

Improving High-Order Diffraction with Edge Visibility Graph

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Team 2

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GSound: Interactive Sound Propagation for games

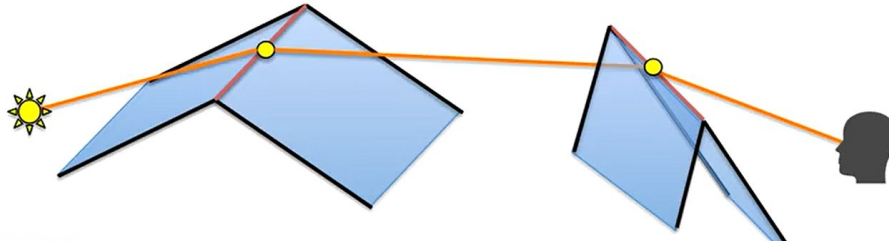
[Schissler et al. 2011]

- 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

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

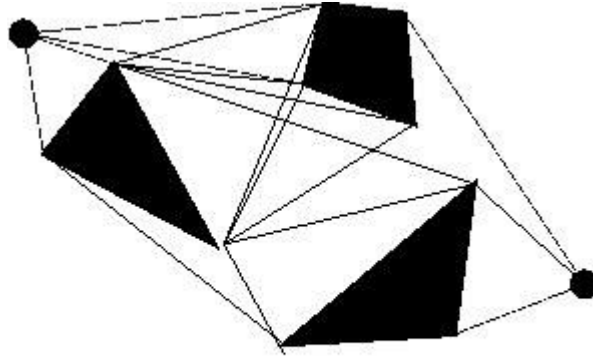
High-Order Diffraction



Previous Algorithm:

Running time can be exponential in the maximum diffraction order.

Edge Visibility Graph



Visibility Graph

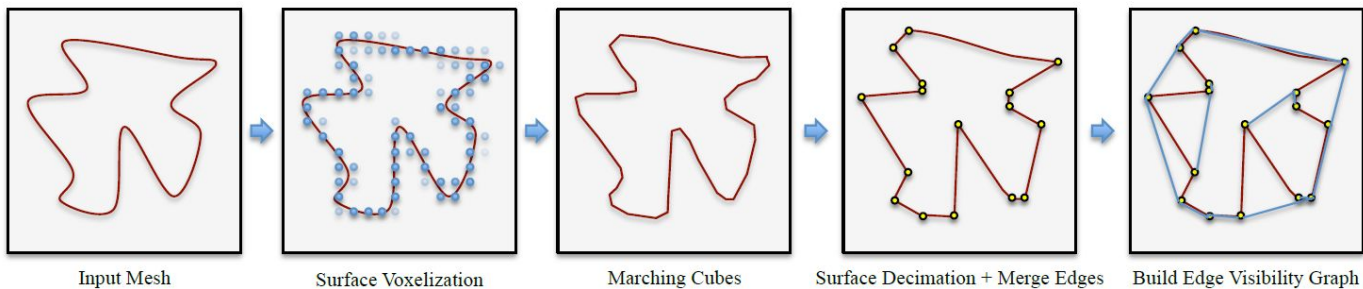
Precompute which edges can diffract with each other edge

Minimize the number of diffraction edges that need to be considered in runtime

Avoid any Runtime edge-edge visibility queries

Our past plans

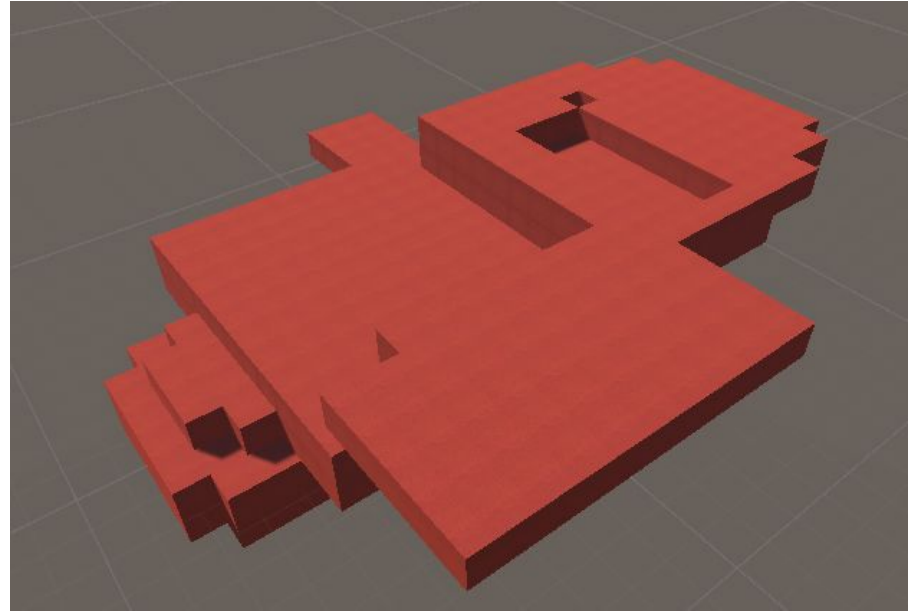
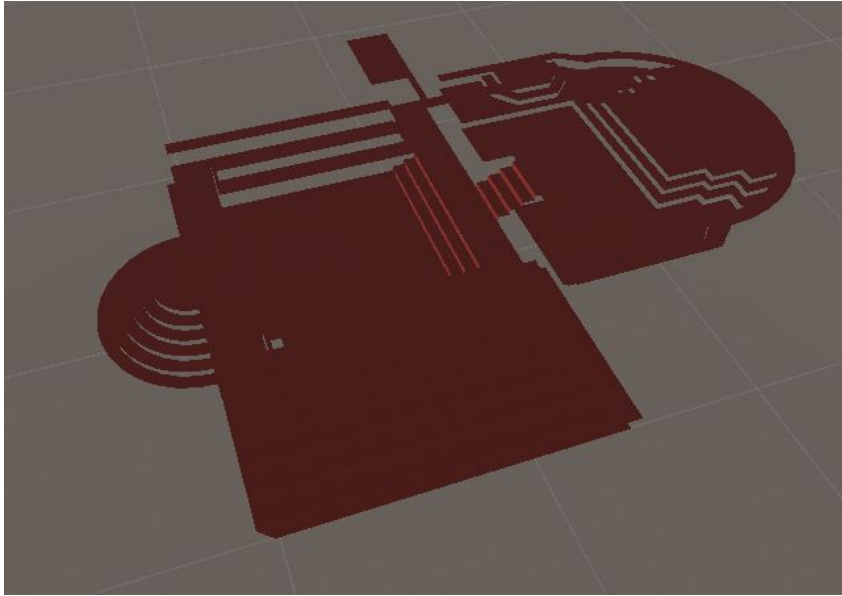
- Build GSound plugin and environment for Unity3D
- Modify G-Sound script to preprocessing edge visibility graph
 - Surface Voxelization of input mesh
 - Marching Cubes
 - Surface Decimation
 - Build edge visibility graph
- Test and compare two methods



Our modified plans

- Not use given G-Sound
- Build method for edge visibility graph in Unity3D
- Our method
 - Voxelization of mesh in the scene
 - Get the edges of voxels
 - Check for visibility between two points using ray methods

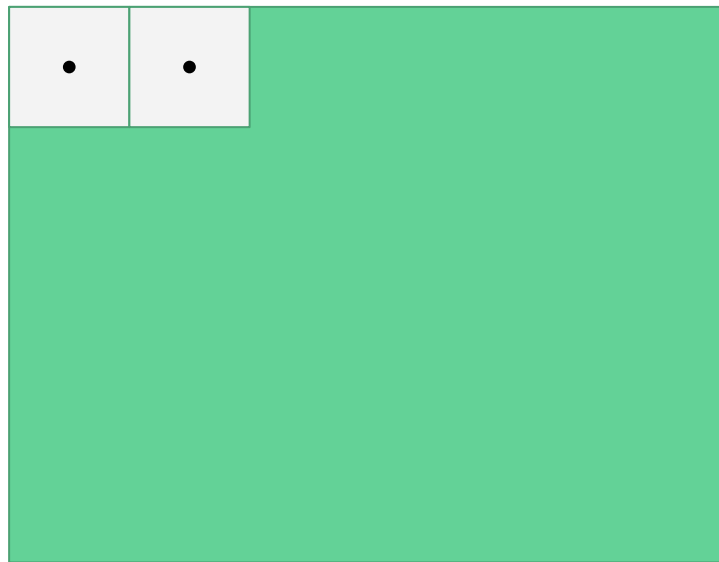
Voxelization



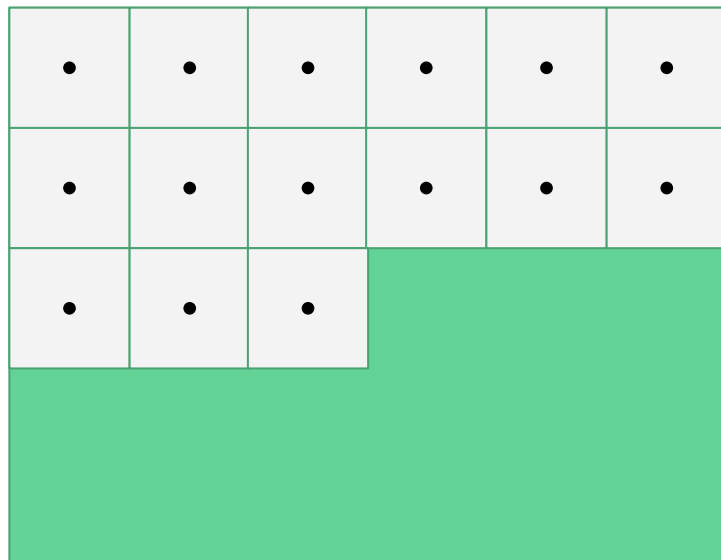
Voxelization



Step
←→



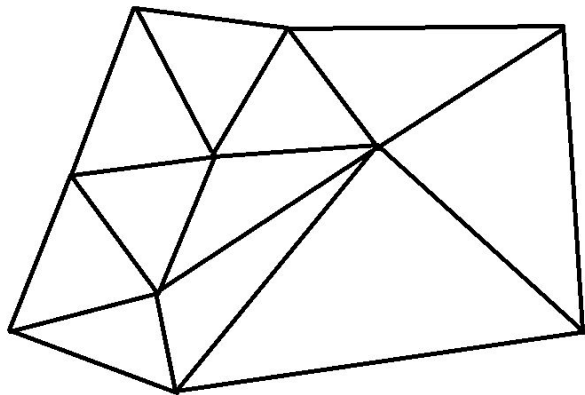
Voxelization



Edges extraction

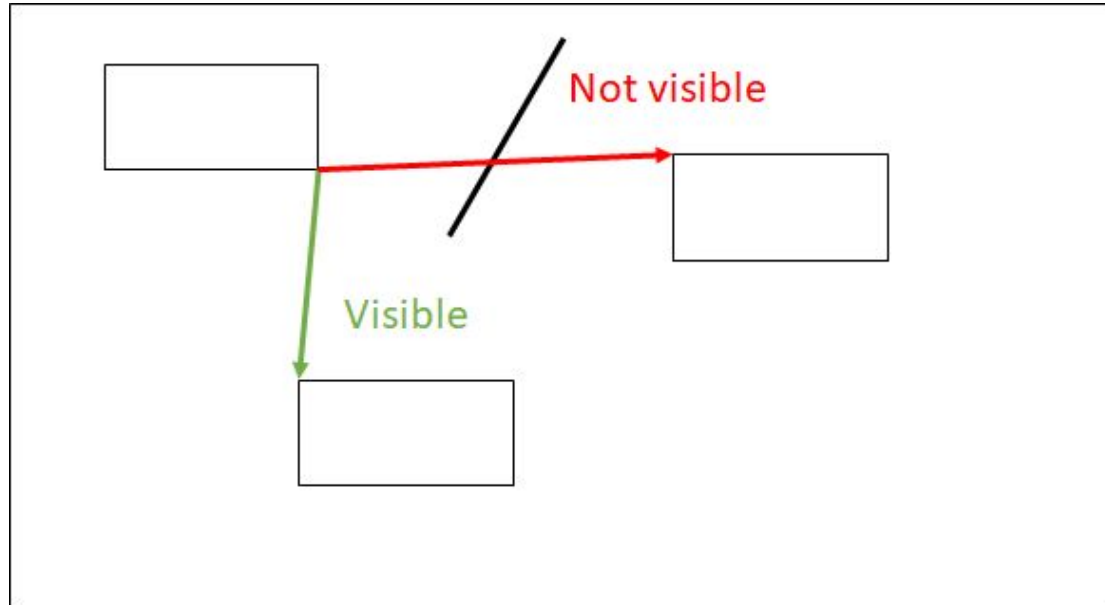
- Store all edges
- Remove edges that is shared in two neighbor triangles

From previous scene : 1581 edges → 673 edges



Visibility checking

- Use “raycasthit” class in Unity3D
- raycasthit checks if ray collision happens



Role of team members

- Jongwon Jang - Presentation, Visibility check
- Denis Thy - Presentation, Edge extractor

Conclusion

- We could not show a lot of results and could not achieve our initial goal
- What we've learned
 - **Start early**
 - **Know your LIMITS**