Improving High-Order Diffraction with Edge Visibility Graph

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Team 2

Overview

- Introduction
- Previous Work
- Limitation
- Our main Ideas
- Roles

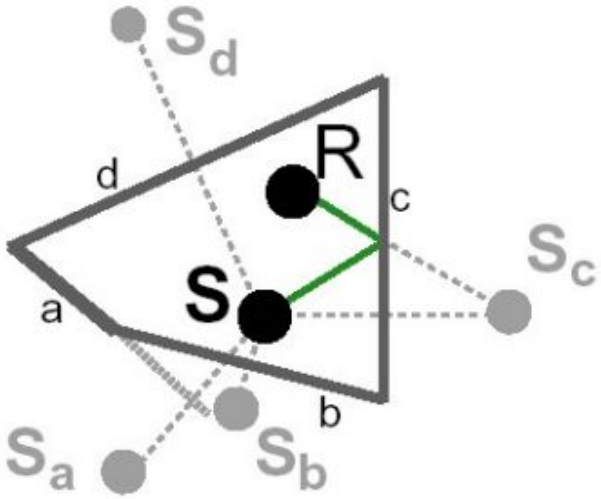
Introduction

Real-Time Sound Rendering

- Numeric methods are accurate but too slow to be used in real-time
- Geometric methods can handle moving sources and dynamics scenes geometry

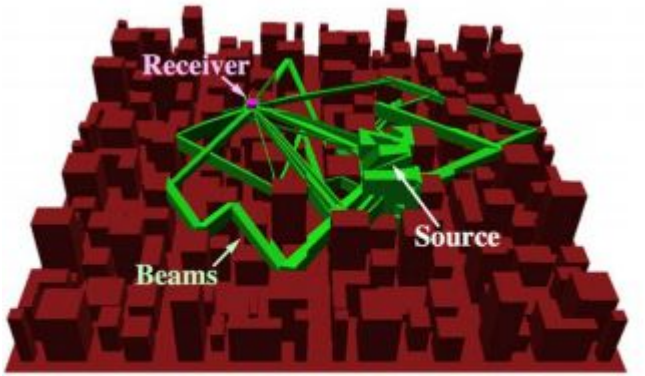
Image Source Method

- Compute a set of virtual image sources
- Too slow when there are many reflections



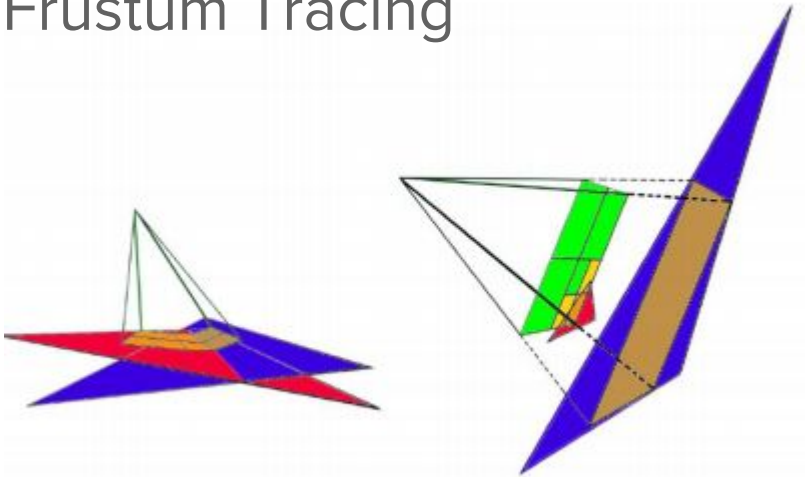
Beam & Frustum tracing

Beam Tracing



[Funkhouser et al. 1998; Tsingos et al. 2001]

Frustum Tracing



[Lauterbach 2007; Taylor et al. 2009; Chandak et al. 2009]

Previous Work

iSound: Interactive GPU-based Sound Auralization in Dynamic Scenes

[Taylor et al. 2010]

- Random spherical sampling of rays is cast from each sound source
- Rays are propagated in the scene
- BVH to fasten intersection tests
- Visibility test to find valid path for sound propagation

GSound: Interactive Sound Propagation for games

[Schissler et al. 2011]

- Modified iSound
- Sound propagation for dynamic scenes (game-like)
  - Real time rendering
  - Reasonable output while consuming minimum of CPU time and memory
- Using Backwards ray tracing and propagation path caching

Backward sound propagation

- The early reflections and diffractions that are important come from geometry near the listener
- Only few of the rays casted from sound source reach the listener
- The number of rays no longer scales with the number of sound sources

Propagation path caching

- They use visibility hash tables as persistent caches

- Once paths are found, they are kept and updated until they become invalid

Limitation

Limitation of GSound

- Diffuse Reflection
- Higher order diffraction
- GA method
  - Inaccuracy at low frequency
- Inability to simulate wave-based sound effects
  - Temperature / pressure change
  - Doppler effects
  - Diffraction

Main Idea

Our main idea

- To improve the GSound by solving limitation

- High-Order Diffraction and Reflections for Interactive Sound Propagation in Large Environments

  [Schissler et al. 2014]

Limitation of GSound

- Diffuse Reflection
- Higher order diffraction
- GA method
  - Inaccuracy at low frequency
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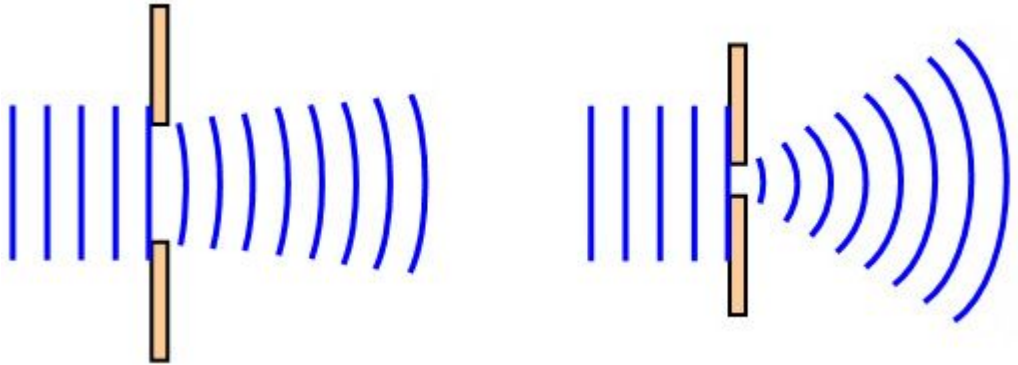
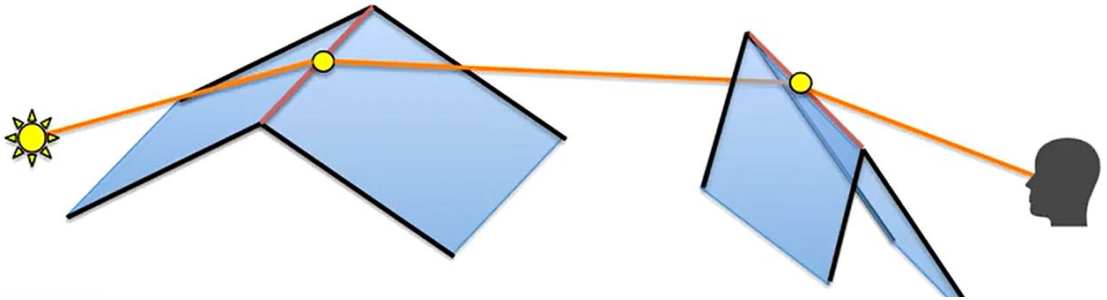
  - Doppler effects
  - Diffraction

Diffraction

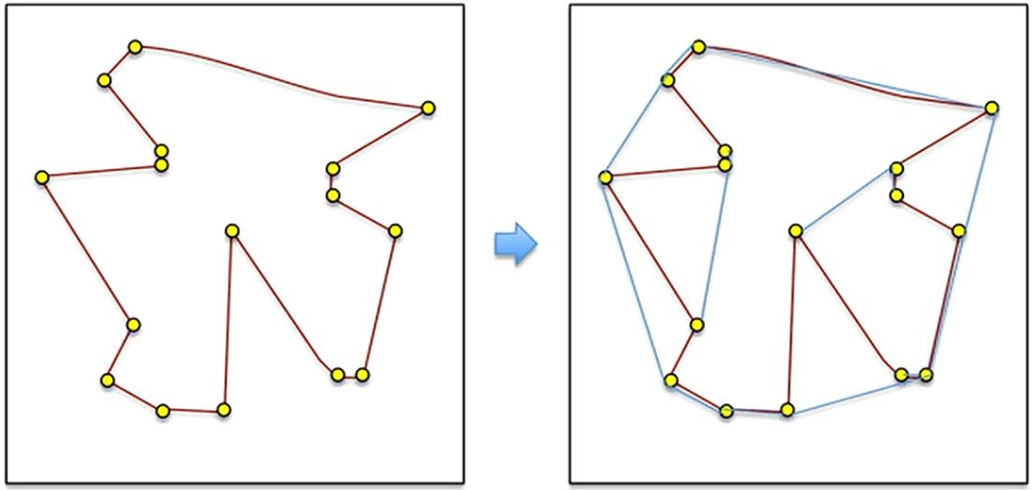
- Low-frequency sound is scattered by objects or features of similar size to the wavelength



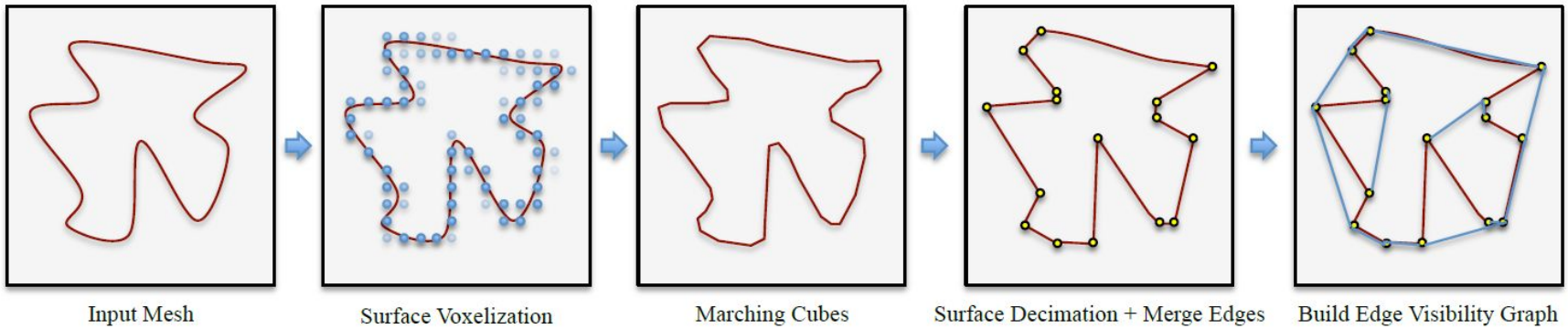
High-Order Diffraction



Edge Visibility Graph



Pipeline of Edge Visibility



Roles

Roles

- Jongwon Jang
  - Presentation, coding

- Denis THY
  - Presentation, coding

Thank you for your attention

Any questions ?