

**DIGITAL DESIGN WORKSHOP //**  
S01 FUNDAMENTALS

@ KOREA UNIVERSITY ARCHITECTURE / 20190212-13

## 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](#)