Learning Objectives

- Digital Prototyping and Simulation is essential for a healthier environment and sustainable economy.
- VR is not only a marketing tool but allows the full confirmation of the right decision made through full immersion.
- We have seamless cross-discipline interacting tools for no rework at hand.
- Full immersion is not science fiction and technology is accessible and ready to be used.

Description

Dynamic modelling and generative designs pathed the way for sophisticated digital prototyping. While software got better and better, it is often that stakeholders and clients are struggling to understand the design and plans not granting the use of the latest tools especially not accepting new solutions. New simulation methods will only path the way when the results are being communicated and well received. The presentation of ‘CFD meets VR’ addresses a well-designed workflow where critical facility data can be communicated to stakeholders to make the right decision about comfort supporting equipment and costs confirming the success of the architecture. The workflow describes the export of a Revit model to CFD Simulation making use of a CFD data translation within 3ds Max preparing it for its final destination Stingray. A second option is offered using Dynamo and Revit Live. The result offers a full immersion and experiencing of CFD data, which can be presented on VR rigs and mobiles. CFD data is 3D data, which is often difficult to communicate through 2D gates such as screens or paper.

Speaker

Florian Neumayr received postgraduate degrees in business and engineering with majors in product lifecycle management (PLM) and controlling in Germany. He offers 20 years of outstanding industry experience in Building Information Modelling for multi-story buildings and warehouses. Living in New Zealand, he is counted to the top BIM, Sim and Viz experts of the Southern Hemisphere which leads him to speak and teach internationally. He has been working for the last 7 years as consultant for a top 5% Global Autodesk Reseller in the Asia Pacific, consulting multiple generations regarding a diversity of projects ranging from $100k to $1 billion. His focus as an application engineer is to optimize the computer as a communications tool. His expertise is to realize workflow studies that offer the flexibility to make room for options and changes while reducing costly repetition.
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Foreword to the tutorial
The tutorial covers all aspects of the workflow you want to follow when in need of presenting CFD data three dimensional with the help of a virtual reality solutions.

This tutorial shall not be a training tutorial of each software used. It describes how models and data can be conveyed from one software to another without rework. Hence, the training is about import, export and inspecting data and only little about software features.

There are over 100+ screenshots documenting the workflow. It is about an advanced but also light weight tutorial to experience Autodesk Software offering to tackle extreme workflows.

Browse, export, import and enjoy! All files have already been prepared for you.

Cheers,
Florian

Contact me on: contact@bim2.tv
Visit me at: http://www.bim2.tv
Today I will do what others won't so tomorrow I can do what others can't.
Preparing the model in Revit
Find the example files in: 10 Revit Models
Find the screenshots in: 15 Screenshots

01 Start view opening the Revit project

02 Level 1 in a 3D view
03 Level 1 in a 2D view

04 Level 1 3D view of the room to analyze
05 Level 1 2D view of the room to analyze

06 Start view of the HVAC model
07 Level 1 3D view of the HVAC model

08 Level 1 2D view of the HVAC model
09 Level 1 3D view of the HVAC model and room to analyze

10 Level 1 floor plan of the HVAC model and room to analyze
Export to the CFD Study Environment
Find the example files in: 20 Exports to CFD
Find the screenshots in: 25 Screenshots

11 Simple geometry with attached walls

12 Any access can be closed within the CFD Design Study Environment
13 Try to simplify windows and doors

14 We can edit the family and add simple geometry
15 For example, create extrusions to cover windows

16 Create simplified geometry for the CFD analysis using visibility parameter
17 Create the parameter to turn on and off the geometry required

18 Connect the parameter ON
19 Connect the parameter OFF

20 Another door example
20a More examples

21 Prepare the view, hiding elements by category and consider view filter for the future
22 Launch the assessment tool

23 Review the model using the assessment tool
24 We can set already external volumes

25 We can set the resolution for the meshing of our geometry
26 We can generate a wrap around our geometry. This simplifies the geometry heavily.

27 This shows a possible view with meshed geometry
This shows the meshed geometry semi-transparent.

Another option is a SAT export.
Another option is also a FBX export from Revit.
Using the CFD Study Environment

Find the example files in: 30 CFD Projects
Find the screenshots in: 35 Screenshots

31 Working with the SAT file importing the geometry

32 Merging complex edges
33 Removing of small objects

34 Creating an external volume
35 Apply the material AIR

36 Apply other materials and hide not required geometry
37 Set up the boundary conditions

38 We can clone the case to compare studies
39 Setup the mesh for the analysis to run

40 Check SOLVE and the required quantities
41 Review the convergence plot

42 Review the complete analysis
43 We can trace the flows

44 Export the nodal results
45 Also export the touched-up geometry from the CFD Study Environment
Preparing the results with 3ds Max

46 Always check the units first when opening 3ds Max

47 Always check the project folder when starting to work with 3ds Max
48 Save the project as the 4 diffuser configuration

49 Setup the grid to suit the project
50 Import the SAT file

51 Check the dimensions measuring the geometry
52 Prepare your working view

53 Import the CFD csv file
54 Place the object on the origin, even if you don’t see it immediately

55 Update the properties
56 Create the velocity field on the origin

57 Update the properties of the field
58 We can work with materials

59 Setup a camera for your reference (ideally use a physical camera)
60 Why not trying for a motivational test render

61 Work with materials and a uvw map
62 Render with the map applied

63 Convert the geometry to polygons, which can be exported
64 Export the vectors

65 Master the export challenges
66 Round 2, let’s change the system units to inch

67 Import the SIMPLE example to practice
68 Import the SIMPLE csv dataset

69 Update the object properties
70 Create the velocity field

71 Update the vertex field properties
Apply the material and UVW Map modifier

What about a motivational test render
Presenting the results with Stingray
Find the example files in: 50 Stingray
Find the screenshots in: 55 Screenshots

74 In 3ds Max, we need to apply a shader material for Stingray

75 We would need to convert all objects to polygons
76 Start Stingray (3ds Max Interactive) using your VR template and create a new level

77 Connect with 3ds Max and send all elements to a new created CFD folder
78 Accept the import settings

79 Drag and drop your model on to the origin and save the level
Preparing the results with Revit and Dynamo
Find the example files in: 60 Revit Dynamo
Find the screenshots in: 65 Screenshots

85 Open Import_CFD_DynamoTest for a practice round

86 Convert the csv to xlsx
87 Review the end of the file

88 This is the Dynamo script, which will create pointers with values as colour in Revit
89 The first part will read the Excel data and slice the list

90 Create the pointer and orient it
91 Grab the velocity value and build a material code to assign it to the arrow

92 This is the data family and its parameter
93 the parameters are set from the origin and linked to the nested family

94 Setup the arrow family
95 Edit and revolve the sketch

96 The material library has already been created
97 Test the creation of the arrow for only a few samples

98 We can transfer the materials into our real project
99 Load the arrow family

100 Run the Dynamo script with the full data extend, this might take a very long while (10h?)
101 Inspect the results
Presenting the results with Revit Live
Find the example files in: 70 Revit Live
Find the screenshots in: 75 Screenshots

102 Upload the file to Revit Live

103 Wait till the model has been converted
104 Open the model in Revit Live

105 Publish it to Windows or other platforms
Using A360 as mobile VR solution

Find the example files in: 80 A360 Stereo Panorama
Find the screenshots in: 85 Screenshots

106 Setup a camera

107 Render the camera as a Stereo Panorama Rendering with A360