Quiz Week 9

Part 1.

1. F 2. F 3. F 4. F 5. F 6. T

Part 2.

1. B 2. BC

Part 3.

1. (1). Explicit geometric representation: Objects are define by directly specifying the geometric primitives and their properties. includes polygon meshes, parametric curves and surfaces

Implicit geometric representation: Objects are defined by implicit equations or conditions. e.g. $f(x,y,z)=0$. Examples includes distance functions, level set, and so on.

(2). Explicit:

Advantages: Easy to render, efficient for certain operations, can represent complex shapes

Disadvantages: Require large memory and computation for detailed models

Implicit:

Advantages: Efficient for boolean operations and inclusion tests.

Disadvantages: hard to render directly

2. Polygon Meshes: consists of lists of vertices, edges and faces Easy to render.

Parametric Curves and Surfaces: Defined by math functions and parameters or control points. eg. Bézier curves

Point Clouds: Discrete points sampled from a surface, simple and lacks connectivity.

Voxel Grids: 3D grids of cells storing occupancy or density.

3. The half-edge structure represents each edge twice, one per adjacent face. Each half-edge stores its origin vertex, twin half-edge, next half-edge, the face it bounds

4.

(1) Compute score of each vertex with quadric error metrics, by measuring distance to planes.

(2). Prioritize edge collapses with minimal error.

(3). Iteratively apply edge collapse and update the mesh.

5. Given a polygonal mesh:

(1). For each face, compute face points by averaging its vertices.

(2). For each edge, compute edge points by averaging its end points and face points of adjacent faces

(3). For each original vertex, compute a new position by a weighted average of the original vertex and adjacent face points and edge points

(4) Repeat the process to produce progressively smoother surfaces