Math Review

Announcement

- Reading: Chapters 1-3

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

Implicit and Explicit (Parametric) 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.

Implicit representations

- Equation to tell whether we are on the curve:
  - {v | f(v)=0}
- Example: line (orthogonal to u, distance k from 0)
  - {v | v.u + k =0 }
- Example: circle (center p, radius r)
  - {v | (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.”