

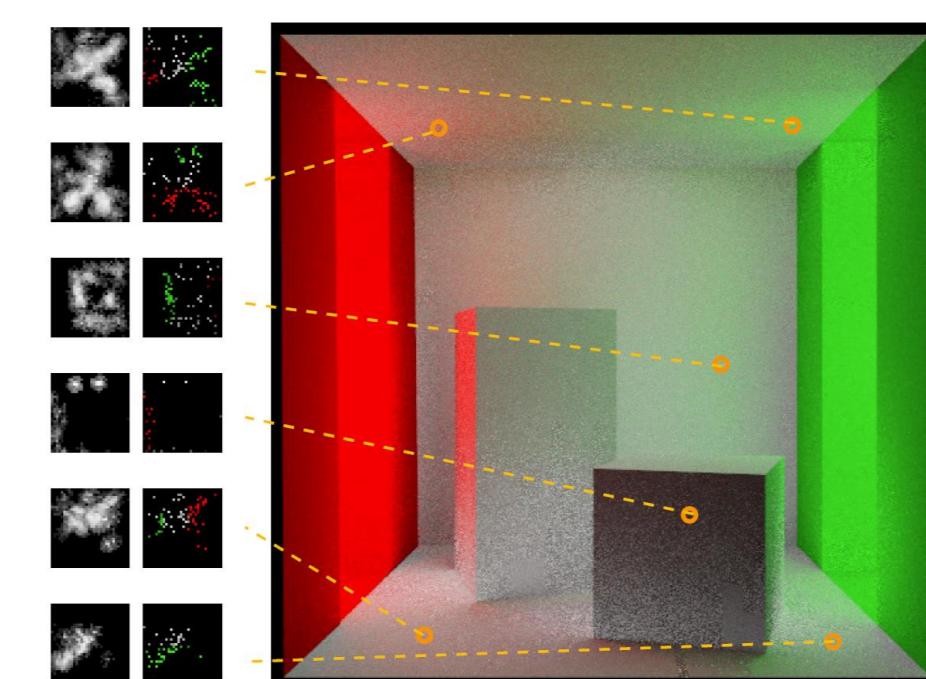
Guided path tracing using clustered virtual point lights

Binh-Son Hua

Kok-Lim Low

Importance sampling

- BRDF
- Incoming radiance



Incoming radiance has more influence for diffuse scenes.

How to add incoming radiance sampling to path tracing?

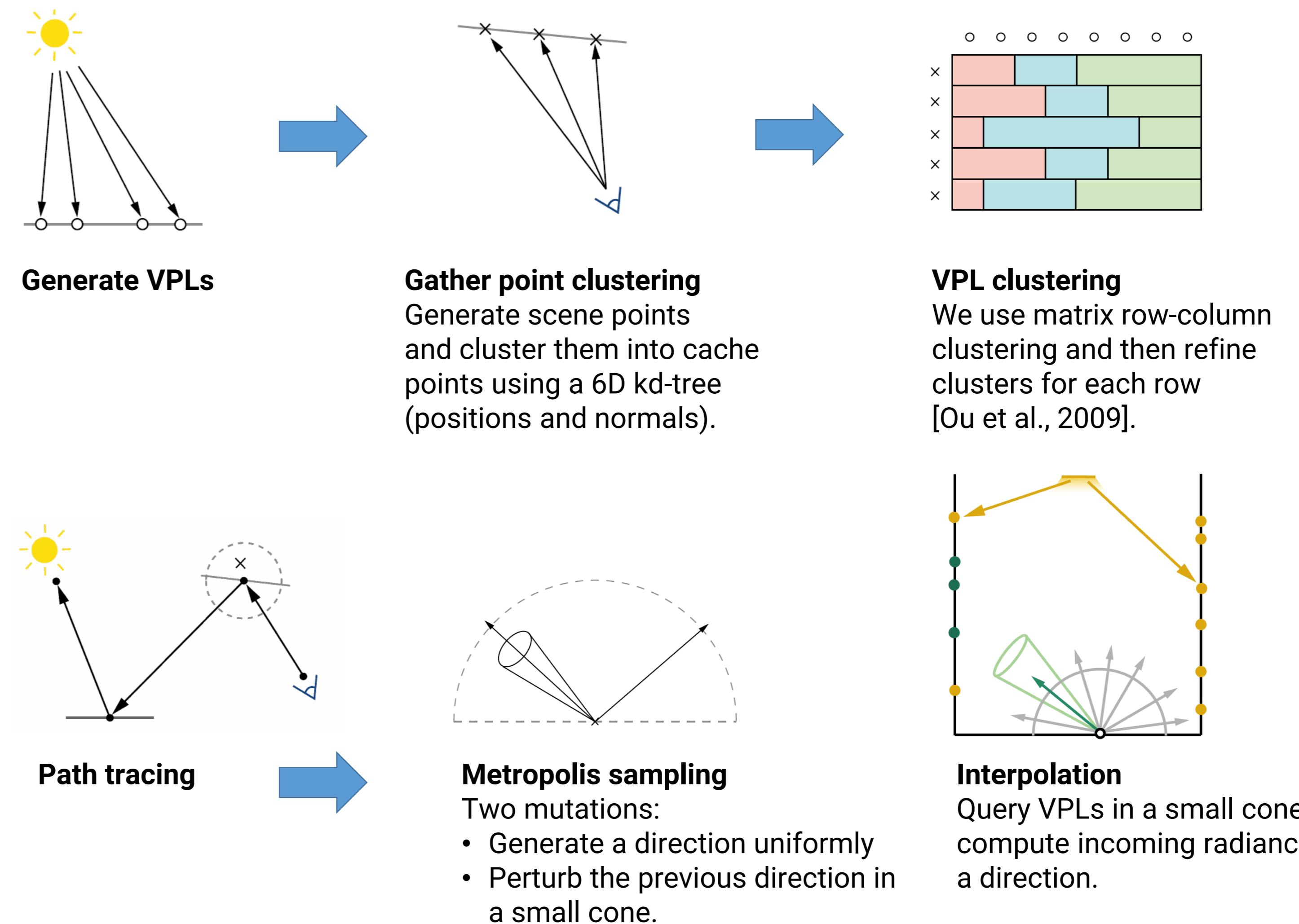
Previous works

- Parameterize incoming radiance distribution by
 - 2D grid [Jensen, 1995]
 - Cones [Hey and Purgathofer, 2002]
 - Gaussian mixture model [Vorba et al., 2014]
- Incoming radiance estimated by nearest neighbour photons.

Main idea

- Virtual point lights (VPLs) can estimate incoming radiance well in diffuse scenes.
- Use VPLs for incoming radiance sampling.
- Sample by Metropolis algorithm so parameterization is not required.
- Build the sampler on top of existing many-light rendering techniques.
- Use multiple importance sampling to combine with BRDF sampling.

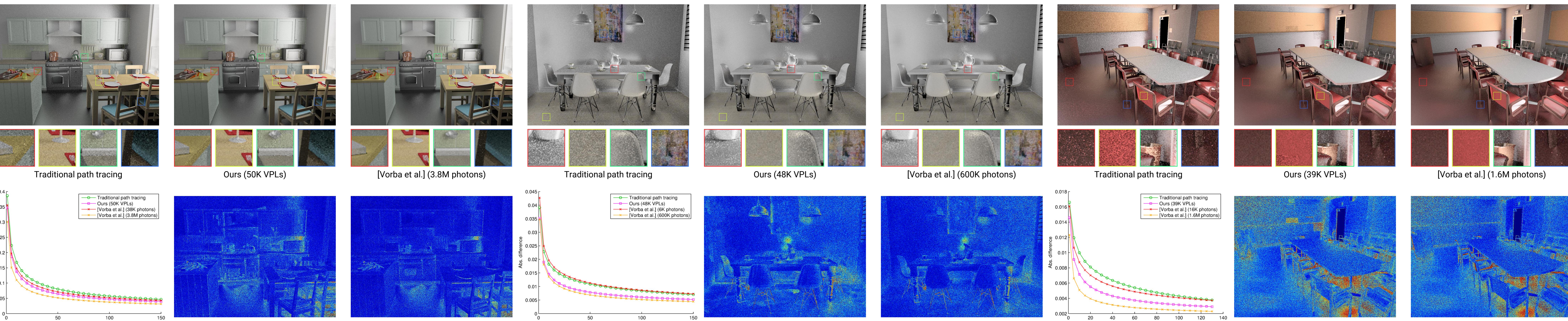
Steps



Implementation

- At each cached scene point, create a Metropolis sampler and store directions generated in a buffer.
- To avoid correlation, scramble the samples in the buffer.
- To compare with the method by [Vorba et al.], we generate photons by tracing one more bounce from the VPLs.

Evaluations



- In our test scenes, our sampler works effectively even for small number of VPLs.
- Method by [Vorba et al.] only outperforms when photons are relatively dense.

Future work

- VPL or photon?
- Bidirectional path tracing.
- Other interpolation techniques.
- More mutation techniques.

References

- Vorba, J., Karlik, O., Sik, M., Ritschel, T., and Krivanek, J. 2014. On-line learning of parametric mixture models for light transport simulation.
- Hey, H. and Purgathofer, W. 2002. Importance sampling with hemispherical particle footprints.
- Jensen, H. W. 1995. Importance driven path tracing using the photon map.
- Ou, J. and Pellacini, F. 2011. Lightslice: matrix slice sampling for the many-lights problem.
- Hardy, J., 2012. Country kitchen - Cycles - Blender 2.62 (Kitchen scene).
- Wayne, W., 2014. The breakfast room - Cycles - Blender 2.71 (Breakfast scene).