Rendering

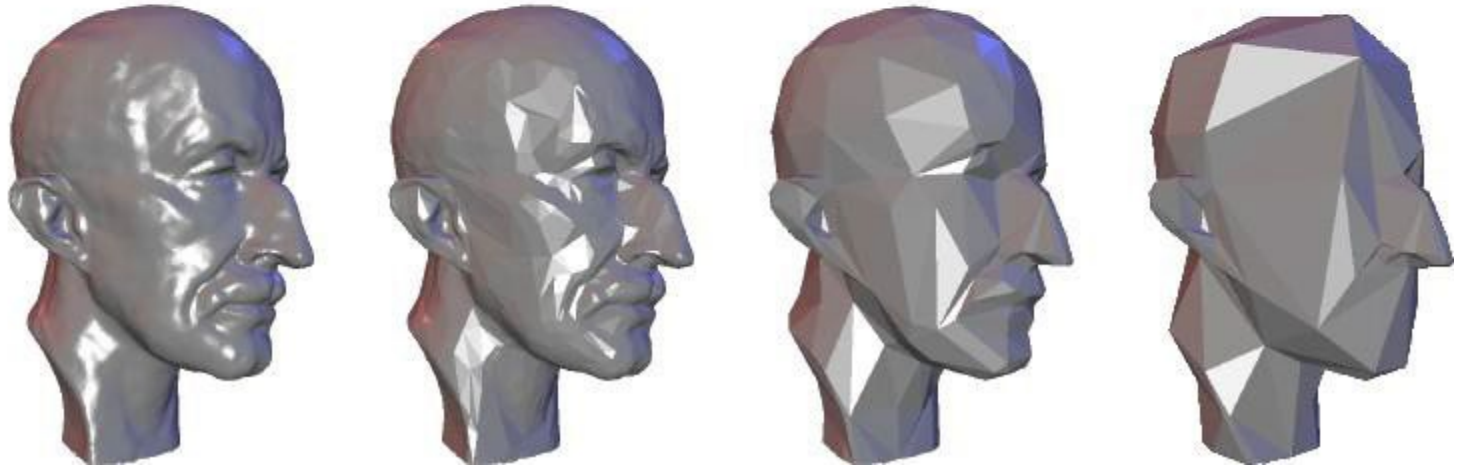
Discrete Level-of-Detail

CS 415: Game Development

Professor Eric Shaffer

Level-of-Detail Rendering

- Construct multiple versions of mesh
  - Varying polygon count
- Multi-resolution hierarchies enable
  - efficient geometry processing
  - level-of-detail (LOD) rendering



Pick which model to use based on approximate screen size…

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Level-of-Detail Rendering

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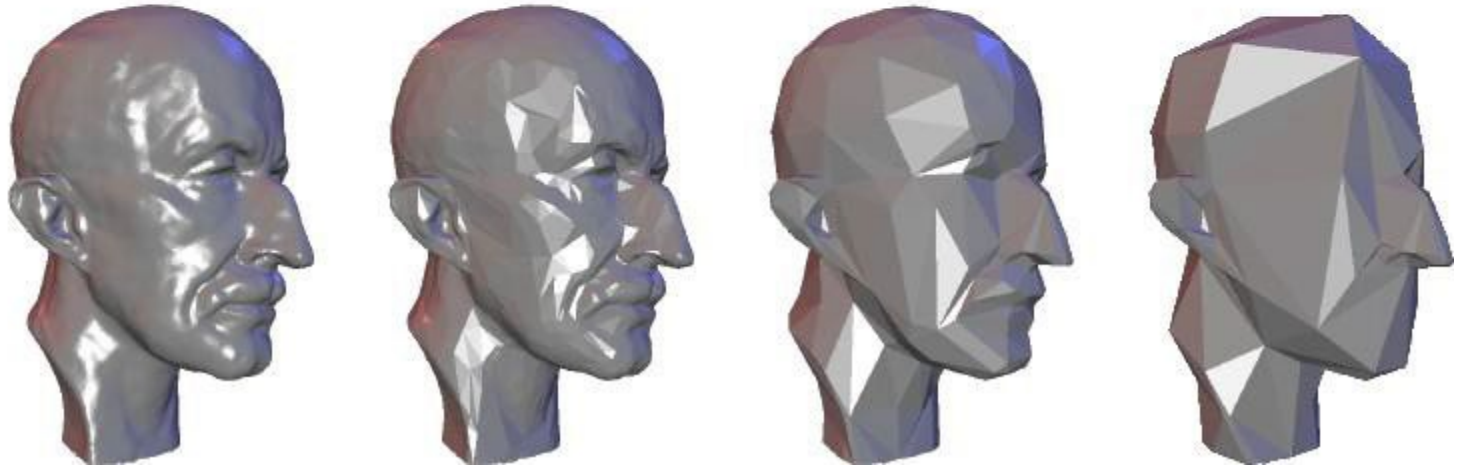

Pick which model to use based on approximate screen size…

Approx screen size ➔ need to guess the width and height in pixels of the rendered mesh….

How could the engine make this guess?

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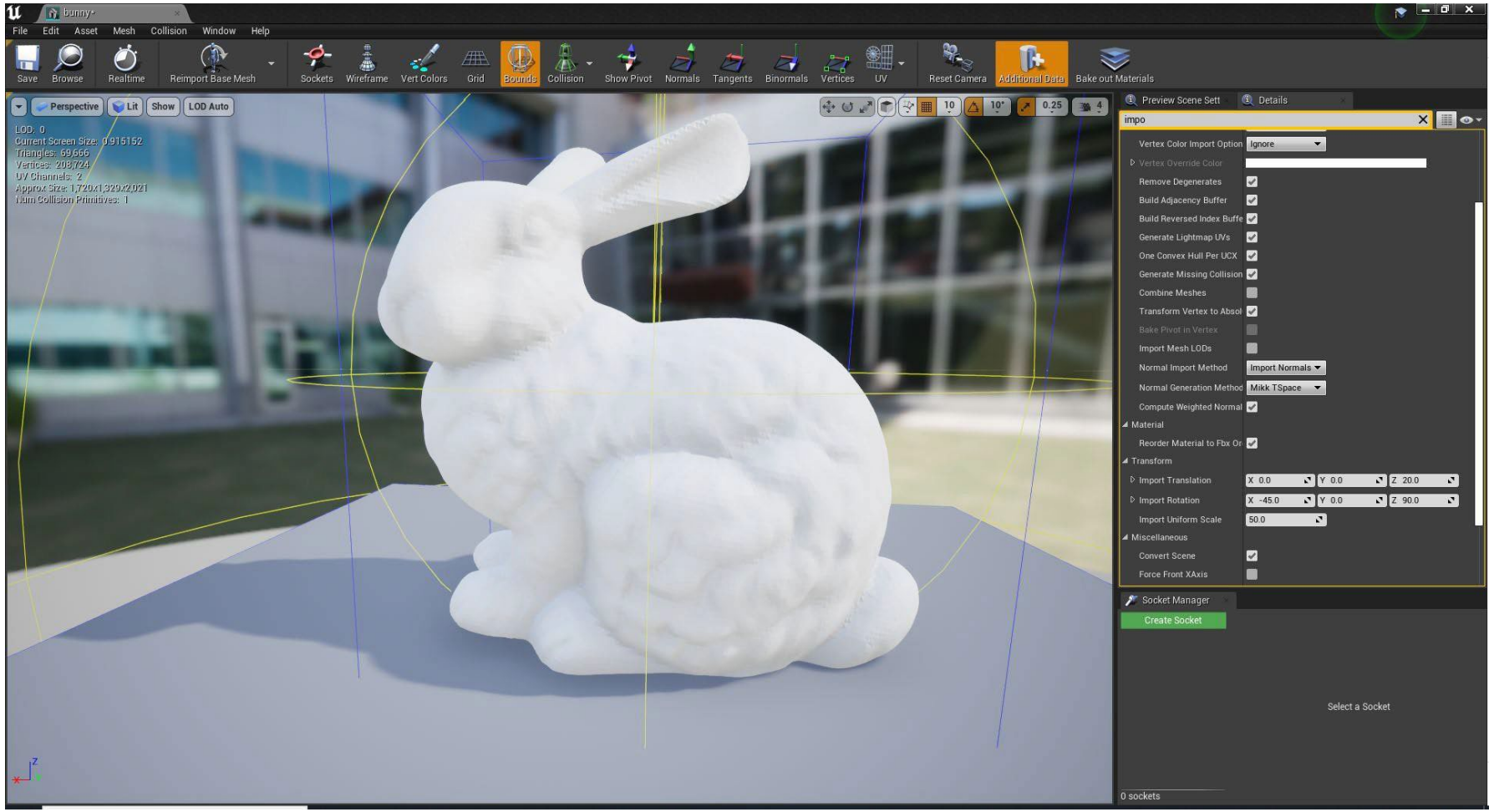
Unreal Engine 4 Mesh Editor



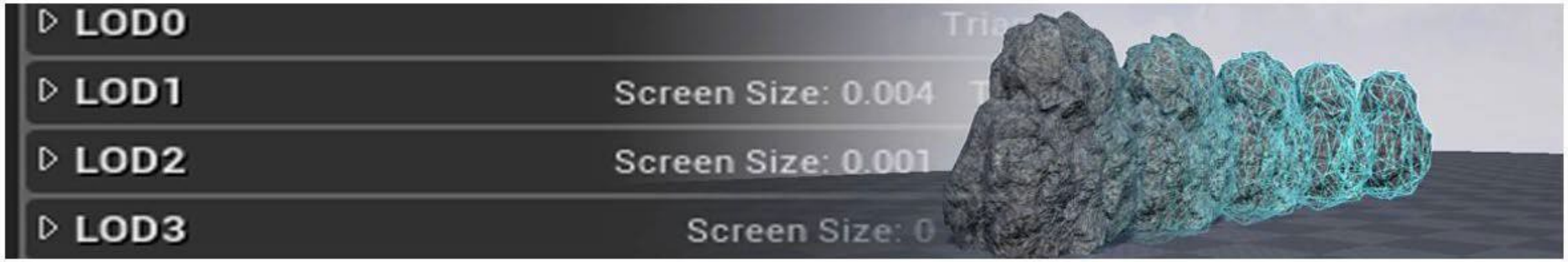
https://docs.unrealengine.com/4.27/en-US/WorkingWithContent/Types/StaticMeshes/HowTo/AutomaticLODGeneration/

Generating LODs for a Static Mesh

Setting Up Automatic LOD Generation

How To use the Automatic LOD Generation system in UE4.

Intermediate

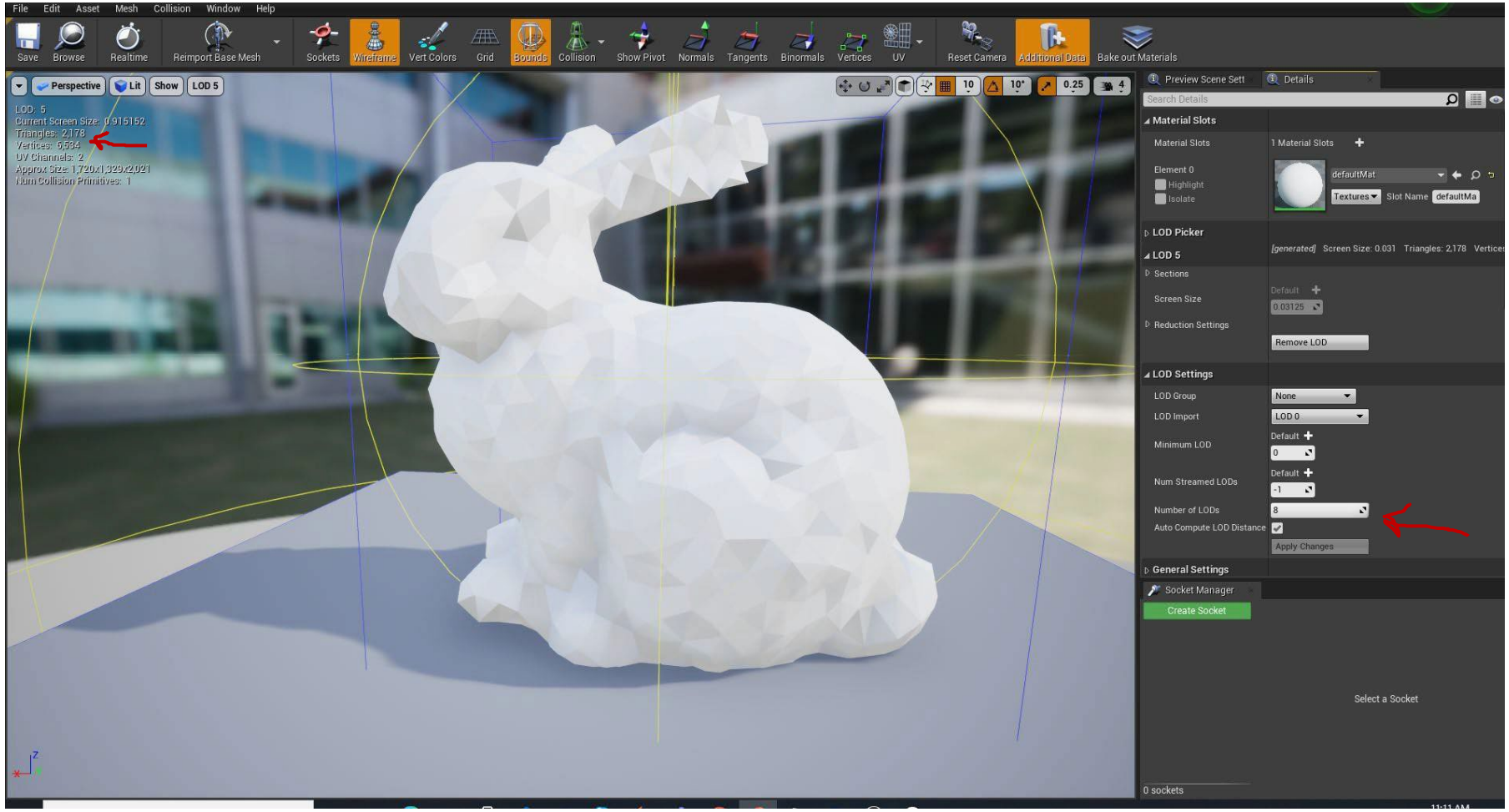


ON THIS PAGE

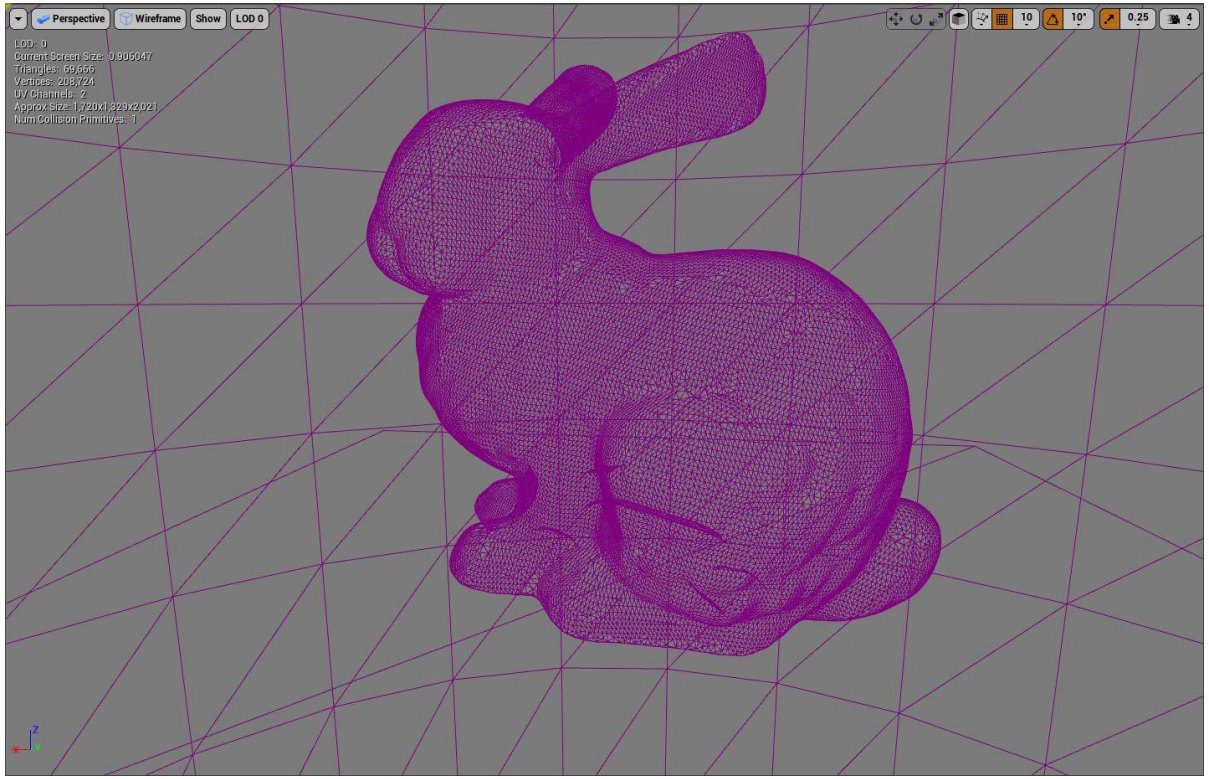
The Automatic LOD generation system allows you to automatically reduce the polygon count of your Static Meshes to create LODs with the Unreal Engine 4 (UE4) Editor. Automatic LOD generation uses what is called quadratic mesh simplification to help generate the LODs for Static Meshes. Quadratic mesh simplification works by calculating the amount of visual difference that collapsing an edge (by merging two vertices) would generate. It then picks the edge with the least amount of visual impact and collapses it. When this happens, the tool will pick the best place to put the newly merged vertex, removing any triangles that have also collapsed along with the edge. It will continue to collapse edges until it reaches the requested target number of triangles. In the following guide, we'll show you how-to setup and use the automatic LOD generation system in your UE4 projects.

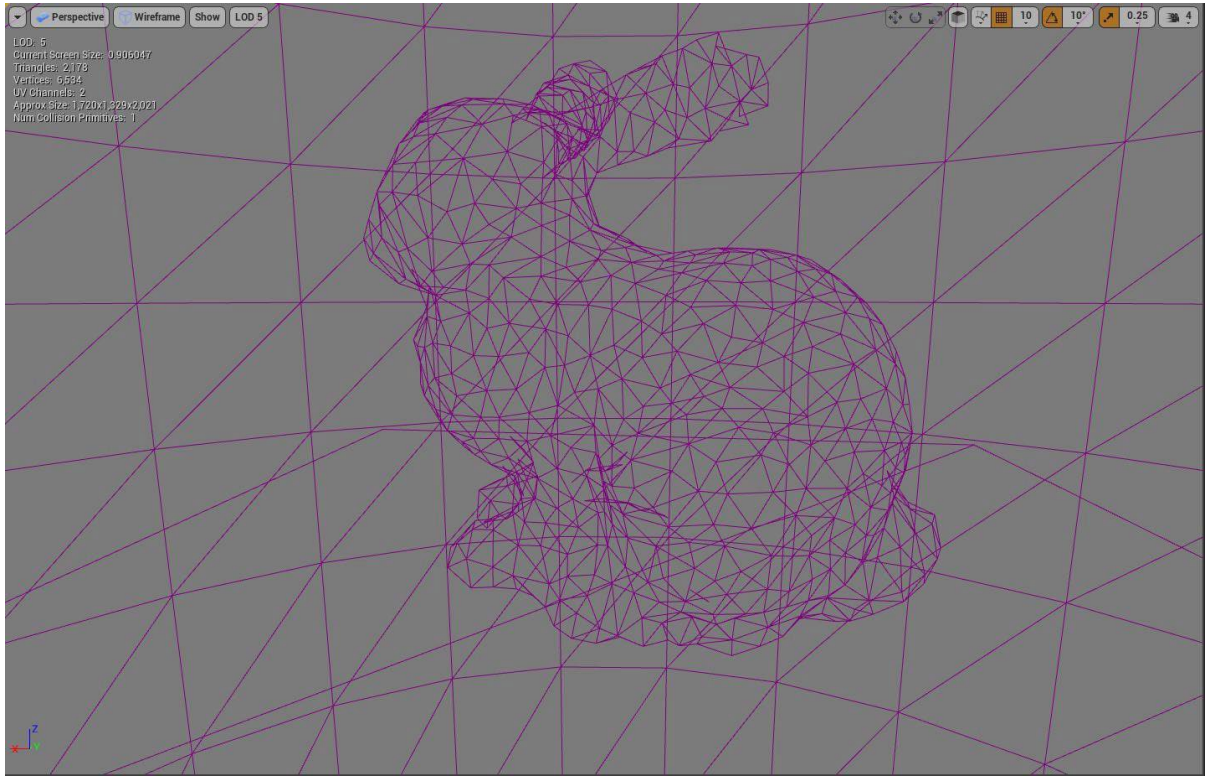
That's wrong - should be quadric mesh simplification

Bunny LOD 5


File Edit Asset Mesh Collision Window Help
Save Browse Realtime Reimport Base Mesh Sockets Wireframe Vert Colors Grid Bounds Collision Show Pivot Normals Tangents Binormals Vertices UV Reset Camera Additional Data Bake out Materials
Perspective Lit Show LOD 5
LOD: 5
Current Screen Size: 0.915152
Triangles: 2,178
Vertices: 6,534
UV Channels: 2
Approx Size: 1,720x1,329x2,021
Num Collision Primitives: 1
Preview Scene Sett
Details
Search Details
Material Slots
Material Slots
1 Material Slots
Element 0
Highlight
Isolate
defaultMat
Textures
Slot Name defaultMa
LOD Picker
LOD 5
[generated] Screen Size: 0.031 Triangles: 2,178 Vertices
Sections
Screen Size
Default
0.03125
Reduction Settings
Remove LOD
LOD Settings
LOD Group
None
LOD Import
LOD 0
Minimum LOD
Default
0
Num Streamed LODs
Default
-1
Number of LODs
8
Auto Compute LOD Distance
Apply Changes
General Settings
Socket Manager
Create Socket
Select a Socket
0 sockets

Comparison: LOD0 vs LOD5





LOD5 has about 3% of the number of polys as LOD0

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Rendering: LOD0 vs LOD5

Mesh Simplification

How can you algorithmically reduce polygon count?