CS559 Spring 2019

Module: 2D Rotation (Transforms 3)

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Rotations

Spin the coordinate system around a point

Rigid transformation: distances preserved

(translations are also rigid)

Measuring rotations (in 2D)

radians = amount a point moves on the unit circle

Handedness

Curl your fingers from X to Y

right-handed vs. left-handed

rotates around your thumb

clockwise (Canvas coordinates, Y down)

counter-clockwise (math coordinates, Y up)

Properties of rotations

- There is a **zero** (point that doesn't move)
- Distances are preserved
- Handedness is preserved

Rotated Coordinate Systems

Basis Vectors point in new directions

Transforms and Coordinate Systems

A transform changes a coordinate system into another

Combining Transformations

Sequences of Rotations in 2D

Commute by adding angles

This does **not work in 3D**

Rotation and Translation

Order matters

The translation changes (same rotation)

Articulated Chains

Sequences of Rotations and Translations

Can be combined to a single rotation / translation

Rotation about specified center

Move center to zero

Rotate

Move center back to its original position

(code is backwards!)

Rotation and Scale

Non-Uniform Scale does not commute!

Scale by an axis

Rotate, Translate, Scale

Skew

One more transformation