Identifying and Visualizing Computational Hotspots in Path Tracing

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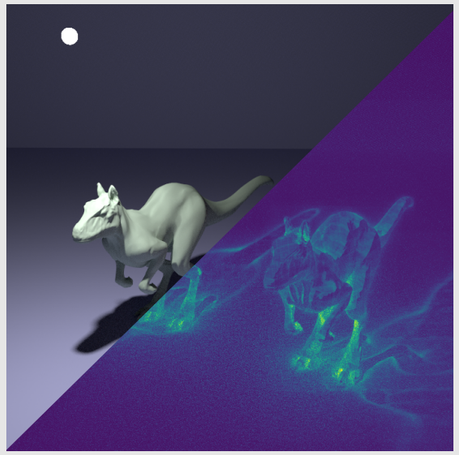
Introduction

Path tracing is a light transport algorithm used to produce a photo-realistic image [1]. However, it is a computationally expensive algorithm.

Therefore, there is a need to be efficient where possible. Visual analytics provides the user insight into the expensive areas in the scene that might need to be addressed.

Visualizing Intersection Cost

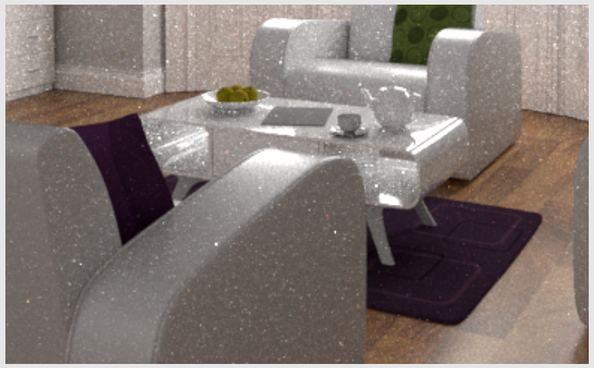


Research Question

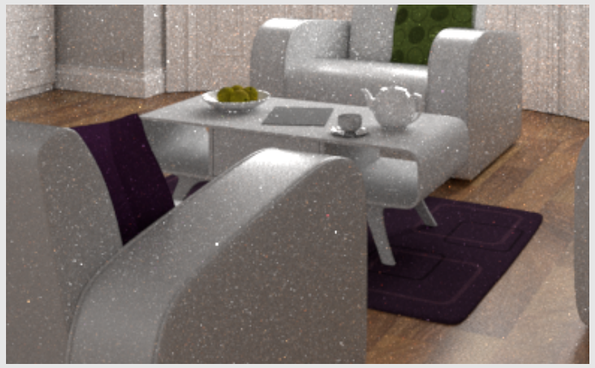
> Can a method be devised to identify and visualize computational hotspots, dependent on material and object placement?

> What is the effect of changing scene variables on computational cost?

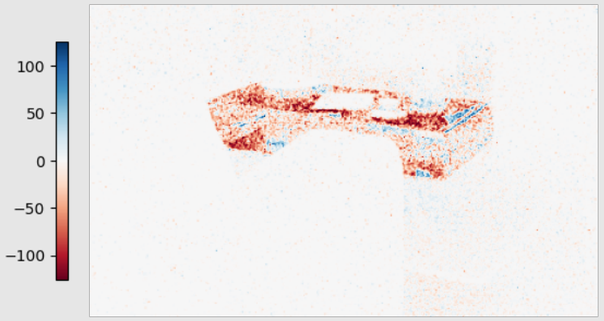
Comparing Scenes Costs



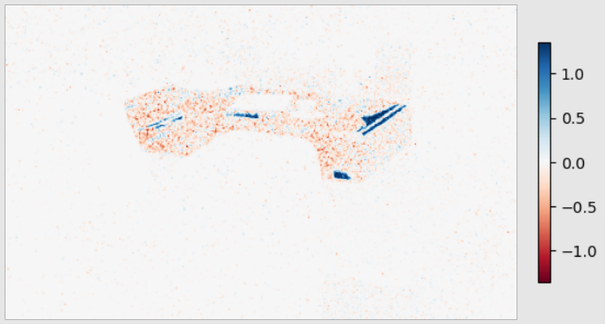
Original scene with glossy table



Modified scene with matte table



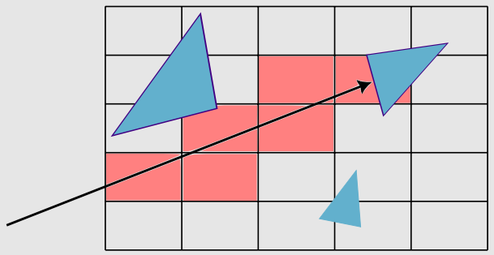
Difference in intersection cost



Difference in path length

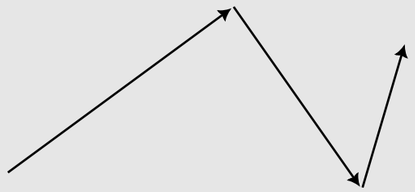
Metrics

Intersection Cost



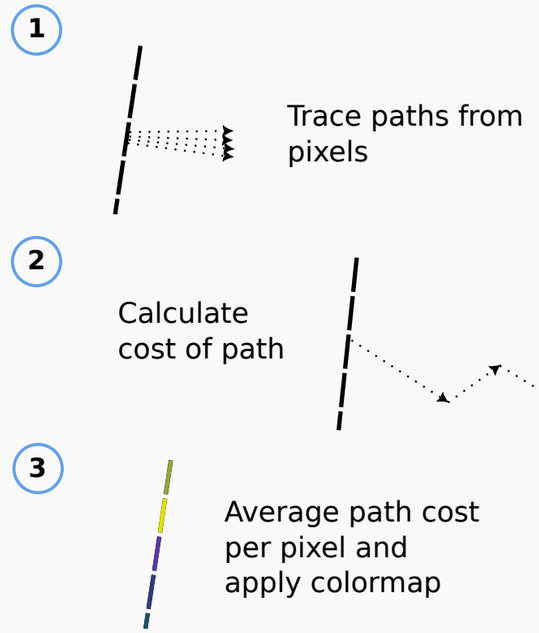
Number of traversals and intersection tests

Path Length



Number of rays cast until terminated

Method



Conclusion

We have shown a simple method and metrics to estimate computational costs from a single viewpoint.

Visualizing the effect of scene changes enables user to make clever changes to reduce computational cost.

Future Work

> Defining metrics to analyze the cause of high cost.

> Measuring costs per point in scene than per pixel in camera.

> Progressive and Interactive cost map.

Sources:
[1] PHARR M., JAKOB W., HUMPHREYS G.: Physically based rendering: From theory to implementation. Morgan Kauf-mann, 2016.

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