1. Motivation

Ambient occlusion (AO) is a fast, approximate technique for uniform environmental lighting. Surface points compute an average occlusion caused by nearby objects. Ambient occlusion properties:

- visually improved lighting
- fast to compute
- real-time approximation possible
- ignores directionality of lighting

Our approach: Use statistics to derive unoccluded directions and estimate contribution of the visible environment.

2. From Ambient Occlusion to Bent Normals

Compute ambient occlusion and bent normals in screen space by testing random directions for occlusion.

3. Bent Cones

Map variance of unoccluded directions to cone angle.

4. Environmental Lighting

Query pre-convolved environment map with bent normal.

5. Results

Ray traced environmental lighting

6. Performance

Importance Sampling 32 directions, 18.8 ms

SS Directional Occlusion 16 directions, 12.5 ms

Bent Cones 8 directions, 6.0 ms speed-up 3x