Screen space indirect lighting with visibility bitmask

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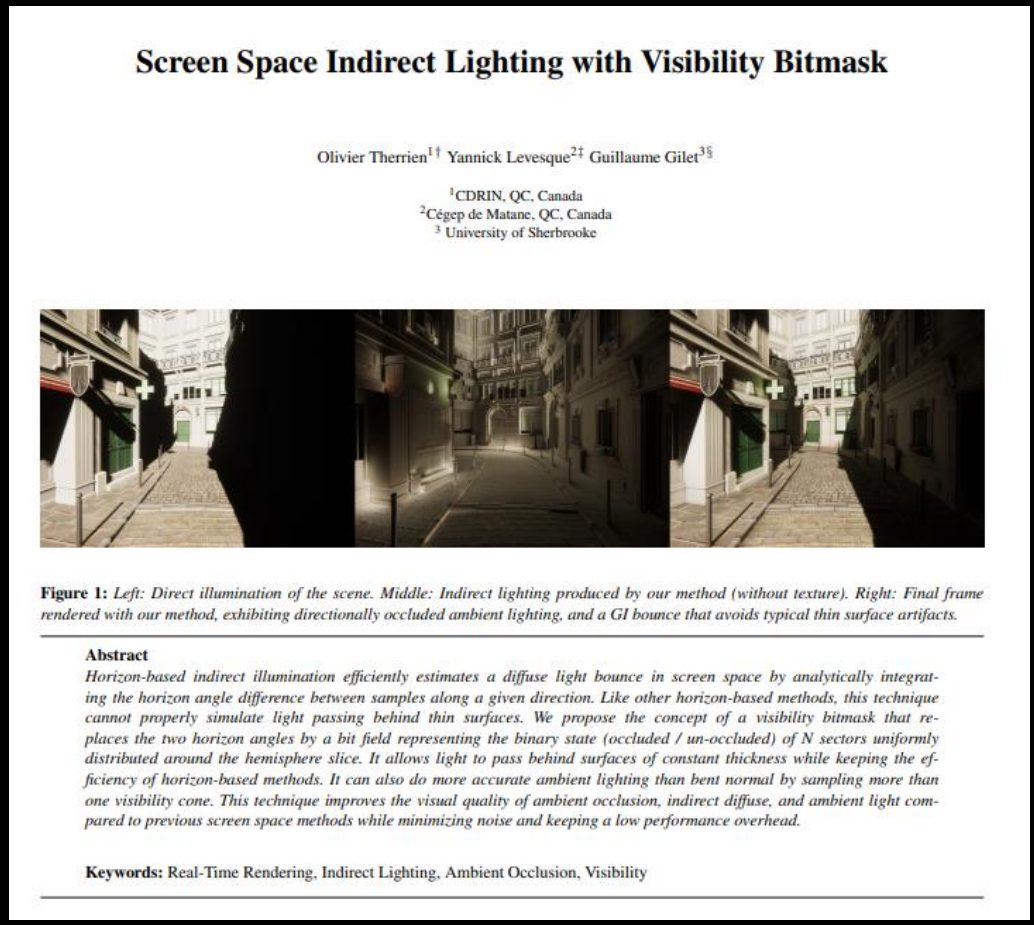
- A multi-institution collaboration:
  - Olivier Therrien (CDRIN)
  - Yannick Levesque (Cégep de Matane)
  - Guillaume Gilet (University of Sherbrooke)

- Special thanks to Peter Shirley



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Olivier Therrien[1†] Yannick Levesque[2‡] Guillaume Gilet[3§]

[1]CDRIN, QC, Canada
[2]Cégep de Matane, QC, Canada
[3] University of Sherbrooke

Figure 1: *Left: Direct illumination of the scene. Middle: Indirect lighting produced by our method (without texture). Right: Final frame rendered with our method, exhibiting directionally occluded ambient lighting, and a GI bounce that avoids typical thin surface artifacts.*

Abstract

Horizon-based indirect illumination efficiently estimates a diffuse light bounce in screen space by analytically integrating the horizon angle difference between samples along a given direction. Like other horizon-based methods, this technique cannot properly simulate light passing behind thin surfaces. We propose the concept of a visibility bitmask that replaces the two horizon angles by a bit field representing the binary state (occluded / un-occluded) of N sectors uniformly distributed around the hemisphere slice. It allows light to pass behind surfaces of constant thickness while keeping the efficiency of horizon-based methods. It can also do more accurate ambient lighting than bent normal by sampling more than one visibility cone. This technique improves the visual quality of ambient occlusion, indirect diffuse, and ambient light compared to previous screen space methods while minimizing noise and keeping a low performance overhead.

Keywords: Real-Time Rendering, Indirect Lighting, Ambient Occlusion, Visibility


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