CMPE 360
Hands-On Activity 9

Name(s):

1. Answer the following questions in 1-2 sentences:

   a) What are the three possible uses of the Scene Graph in Computer Graphics?

   b) What is the benefit of using a hierarchical structure in a Scene Graph? Give at least two benefits.

   c) What are the key components typically found in a node of a scene graph?

2. Your task is to evaluate the appropriateness of "Indexed Triangle Set" and "Half-Edge Mesh" representations for triangle meshes across various applications, determining the most suitable representation for each specific use case mentioned in the questions below. Check the most suitable representation for each question, and provide a concise one-sentence explanation of your response.

   a) **Mesh Editing and Modification** (e.g. 3D modeling software)

      (__) Indexed Triangle Set (__) Half-Edge Mesh

      Explain:

   b) **Efficient Rendering** for Real-Time Graphics Pipelines

      (__) Indexed Triangle Set (__) Half-Edge Mesh

      Explain:

   c) ***Geometry Compression:*** *In applications where bandwidth and memory usage are critical, such as in web graphics and virtual reality, indexed triangles are employed to compress geometry data by reusing vertices.*

      (__) Indexed Triangle Set (__) Half-Edge Mesh

      Explain:

   d) **Boundary Detection::** In applications where the goal is efficient identification and analysis of the mesh boundaries (i.e. outer edges of the mesh).

      (__) Indexed Triangle Set (__) Half-Edge Mesh

      Explain:

3. What is the memory difference for a simple tetrahedron stored as four independent triangles and one stored in an indexed triangle data structure? Assume that vertex positions and normal vectors are stored for each vertex.