KAIST

CS 380

Introduction to Computer Graphics

LAB (9)

2018.05.28~31

VISUAL COMPUTING Lab

Overview

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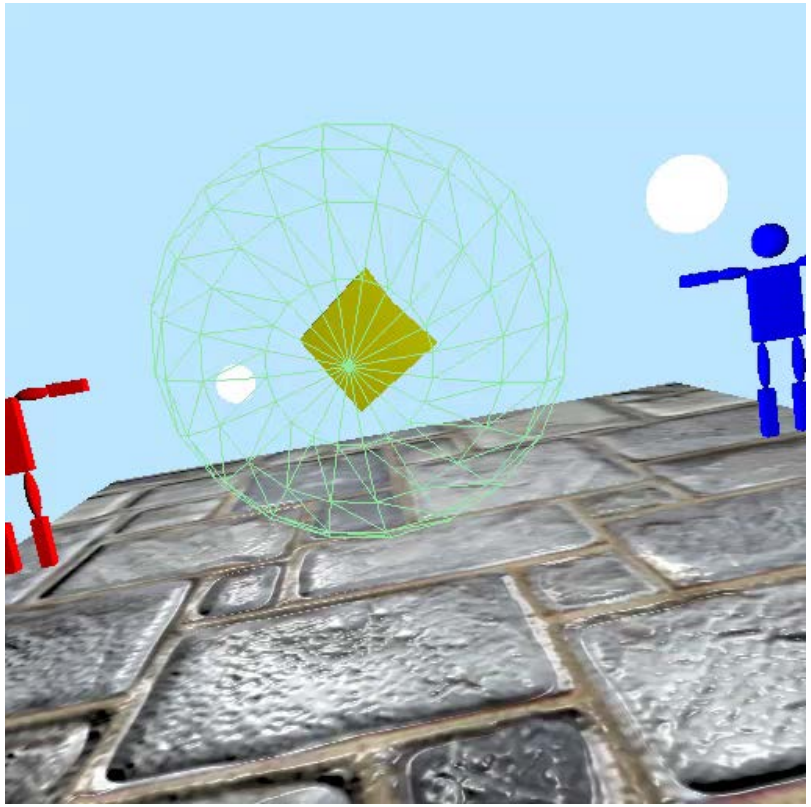
- Subject: meshes and subdivision
- Steps
  - Preparation
  - Task1: read a mesh file
  - Task2: smooth shading
  - Task3: animate the cube
  - Task4: sub-divide the cube



TASK1

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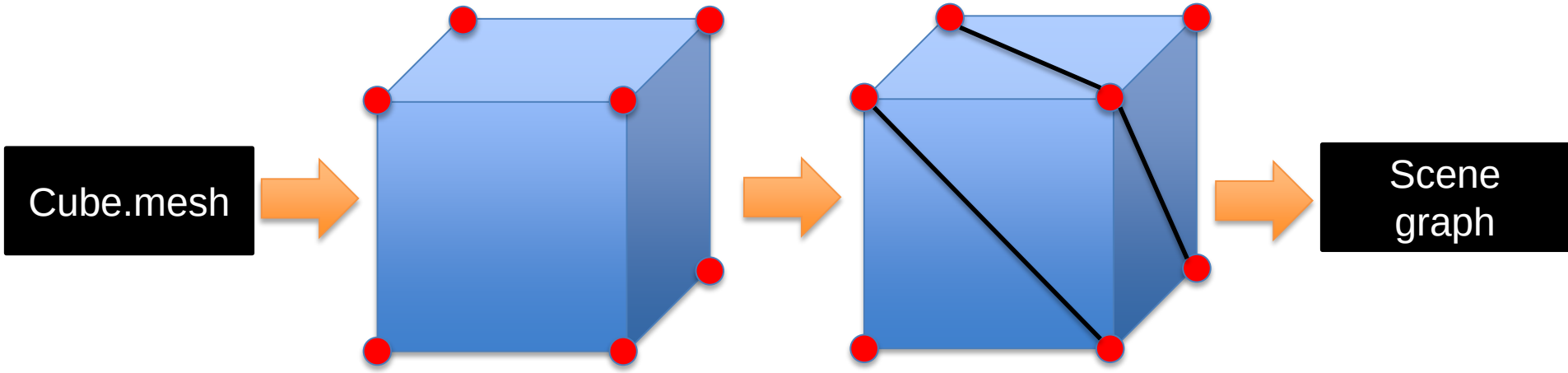
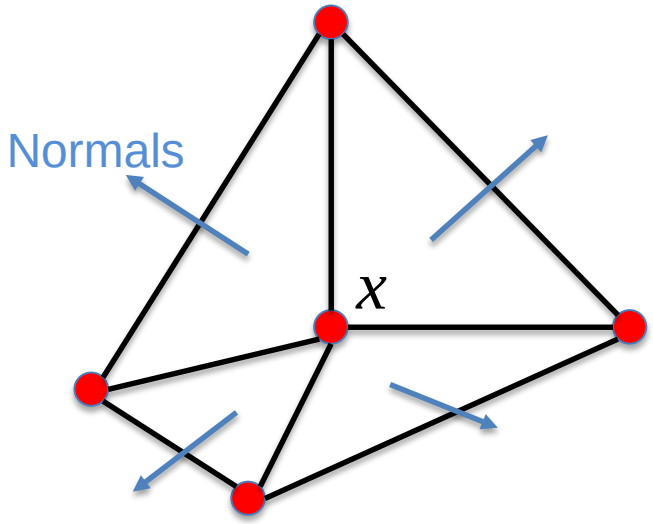


1. Read the cube mesh (cube.mesh)
2. Convert quad components to triangles
3. Node is added to the scene graph

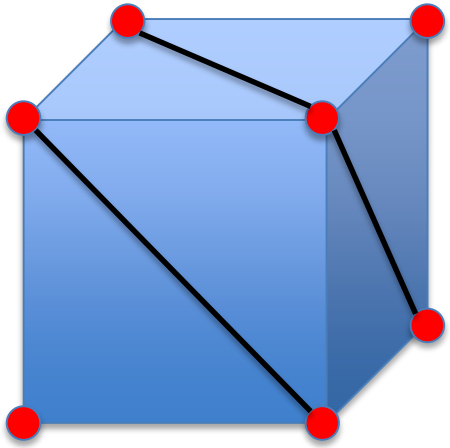
TASK2

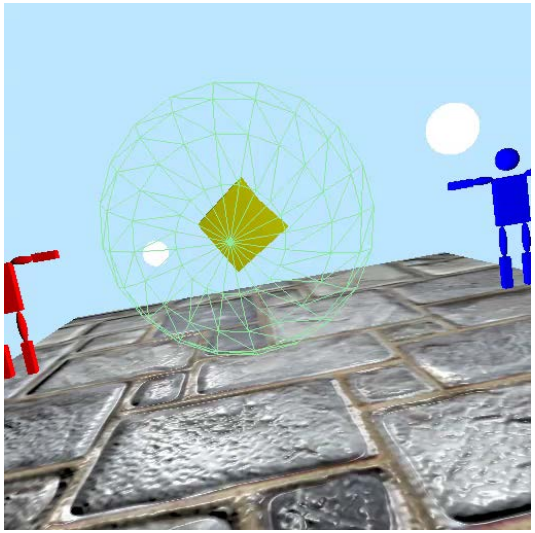


What is normal of x?

- Flat shading
  - A normal of a incident face is chosen
- Smooth shading
  - Average of normals of all incident faces is chosen

TASK3





- A new call back for animating the vertices of the cube
  - GLUT timer callback

TASK4

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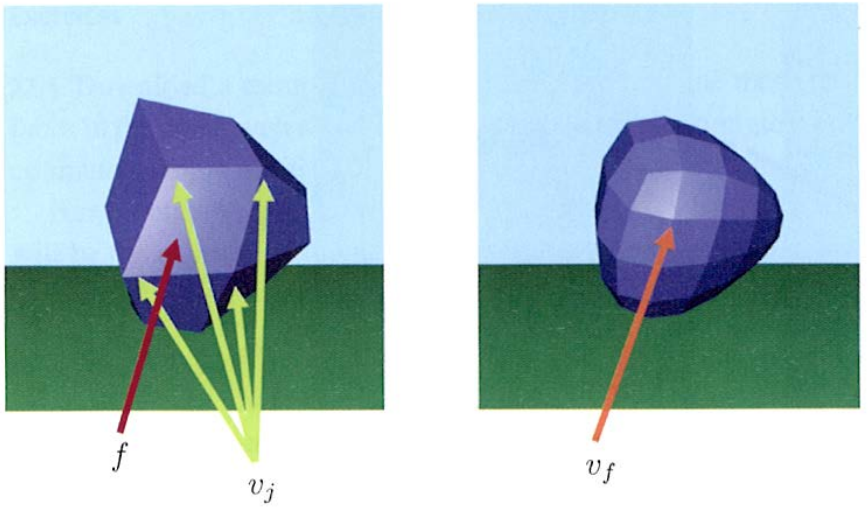
- Subdivision with Catmull-Clark algorithm



Watertight mesh M^0 M^1

Face-vertex $v_f = \frac{1}{m_f} \sum_j v_j$ (Centroid of the vertices)

# of vertices

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TASK4

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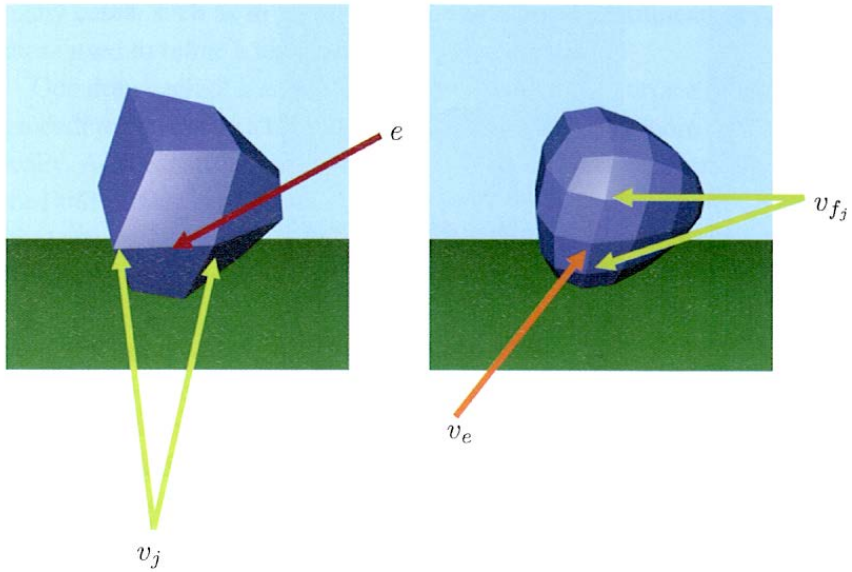
- Subdivision with Catmull-Clark algorithm



Watertight mesh M^0 M^1

Edge-vertex $v_e = \frac{1}{4}(v_1 + v_2 + v_{f_1} + v_{f_2})$

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TASK4

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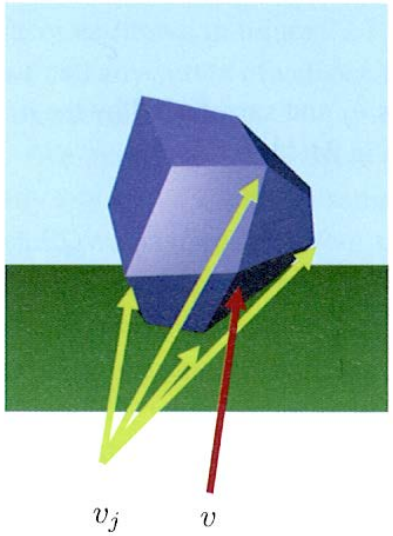
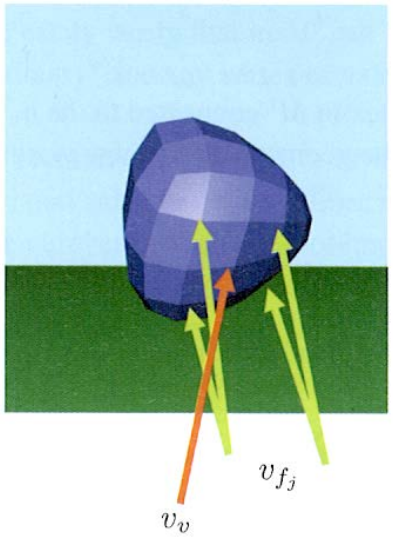
- Subdivision with Catmull-Clark algorithm





Watertight mesh M^0 M^1

Vertex-vertex $v_v = \frac{n_v - 2}{n_v} v + \frac{1}{n_v^2} \sum_j v_j + \frac{1}{n_v^2} \sum_j v_{f_j}$

# of connected vertices

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TASK4

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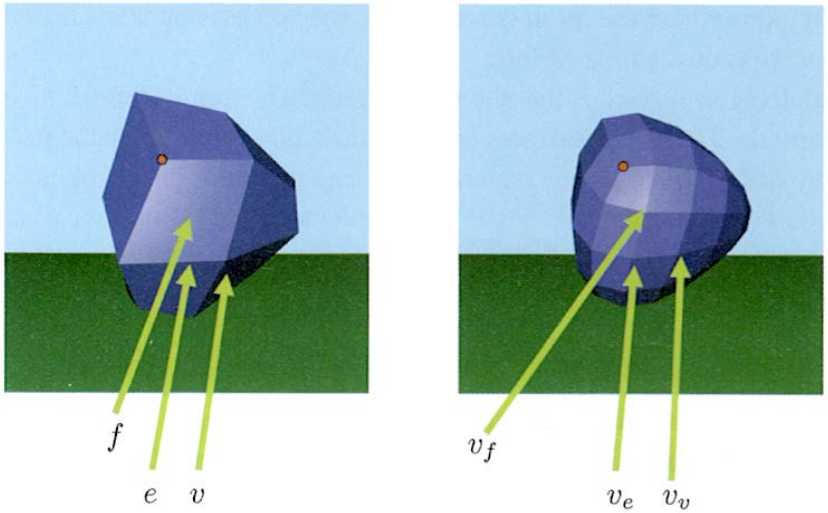
- Subdivision with Catmull-Clark algorithm



Vertex-vertex $v_v = \frac{n_v - 2}{n_v} v + \frac{1}{n_v^2} \sum_j v_j + \frac{1}{n_v^2} \sum_j v_{f_j}$

Edge-vertex $v_e = \frac{1}{4}(v_1 + v_2 + v_{f_1} + v_{f_2})$

Face-vertex $v_f = \frac{1}{m_f} \sum_j v_j$

Summary

- In this session, you have learned mesh-related things
  - Basic structure of mesh
  - Smooth shading
  - Sub-division of vertices