
Type Note

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3D graphics, computer graphics, matrix transform, 3D visualization, 2D graphics, gps

Computer graphics course notes - 2D and 3D

COSI 155B : Computer Graphics

<https://www.cs.brandeis.edu/~cs155/> >> see for course topic schedule and links below

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Drawing 2D Primitives

Foley & Van Dam, Chapter 3

https://www.cs.brandeis.edu/~cs155/Lecture_02.pdf

Input and Output Devices

Foley & Van Dam, Chapter 4

https://www.cs.brandeis.edu/~cs155/Lecture_03.pdf

Sampling Theorem

2D Example: Moire' Effect

https://www.cs.brandeis.edu/~cs155/Lecture_04.pdf

Vector Calculus

Foley & Van Dam, Appendix

https://www.cs.brandeis.edu/~cs155/Lecture_05.pdf

2D Geometrical Transformations

Foley & Van Dam, Chapter 5

https://www.cs.brandeis.edu/~cs155/Lecture_06.pdf

3D Geometrical Transformations

Foley & Van Dam, Chapter 5

https://www.cs.brandeis.edu/~cs155/Lecture_07.pdf

Viewing in 3D

Foley & Van Dam, Chapter 6

https://www.cs.brandeis.edu/~cs155/Lecture_08.pdf

Viewing in 3D – Part II

Foley & Van Dam, Chapter 6

https://www.cs.brandeis.edu/~cs155/Lecture_09.pdf

Representing Curves

Foley & Van Dam, Chapter 11

https://www.cs.brandeis.edu/~cs155/Lecture_10.pdf

Free Form Representations

Explicit form: $z = f(x, y)$

$f(x, y)$ must be a function

Not a rotation invariant representation

Difficult to represent vertical tangents

Implicit form: $f(x, y, z) = 0$

Difficult to connect two curves in a smooth manner

Not efficient for drawing

Useful for testing object inside/outside

Parametric: $x(t), y(t), z(t)$

A mapping from $[0, 1] \rightarrow \mathbb{R}^3$

Very common in modeling

Example: A Circle of radius R

Implicit: $x^2 + y^2 + z^2 - R^2 = 0 \ \& \ z = 0$

Parametric:

$x(\theta) = R \cos(\theta)$

$y(\theta) = R \sin(\theta)$

$z(\theta) = 0 \dots$

Polynomial Splines

Piecewise, low degree, polynomial curves, with continuous joints

Representing Curves – Part II

Foley & Van Dam, Chapter 11

https://www.cs.brandeis.edu/~cs155/Lecture_11.pdf

Solid Modeling

Foley & Van Dam, Chapter 11.1 and Chapter 12

https://www.cs.brandeis.edu/~cs155/Lecture_12.pdf

Color Representation

Foley & Van Dam, Chapter 13

https://www.cs.brandeis.edu/~cs155/Lecture_13.pdf

Visible Surface Determination

Foley & Van Dam, Chapter 15

https://www.cs.brandeis.edu/~cs155/Lecture_14.pdf

Visible Surface Determination - Part II

Foley & Van Dam, Chapter 15

https://www.cs.brandeis.edu/~cs155/Lecture_15.pdf

Illumination Models and Shading

Foley & Van Dam, Chapter 16

https://www.cs.brandeis.edu/~cs155/Lecture_16.pdf

Surface Detail

Foley & Van Dam, Chapter 16

https://www.cs.brandeis.edu/~cs155/Lecture_17.pdf

Shadows and Transparency

Foley & Van Dam, Chapter 16

https://www.cs.brandeis.edu/~cs155/Lecture_18.pdf

Ray Tracing

Foley & Van Dam, Chapters 15 and 16

https://www.cs.brandeis.edu/~cs155/Lecture_19.pdf