Class Description

With complexities in new Designs comes an Issue; How do I actually build that digitally? An advanced course in understanding parametric based modelling as well as procedural based.

This course will illustrate the advanced tools industry uses to solve complex geometry using such software as Revit all the way too Grasshopper. The key ideas learned in this presentation will include:

- Understanding the Limits of Revit’s geometry.
- A brief view of several complex designs in several Architects and Designers are creating today.
- The new design initiative; pushing the limitations of technology and design.
- Understanding parametric modelling and parameters inside Revit.
- Developing a correct workflow while creating a smart object.
- Benefit from several different techniques as well as different software packages.
- Brief introduction to advanced scripting using Algorithmic Modelling.

Other key ideas learned will be creating parametric relationships inside your REVIT family as well as creating formulas in your parametric
family. This course will give you the understanding of some limitations with current Revit families. As well as being creative and creating a workaround the current limitations. This course will provide the basic understanding of visual based scripting using Grasshopper or Dynamo. The how to videos will be hosted on YouTube. 
http://www.youtube.com/user/ramtybee?feature=mhee

About the Speaker:

Tim is a graduate of Savannah College of Art and Design (SCAD) VFX + Architecture in 2005. He currently is the Visual Director and BIM Specialist at NELSON. He brings creativity in the terms of design and technology. Developing complex designs as well as complex tools and processes to solve them. Currently he has developed virtual walkthroughs using gaming software for use on X-Box and tablets. He also is responsible for Revit implantation, training, support and coordination for Architecture and MEP.

Tim is also part of the 3rd Canvas group; his roles are developing Revit families for manufactures and engineers. As well as playing an active role as a BIM strategist and developer of new tools.

He currently is involved with several BIM forums locally in the Chicago area, as well as currently working on teaching gaming solutions to middle school students on a mentoring program. When he’s not spending all-nighters at the office he’s active outdoors enjoying scuba diving and remote travels.

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Parametric Modelling

Creating parametric’s in Revit

Plan before you start, develop an action item list before creating your family in Revit. Whether you want to only control certain values of your item, height, length, etc. Also, use a system to develop parameters in a correct order to save you the headaches later.

Understand what type of parameter and groups you want to organize your values.

1. Choice whether you want a in-place family parameter or shared parameter.
2. Select the appropriate type of parameter. Length
3. Select the appropriate group for parameter. Dimensions
4. Choice Type or Instance

Also get in the habit of understanding formulas and how the “if and then statements” work.

- Example of parametric array and formulas in a lined based family.
- Example yes/no parameter controlling visibility options
You Have Much To Learn Grasshopper!
Tim Riefenberg, NELSON

- Example of using polar array parametric with conjunction with radius and quantities
- Using parametric’s to control a conceptual based family.
- Building reference points to control profile lines.
- Creating values to control length, width and arc of the profile line to be extruded

There are several add-ins available on the internet that make life much easier. One can benefit from using Parameter slider add-in. Currently the add-in is available with conjunction inside Project Vasari 2.5 and Revit 2012. Such tools can provide the user a more visual based control on their content.

Creating parametric’s inside Grasshopper

Grasshopper is a plugin used with conjunction to Rhino. Grasshopper is a visual scripting tool that uses nodes that builds up the desired model. Each node then in-turn affects the rest down the chain. Inside Rhino one can dynamically alter an objects structure in any part of the modelling.
Example: Manipulating curves and splines that interact with the rest of the structure.
Procedural based modelling

Visual scripting

Using a visual scripting tool; like Grasshopper or Dynamo for Revit or Rhino. Can be easier to manage then the old days of manual scripting.

I learned visual scripting from a program called Houdini; Houdini is a procedural based modelling program used in the movie industry that uses node based modelling as well as procedural scripting to produce particle effects.

(Houdini, Node based modelling)

Biggest benefit to visual scripting is as live history of the build-up of your component. The database will provide the user with a live error displaying the bad node as red. This check and balance act can really help those whom are not a master at coding.

Dynamo with Revit or Vasari, uses a .txt file to also provide those whom can edit out code manually. The transfer of this .txt file to another office keeps the code bare and easy to upgrade for future use.

Teammates of all skill sets can work through a uniformed organization of a structuralized script. The basic design of a tree is start with the roots and branch your way up to the top.

(Dynamo, Visual scripting for REVIT)

Visual scripting is the same philosophy between programs. The concept of how items work in Grasshopper and Dynamo are relatively the same. The user starts with geometry driven points defining the x,y,z of an object. These points then are plugged into a variable that collects the data are
unleashes it to your function. Each node then is plugged into another to transfer the data being generated. With an desired build-up of nodes one can copy the structure and continue to build as far as the imagination leads them to.

Some scripts can be a work of art in itself. Biggest draw to using visual scripting is the complex geometry and organic patterns one can design with using math. Designers encompass these organic shapes in awnings, panels and even facade designs. Firstly when an architect or engineer sees the conceptual design, first words come out as “yeah right”. With so many advances in technology the computer is automatizing the fabrication side. With automation comes the solver of bringing concepts to life.

Developing a form, based on accurate math algorithms, wipes out the possibility of flaws or inaccuracies. The old techniques of if you want to produce real fabrication off your design you had to either redraw the 3d component in AutoCAD, checking the arc’s and curves based on circular geometry to make things correct. But even one flaw was obvious in the end product.

Creating cellulose patterns and grids with parameters can be achieved much easier by using visual based add-ins. The old days of going back and redrawing a pattern is out dated. Using math to generate complex organic designs gives the designers a leading edge on creativity. The biggest issue is how do they build that? Using Revit one can divide the faces in a conceptual based family or even export the object to AutoCAD and draw profiles from the object. Benefit from developing skins in Rhino one can break apart the component to develop fabrication of pieces, getting closer to actually building the concept. These pieces then can be sent to a CNC machine or even a 3d printer to cut forms of your design.
In conclusion, the idea of being pulled down from software limitations is merely on the user side. To solve complex designs or complex processes one need’s to first identify the “how to”, “why”, and what tools I have at my disposal. Understanding parametric and procedural based modelling can provide the user with a much needed roadmap to finalizing the end all product.

Once again; these Videos are hosted here:
http://www.youtube.com/user/ramtybee?feature=mhee

Questions… Anyone?