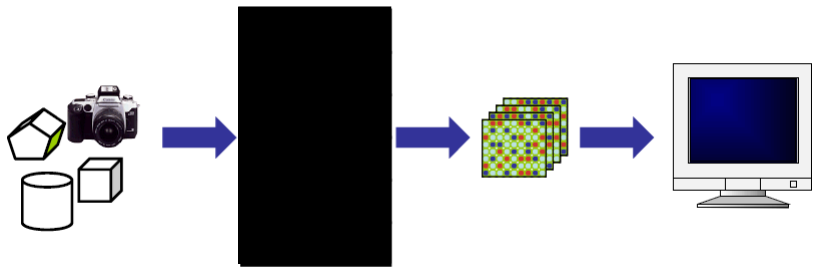
3D Graphics Programming Tools

Wrapped up in 10 main points …

Point 1

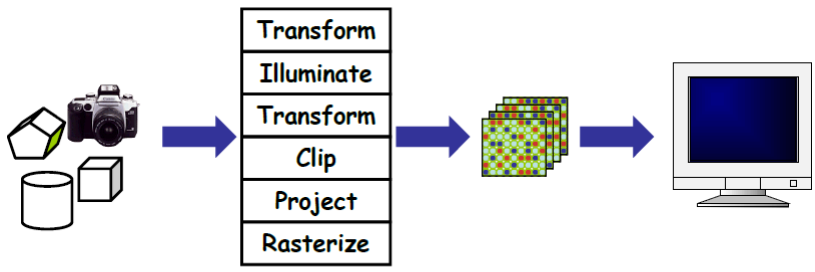
3D Graphics Programming is the subject concerned with how images can be constructed from the combination of:

1. the abstract description of objects
2. the specification of a viewer



Point 2

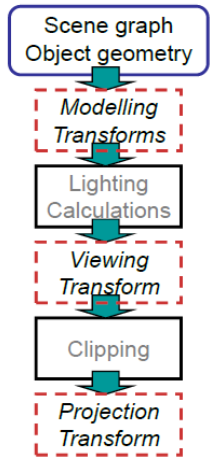
3D Graphics Programming tools use a pipeline architecture.



model & camera parameters | rendering pipeline | framebuffer | display

Point 3

Transforming means converting to a representation in a different coordinate system.



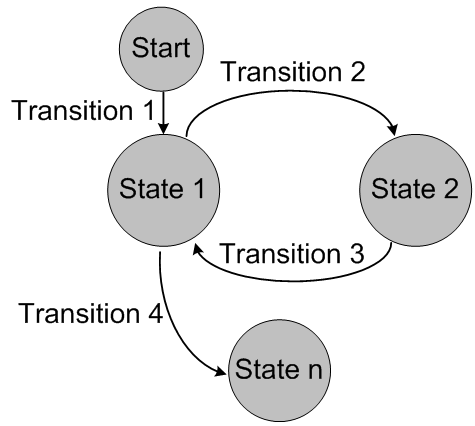
From object coordinates to world coordinates

From world coordinates to camera (or eye) coordinates

From camera coordinates to window (or screen) coordinates

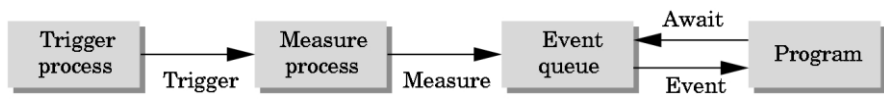
Point 4

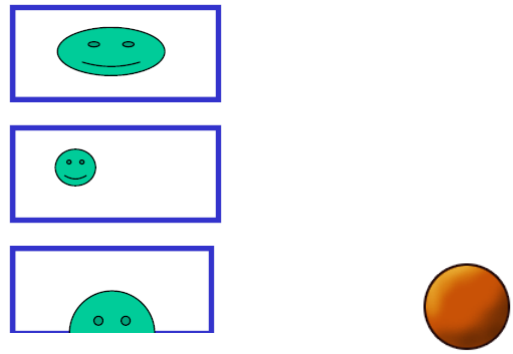
OpenGL is a state machine.



Point 5

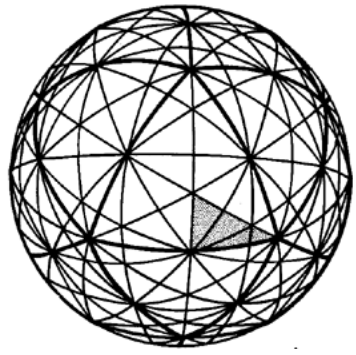
OpenGL is event driven.

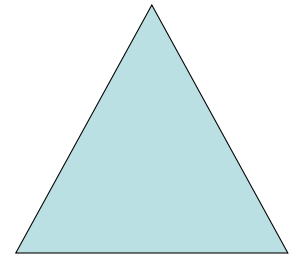




Point 6

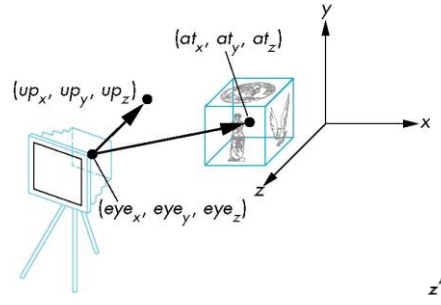
Polygons rule the world of 3D Graphics Programming !

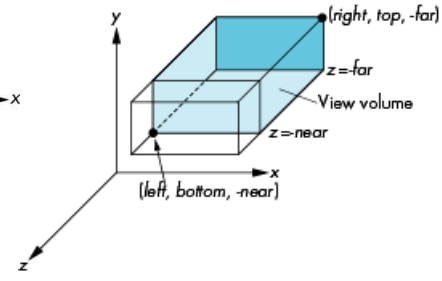




Point 7

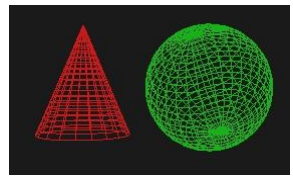
Viewing is the result of two processes: switching to eye coordinates and projection (including clipping).

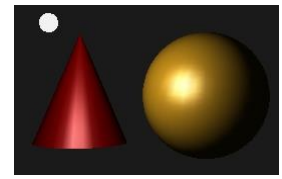




Point 8

Lighting and shading are key to the creation of realistic images of computer-generated 3D objects.





Point 9

3D Graphics Programming requires practice and skills.

Point 10 ?

- Discuss and then write down on a paper the 10th point.

- Think carefully: (1) it must be different from the previous 9 points; (2) it must be characteristic and significant; (3) it must be general.

- Write a ‘catch phrase’ and then some explanations.

Quiz

- You are going to be asked to answer 20 quiz questions

- Each question has 4 possible answers

- Any number of answers (from 0 to 4) may be correct

- For each question (Q1, Q2, etc.) write on a paper the answers you think are correct (e.g. Q1: a, b, and d)

- You have about 1 minute per question …

Q1

Q1: What Computer Graphics (CG) do NOT refer to ?

a) Pictures

b) Tools to make pictures

c) Photographs

d) Animations

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Q2

Q2: Which of these CG applications do NOT strive for realism ?

a) Computer assisted design

b) Scientific visualisation

c) Flight simulators

d) Computer games

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Q3

Q3: Which of the following terms are equivalent to the term "raster image" ?

a) Pixel map

b) Pixels

c) Bitmap

d) Colour buffer

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Q4

Q4: How can raster images be created ?

a) Hand-designed images

b) Computed images

c) Digital photographs

d) Scanned images

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Q5

Q5: Which of these processes are NOT in the rendering pipeline ?

a) Object modeling

b) Viewing transforms

c) Clipping

d) Rasterisation

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Q6

Q6: Which of these transformations are NOT linear ?

a) Rotation

b) Mirror

c) Translation

d) Shear

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Q7

Q7: Which of the following do NOT characterise a vector ?

a) Infinitely small

b) Has no location

c) Specifies a direction

d) Has a magnitude

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Q8

Q8: Which of the following do NOT belong to an affine space ?

a) Scalars

b) Points

c) Vectors

d) Dot product

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Q9

Q9: The dot product is NOT useful for what ?

a) Computing norms

b) Normalising vectors

c) Checking for orthogonality

d) Computing angles

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Q10

Q10: Which of the following OpenGL functions are NOT affecting the state ?

a) glRotate

b) glColor

c) glVertex

d) glOrtho

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Q11

Q11: Which of these functions are NOT valid OpenGL functions ?

a) glVertex2f

b) glVertex3d

c) glVertex3v

d) glVertex3fv

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Q12

Q12: Which of these functions are NOT mandatory ?

a) glutInit

b) glutCreateWindow

c) glutDisplayFunc

d) glutMainLoop

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Q13

Q13: Which of the following OpenGL functions are NOT callback functions ?

a) glutMouseFunc

b) glutReshapeFunc

c) glutInit

d) glutIdleFunc

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Q14

Q14: Which of the following OpenGL functions are useful to create smooth animations ?

a) glutPostRedisplay

b) glutSwapBuffers

c) glutIdleFunc

d) glEnable(GL_DEPTH_TEST)

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Q15

Q15: Which of the following 3D homogenous coordinates are NOT valid ?

a) (0, 0, 1)

b) (0, 0, 5)

c) (0, 0, 0)

d) (1, 0, 0)

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Q16

Q16: Which of the following are properties of an affine transformation ?

a) Origin maps to origin

b) Lines map to lines

c) Parallel lines remain parallel

d) Ratios are preserved

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Q17

Q17: Which of the following types of projections are orthographic?

a) Front elevation

b) Isometric

c) One-point

d) Oblique

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Q18

Q18: Which of the following OpenGL functions do NOT affect the projection matrix ?

a) gluOrtho2D

b) gluLookAt

c) glFrustum

d) gluPerspective

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Q19

Q19: Which of the following statements are NOT true ?

a) Visual perception is subjective

b) We perceive absolute intensities

c) Identical perceptions of colour correspond to a given light spectrum

d) Colour perception is affected by adaptation

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Q20

Q20: Which of the following are source light properties in OpenGL?

a) Diffuse

b) Shininess

c) Ambient

d) Specular

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How to prepare for the exam?

- Review the slides and your notes: make sure you UNDERSTAND their content.
- Make sure you are able to answer all the exercises you did in class and in the labs.
- Review all the code discussed in class, make sure:
  - You understand every line (as a good exercise, try to add a comment to each line)
  - You are able to modify the code to alter its output (set yourself exercises, for example to change the colour of objects, their size, their position, their number, their behaviour).
- Attempt the past exams questions: see what you find easy and what you find not so easy.

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