

DIGITAL DESIGN WORKSHOP //
S01 FUNDAMENTALS

@ SAMOO ARCHITECTS & ENGINEERS / 20180809

Session 01 : Fundamentals to Digital Design

Monday, August 6, 2018 2:59 PM

Grasshopper

- Non Parametric vs Parametric
- Interface
 - Parameters and components
 - Objects
 - Connection
 - Object status
- Systems
 - Coordinate systems
 - Data matching : [practice](#)
 - Data structure : [practice](#)
- Parameter
- Math
- Set
- Vector
- Curve
- Surface
- Mesh
- Intersect
 - Mathematical vs physical : [practice](#)
- Transform
 - Euclidean, Affine, Morph : [practice](#)
- Display

Geometry

- **Point, Vector and Line**
 - Point
 - Setting a point
 - Kinds : 2d, 2f, 3d, 3f, 4d (4d with weight)
 - Operators : [practice](#)
 - Interchangeable with vectors : start(0,0,0), end(self), direction and magnitude : [practice](#)
 - Vector
 - Setting a vector : [practice](#)
 - Operators : +, -, cross and dot : [practice](#)
 - Line
 - Setting a line
 - Interchangeable with vectors : start, end, direction and magnitude : [practice](#)
 - Frame (Plane)
 - Components : point & vectors

• Curve

- Curve as equation : $x^2+y^2=1$
- Curve as function : $x=\cos(a)$, $y=\sin(a)$: parametrical(kinematic) description
- Trace of point in space at certain time interval
- Curve parameter(t) vs length factor(L) : [practice](#)
- Bezier : parametric curve / linear interpolation : de Casteljau's algorithm / degree : [practice](#)
 - $y=x^2$ and $x=f(t)$, $y=g(t)$ - differently expressed. In rhino, curves are parameterized.
- Types of curves
 - Linear spline : polyline
 - Cardinal spline : interpolated curve : [practice](#)
 - Bezier span / Hermite interpolation (handle vs points) : [practice](#)
 - NURBS (Non Uniform Rational B Spline) : weight - 4d point : [practice](#)
- Curve property
 - Tangent (unit slope vector) : [practice](#) : 1st derivative
 - Curvature : function of 1st and 2nd derivatives
 - Total curvature
 - Average curvature
 - Curvature
 - Curvature circle / osculating plane : [practice](#)
 - Positive / Negative / Inflection
 - Normal (unit curvature vector)
 - Binormal : cross product of T & N
 - Rotation along binormal - curvature / rotation along tangent - torsion
 - Continuity: G0(position), G1(tangent), G2(curvature) / evaluating : curvature graph : [practice](#)

• Surface

- Parametric description : (u, v) domain
- Always have 4 sides - trim?
- Iso curves : graphical representation of any possible curves on the surface
- Vectors : Normal, u & v, tangent plane
- Normal section
- Curvature
 - Principal, Average, Gaussian : [practice](#)
- Types of surface : flat, ruled, synclastic, anticlastic, revolving : [practice](#)
- Creating surface : loft, 1rail, 2rail, revolve, network, patch, drape : [practice](#)
- Continuity: G0(position), G1(tangent), G2(curvature) / evaluating - zebra : [practice](#)

• Polygon : Mesh : [practice](#)