CODE3202

STANDARD-BASED WIND ANALYSIS TOOL

SARAH XAVIERA

EXISTING WIND ANALYSIS TOOLS

EXISTING WIND ANALYSIS TOOLS

AUTODESK VASARI

Vasari is an easy-to-use standalone application built on the same technology as the Revit platform

EXISTING WIND ANALYSIS TOOLS

AUTODESK VASARI

Vasari is an easy-to-use standalone application built on the same technology as the Revit platform

EXISTING WIND ANALYSIS TOOLS

AUTODESK VASARI

Vasari is an easy-to-use standalone application built on the same technology as the Revit platform

ANSYS CFX

ANSYS CFX is a high-performance computational fluid dynamics (CFD) software tool

EXISTING WIND ANALYSIS TOOLS

AUTODESK VASARI

Vasari is an easy-to-use standalone application built on the same technology as the Revit platform

ANSYS CFX

ANSYS CFX is a high-performance computational fluid dynamics (CFD) software tool

EXISTING WIND ANALYSIS TOOLS

AUTODESK VASARI

Vasari is an easy-to-use standalone application built on the same technology as the Revit platform

ANSYS CFX

ANSYS CFX is a high-performance computational fluid dynamics (CFD) software tool

FLOW DESIGN

Flow Design is a virtual wind tunnel software

GOVERNMENT STANDARD

GOVERNMENT STANDARD

COMPLIANCE

CFD VS AS/NZS 1170.2

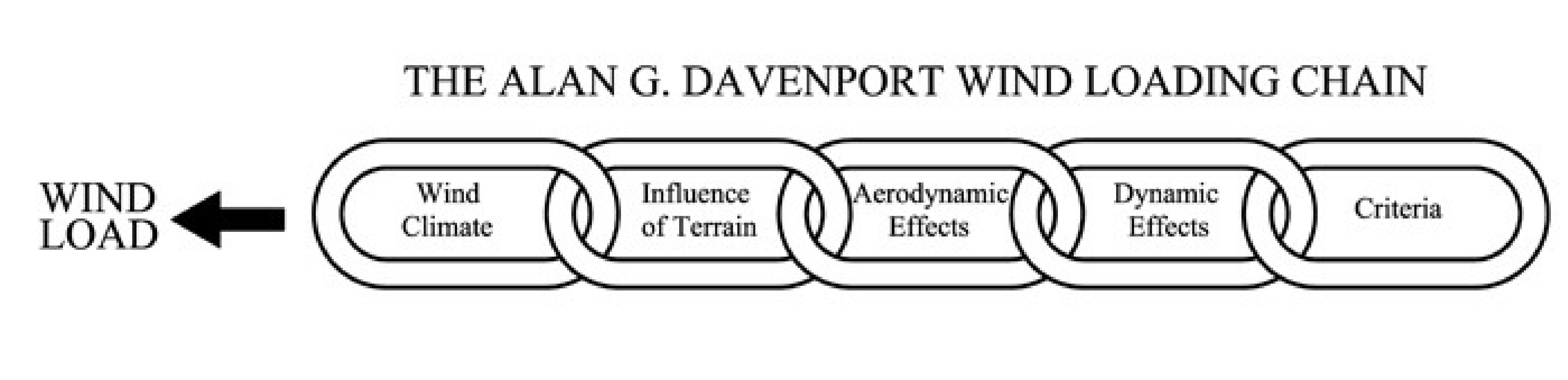
COMPUTATIONAL FLUID DYNAMICS	AS/NZS 1170.2
• DOES NOT ASSESS LOCAL PRESSURE	• ASSESS LOCAL PRESSURE
• CAN ANALYZE COMPLEX DESIGN MODELS	• ONLY ANALYZES RECTANGULAR PLAN MODELS
• THE FINAL OUTCOME COMES FROM THE AVERAGE OF THE PREDICTIONS	• THE FINAL OUTCOME COMES FROM EXTREME PREDICTIONS
• VERY TIME-CONSUMING	• NOT TIME-CONSUMING

”

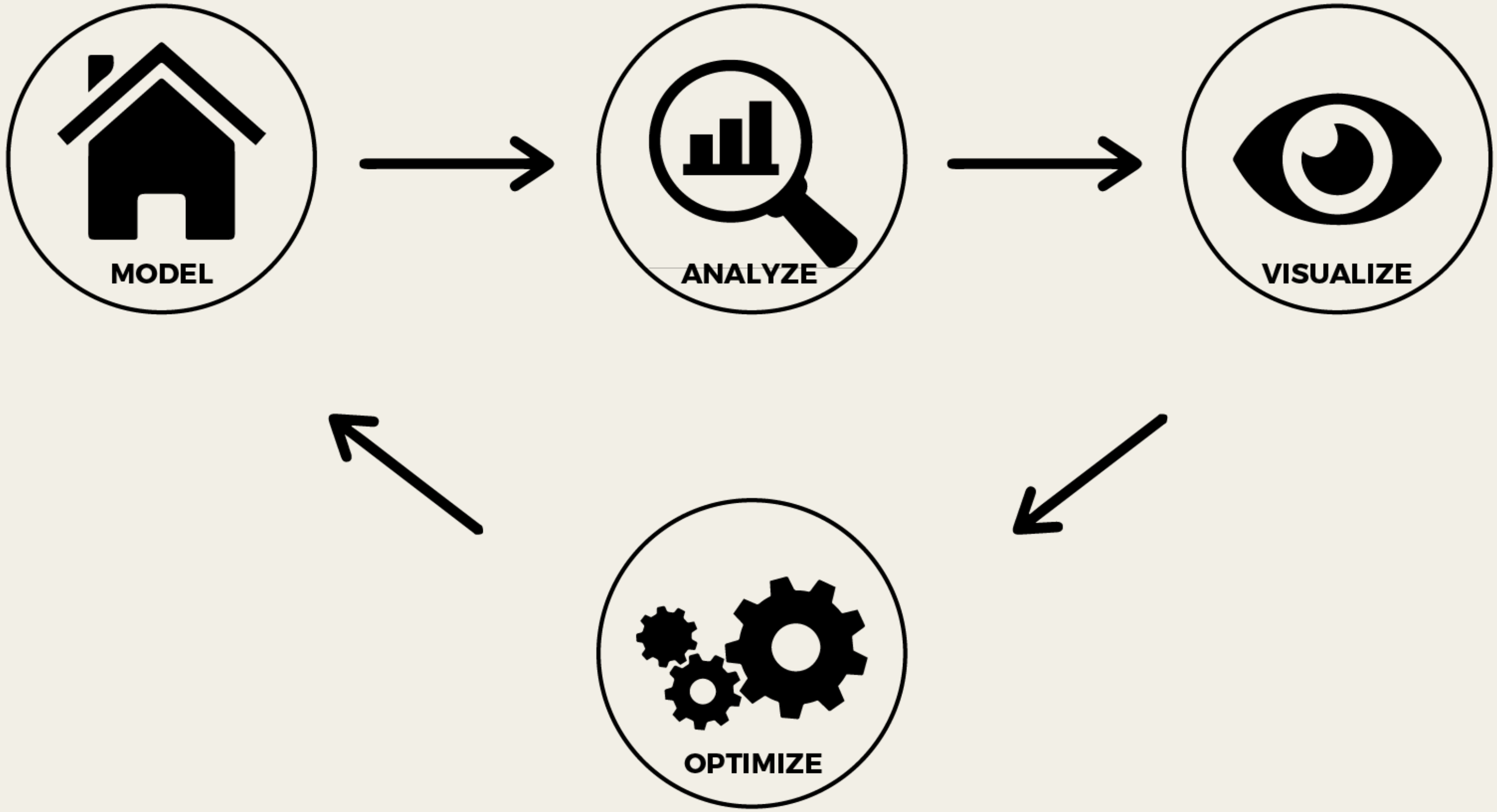
THE RESULTS OBTAINED BY USING COMPUTATIONAL FLUID DYNAMIC ARE SIMILAR TO THOSE OBTAINED USING 3 DIFFERENT CODES, EVEN THOUGH THE ANALYTICAL METHOD PROPOSED BY CODES IS VERY DIFFERENT FROM THE FLUID MECHANICS THEORY USED BY CFD.

(Parv, Hulea & Zoicas, 2012)

AS/NZS 1170.2: ELEMENTS



METHODOLOGY



AS/NZS 1170.2: RULES

$$p = 0.5 \rho_{air} V_{des,\theta}^{2} C_{fig} C_{dyn}$$

$$C_{fig} = C_{p,e} K_a K_{c,e} K_l K_p \qquad C_{fig} = C_{p,i} K_{c,i}$$

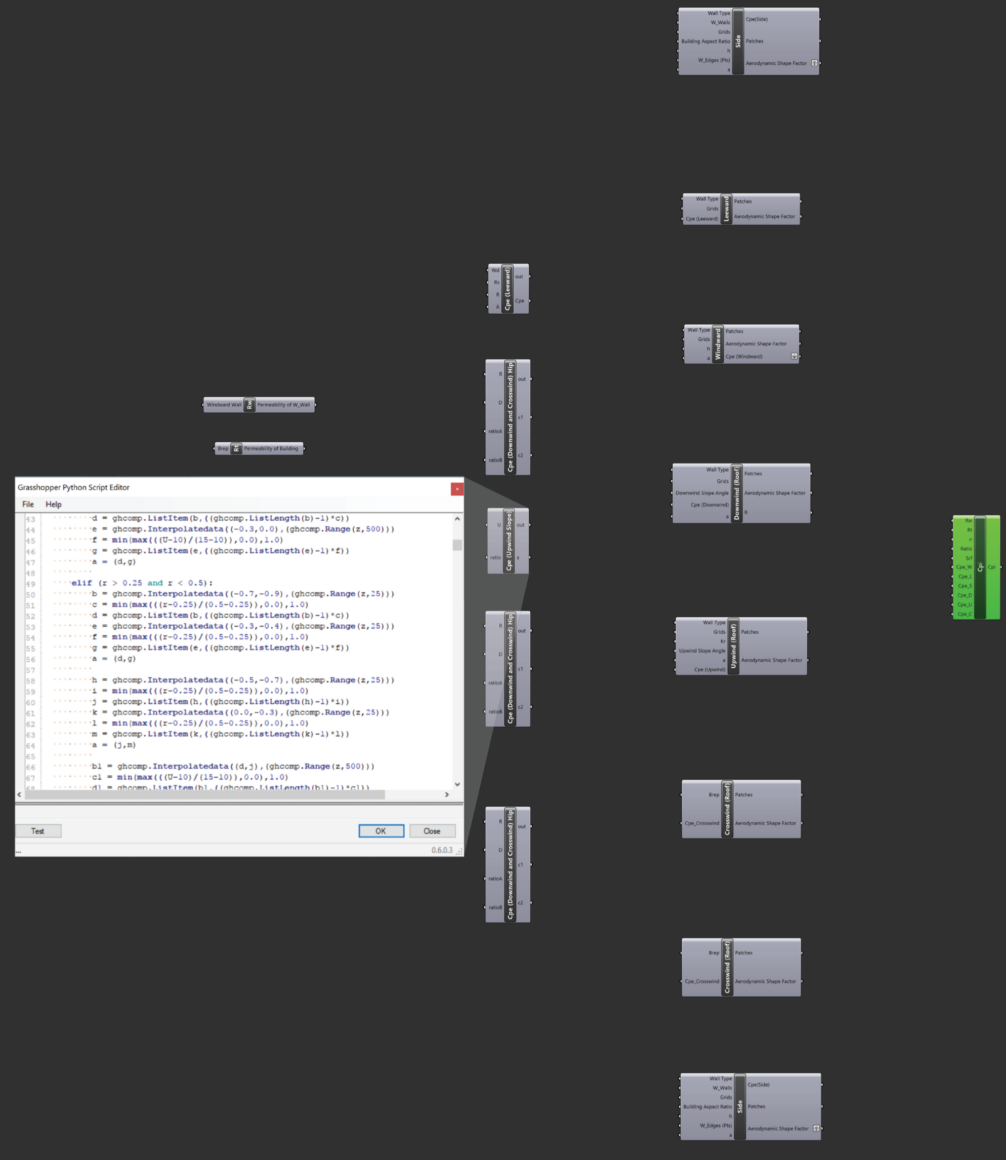
$$C_p \quad K_a \quad K_c \quad K_l \quad K_p$$

STAGE 1

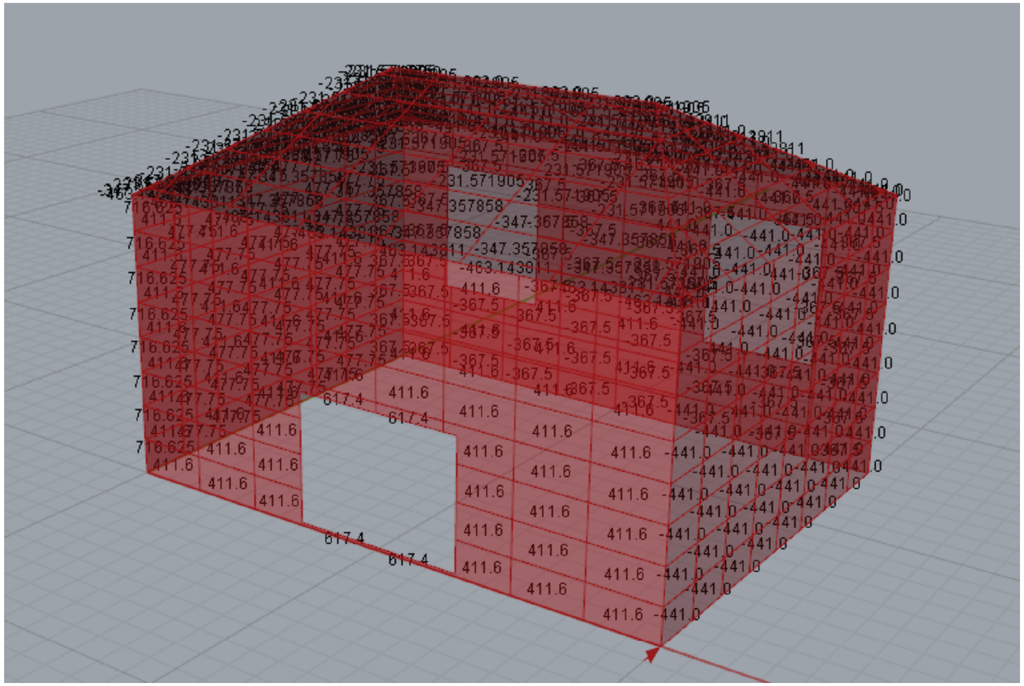
Importing of Models & Analysis

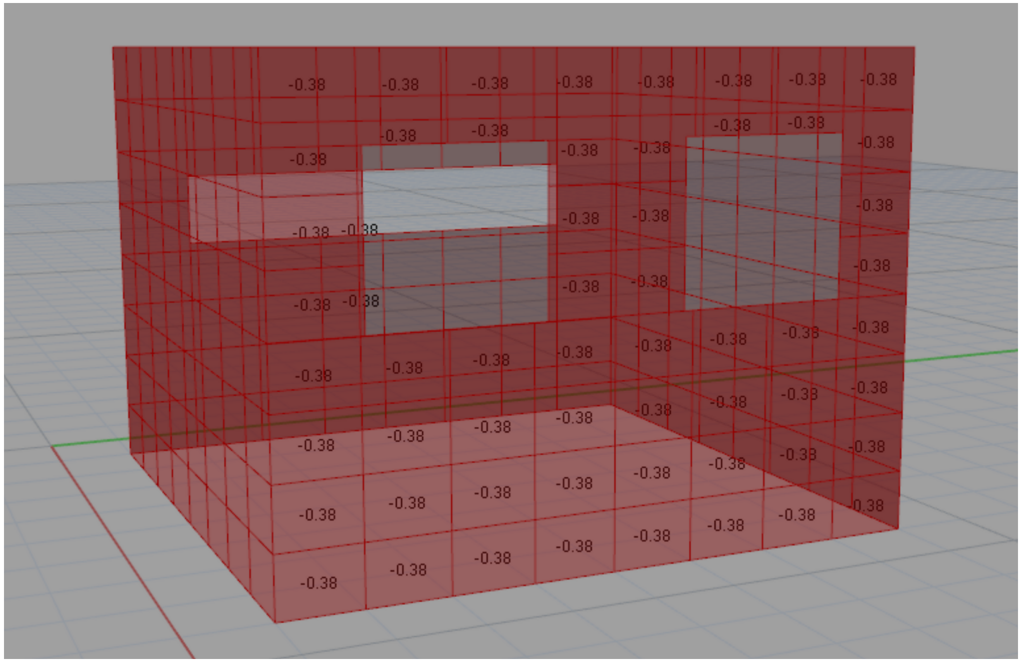
Evaluation

- The rules of the standard is incorporated.
- Design wind pressures can be calculated.
- However, only the first 2 stages of the workflow is completed.



1st Stage: Creating Grasshopper Components that incorporates the rules of the standard.





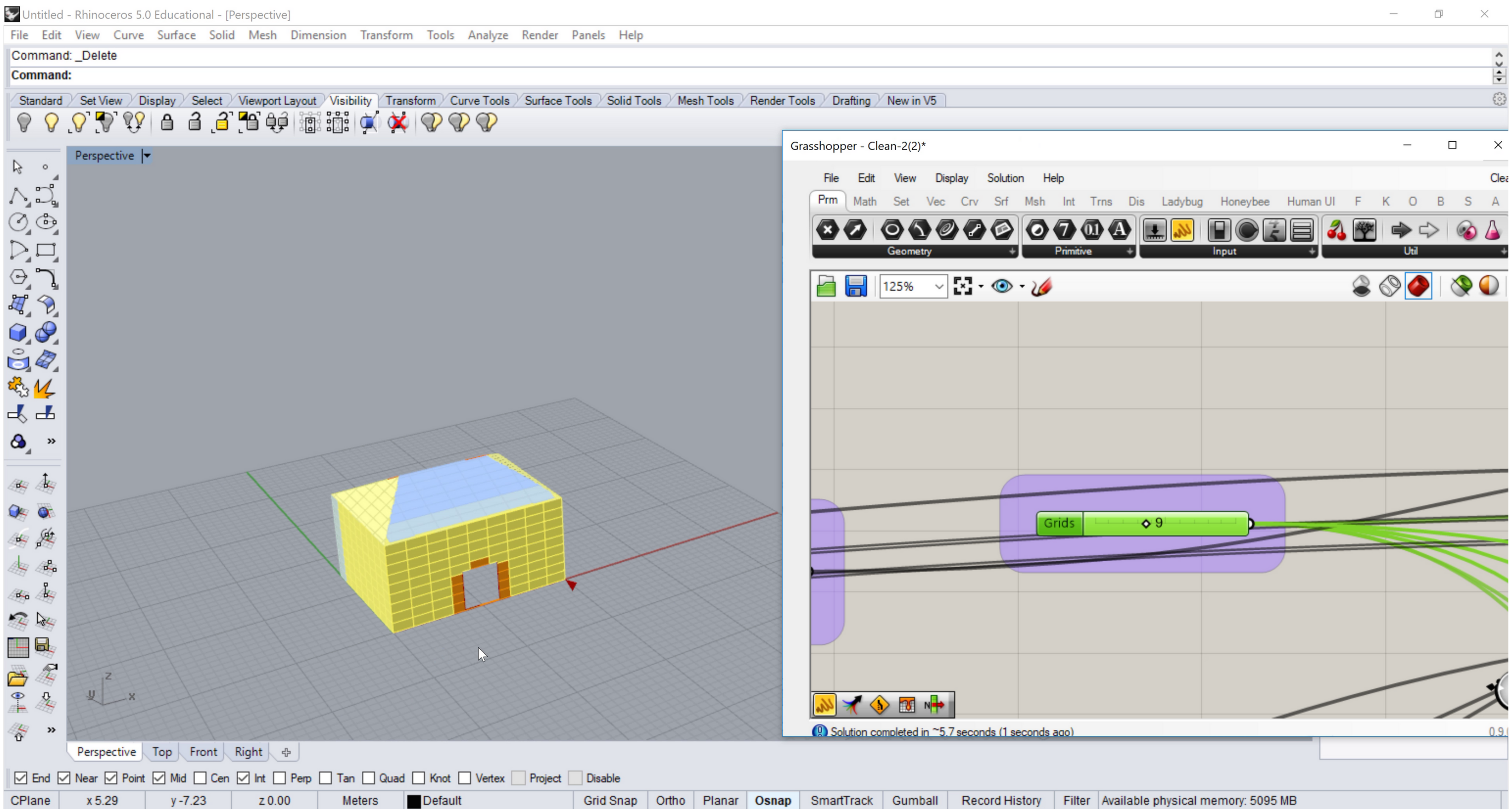
STAGE 2

Initial Visualization

Evaluation

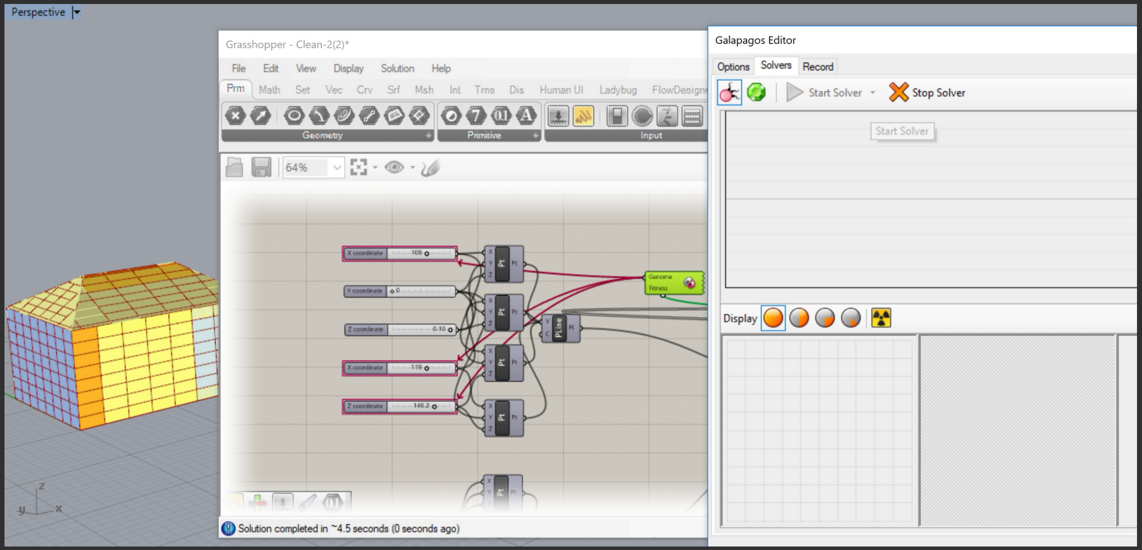
- Allows a display of results to the user.
- Voxel grids were created on the design model to represent the local pressure.
- Grids can be adjusted
- Displayed result is not clear and difficult for user to interpret

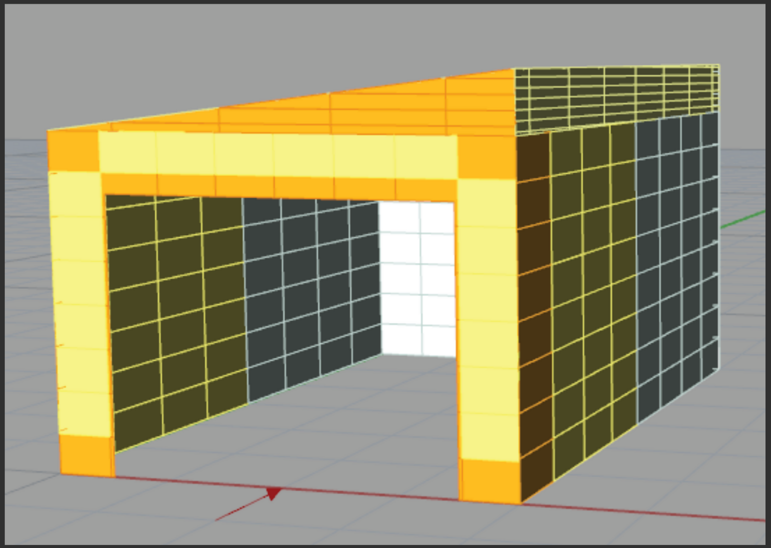
STAGE 3


Untitled - Rhinoceros 5.0 Educational - [Perspective]
File Edit View Curve Surface Solid Mesh Dimension Transform Tools Analyze Render Panels Help
Command: _Delete
Command:
Standard Set View Display Select Viewport Layout Visibility Transform Curve Tools Surface Tools Solid Tools Mesh Tools Render Tools Drafting New in V5
Perspective
Grasshopper - Clean-2(2)*
File Edit View Display Solution Help
Prm Math Set Vec Crv Srf Msh Int Trns Dis Ladybug Honeybee Human UI F K O B S A
Geometry
Primitive
Input
Util
125%
Grids
9
Solution completed in ~5.7 seconds (1 seconds ago)
Perspective Top Front Right
End Near Point Mid Cen Int Perp Tan Quad Knot Vertex Project Disable
CPlane x 5.29 y -7.23 z 0.00 Meters Default Grid Snap Ortho Planar Osnap SmartTrack Gumball Record History Filter Available physical memory: 5095 MB

STAGE 4

- Models imported is made parametric during the importing process.
- Optimization stage is implemented



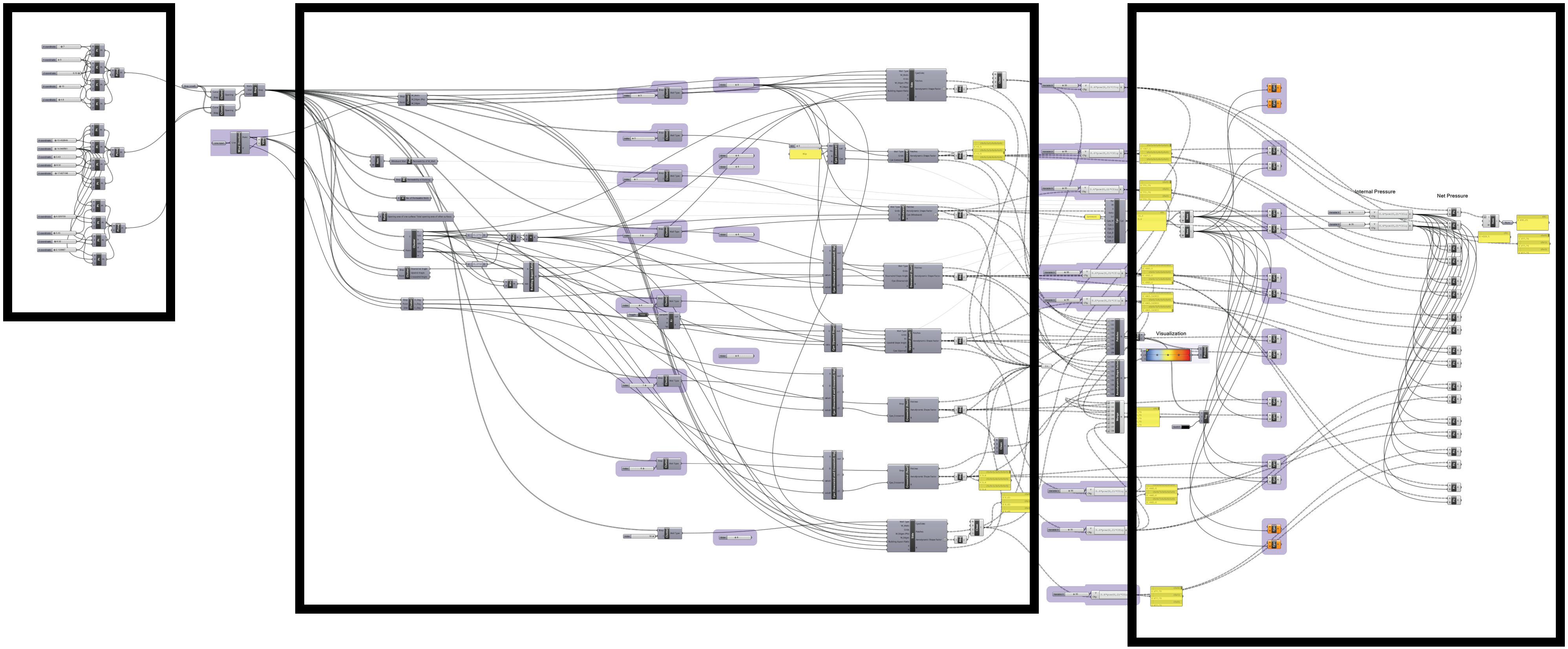


WORKFLOW

Model

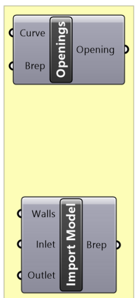
Analysis

Visualization & Optimization

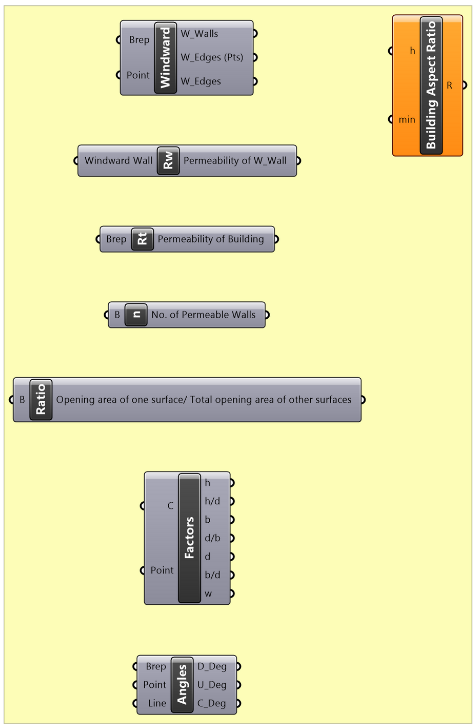


COMPONENTS

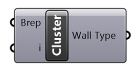
Importing Model



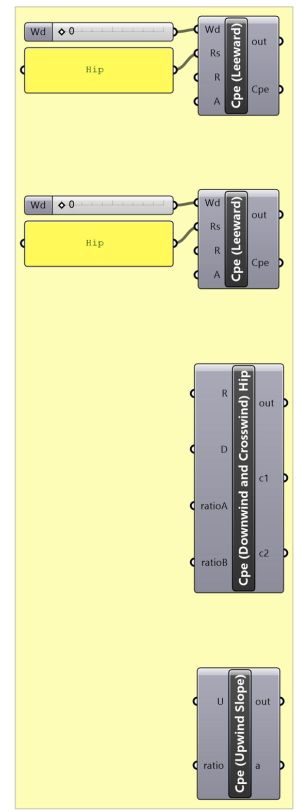
Factors



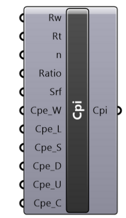
Choosing Walls



External Pressure Coefficient



Internal Pressure Coefficient



SIGNIFICANCE OF RESEARCH

Standard-based wind analysis tool could potentially reduce the use of CFD software in situations when it is not needed which consequently reduces the time and cost used for simulations.

LIMITATIONS AND FUTURE WORK

- The workflow only focuses on one section of the standard.

In the future, more sections could be added to the workflow.

- Several lags made by the workflow during the analysis due to the lack in ability of programming.

In the future, to reduce lags, components fully made in Python would be preferable.

CODE

THANK YOU FOR LISTENING

SARAH XAVIERA