Math Review

CMSC 435 / 634 Aug

August 2013

Math 1/6

Announcement

 Programming assignment 1 is online, due on September 12, 11 pm.

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Math 2/6

Overview

- Vector (trigonometry)
 - length
 - addition, subtraction, multiply
 - Normalization
 - Dot product, cross product, angles
- Coordinates
 - Right-handed coordinates
 - Global (world) vs. local (object) coordinates
- Matrix
 - Transpose, inverse
 - Multiply
- Linear interpolation

Primitives: Implicit and Parametric (explicit) forms

- Line
 - Line equation from two points
 - Line defined by two end points
- Plane
 - A plane orthogonal to n, through a point p;
 - A plane passing three points

Triangle

- Order of the three points is important
- Find the normal direction (for calculating lighting effects)
- Sphere
 - Radius r at the center point of c.

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Implicit representations

• Equation to tell whether we are on the curve:

 $- \{v \mid f(v)=0\}$

 Example: line (orthogonal to u, distance k from 0)

Example: circle (center p, radius r)

$$- \{v \mid (v-p).(v-p)+r^2 = 0\}$$

Explicit representations

- Also called parametric
 - Equation to map domain into plane $\{f(t)\,|\,t\in D\}$
- Example: line (containing p, parallel to u)

 $\{\mathbf{p} + t\mathbf{u} \,|\, t \in \mathbb{R}\}$

- Example: circle (center b, radius r) $\{\mathbf{p} + r[\cos t \ \sin t]^T | t \in [0, 2\pi)\}$
- Like tracing out the path of a particle over time; the variable t is the "parameter."