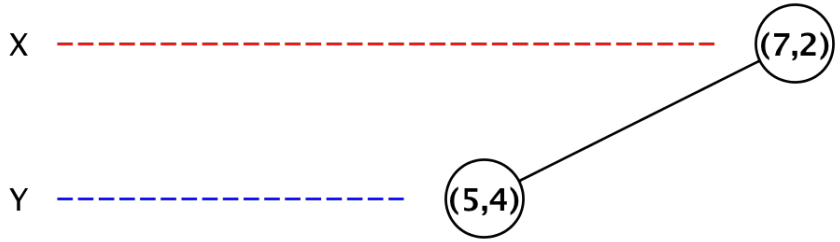

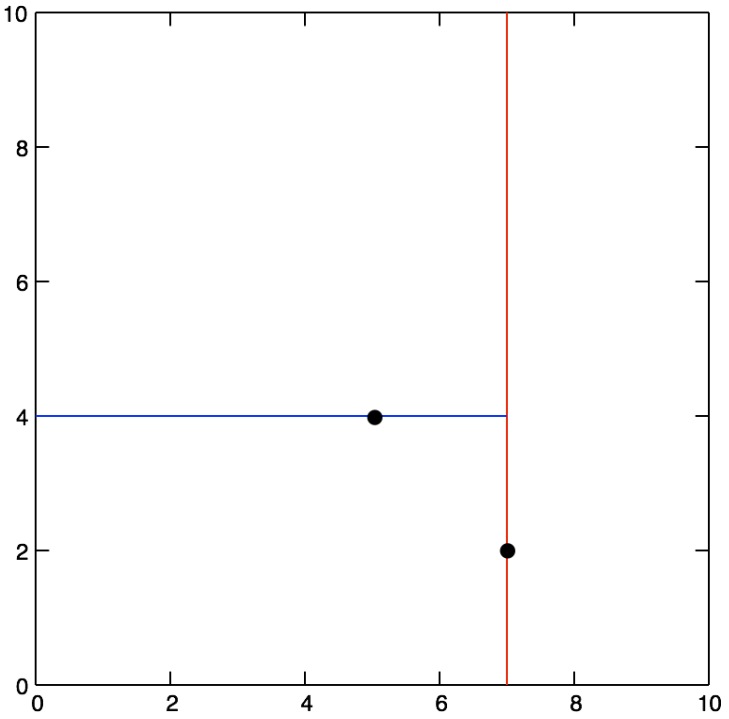

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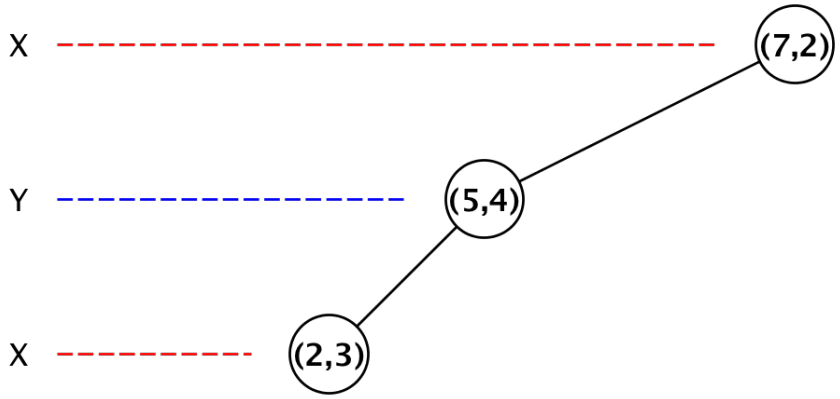

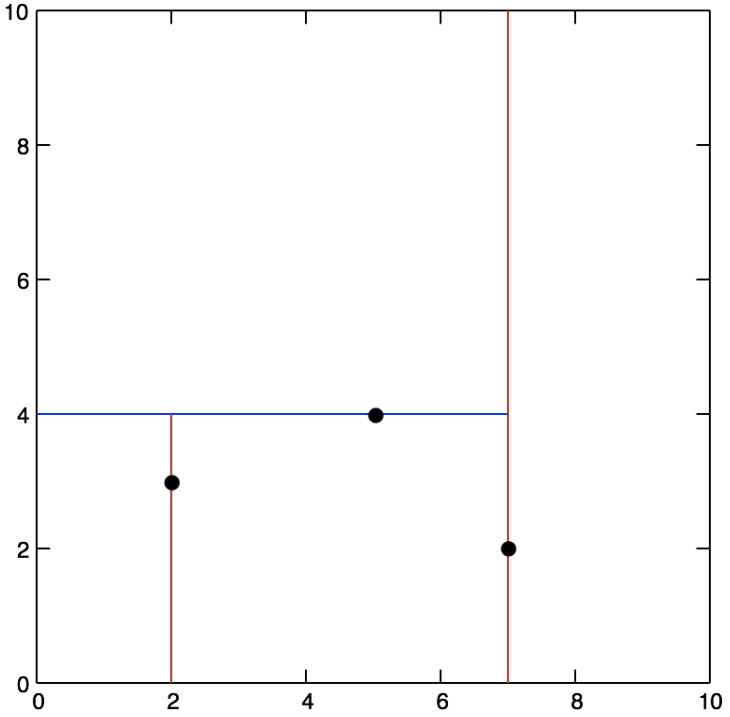

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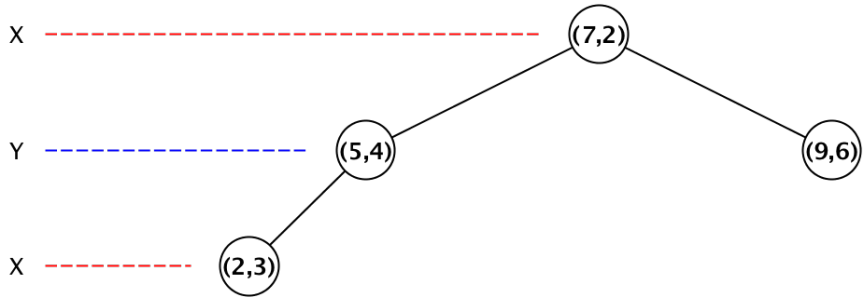

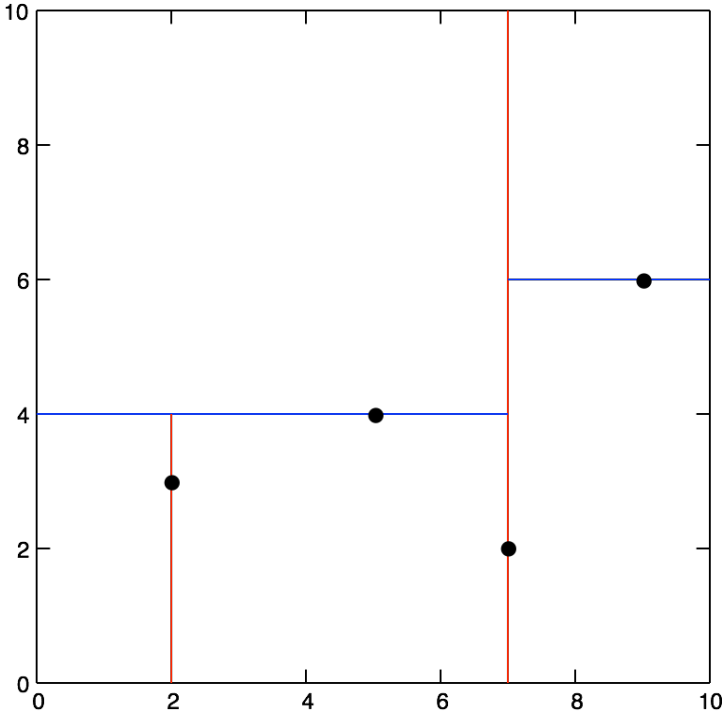

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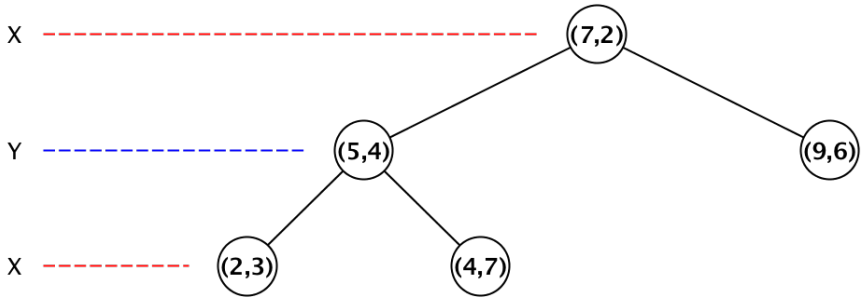

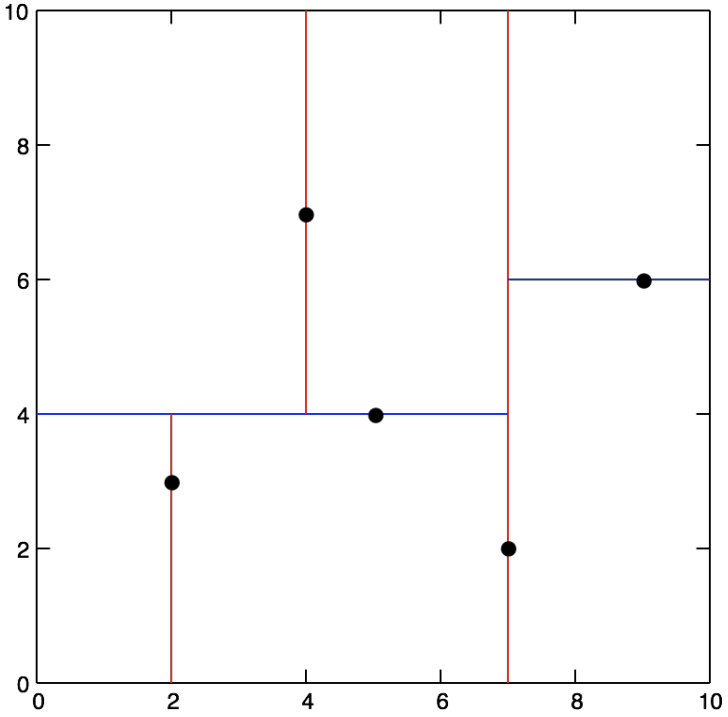

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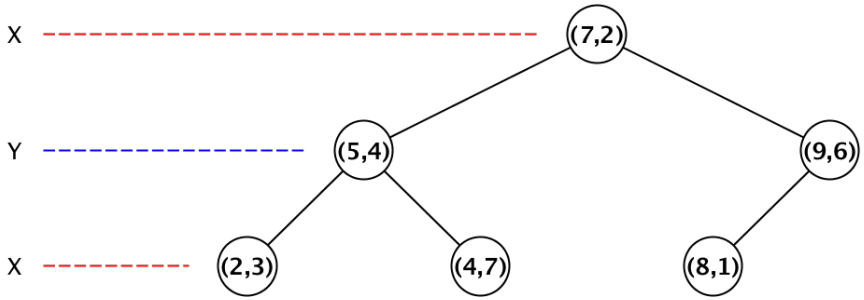

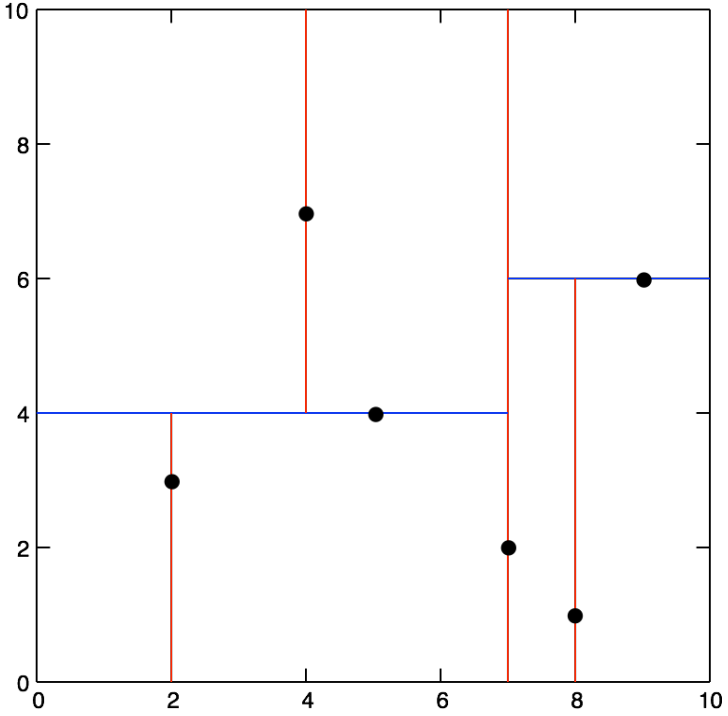

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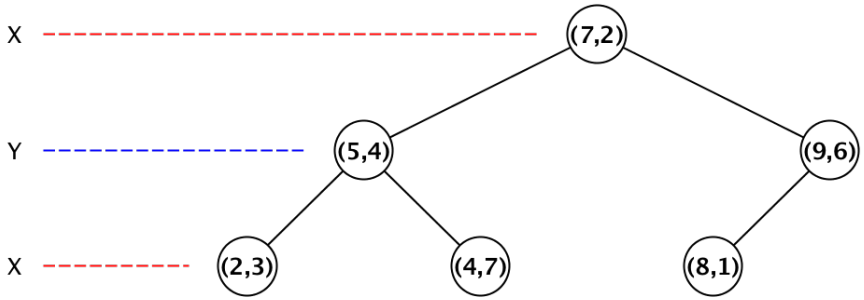

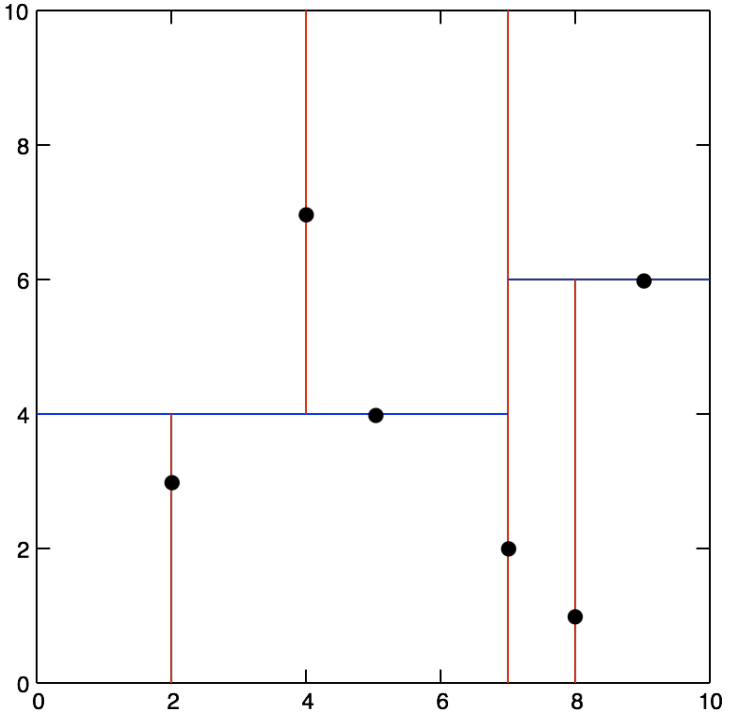

Appropriate parallelization of algorithms

Libraries and resources to be mentioned

Result