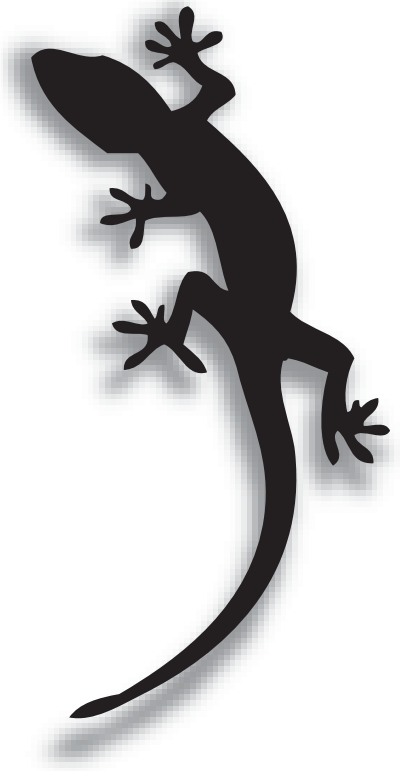
geco

GH2ECO AND VICE VERSA

by [uto] ursula frick - thomas grabner
Grasshopper® Robert McNeel & Associates
Autodesk© Ecotect Analysis 2010/2011



reference manual

version 1.0.16.0 for GH 08.xxxx
tested with GH08.0001

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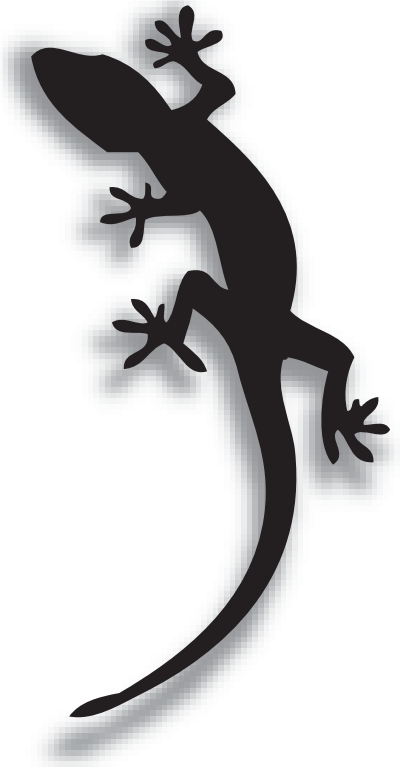


component EcoLink

component EcoLua

component EcoDayOfYear

component EcoWeaFile

component EcoSunPath

component EcoSunRay

component EcoMeshExport

component EcoMoveMeshVertices

component EcoPointExport

component EcoSetMaterial

component EcoSolCal

component EcoLightCal

component EcoObjectRequest

component Eco2DGrid

component EcoGridVectorRequest

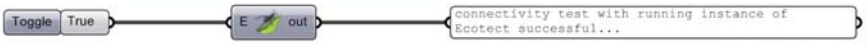
component EcoGridVectorRequest

component EcoGridRequest

component EcoMeshGrid

component EcoGridVectorRequest

component EcoLink



searches on your computer for a installed version of ecotect analysis (only tested with 2010/2011)

setting boolean toggle to true:
connectivity test if ecotect is already started, if not the component try to start it and test again

setting boolean toggle to false again:
if you have started ecotect with EcoLink the application will be closed searches on your computer for a installed version of ecotect analysis

component EcoLua

send and receive Lua commands to/from Ecotect
LUA command SDK is available in the scriptmanager of ecotect

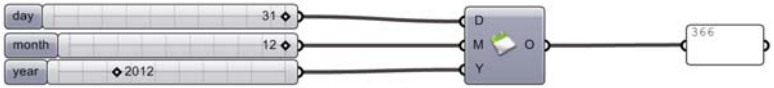
input:
[I] options

0: Executer p.e. 0:model.new;
1: Requester p.e. 1:get.object.attr2 0;

output:
out
the received iformation

export to file
C:\Program Files (x86)\Rhinoceros 4.0 or similar foler

component EcoDayOfYear



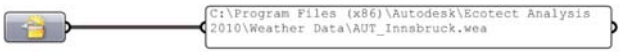
Day of The Year 'Julian Date'

input:
[D] day
[M] month
[Y] year

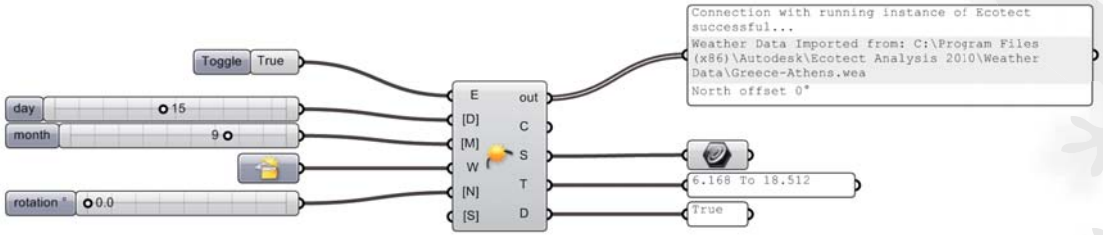
ouput:
O : Day of the Year in [int] 1-365(366)

component EcoWeaFile

set the weather file
double click or right click to set weather file location



component EcoSunPath



set the project data
Weahter Data, North offset

get the sun path of the current day(s) and month(s)

setting boolean toggle to true:
export project data - import sun path

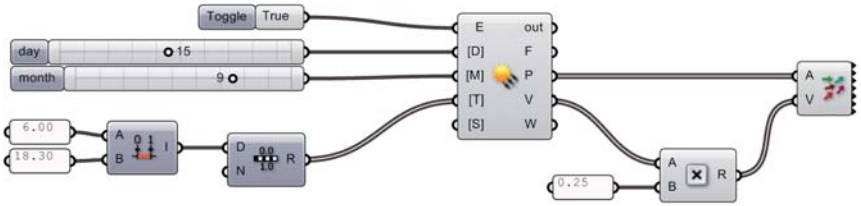
input:

[D] day 1-31 default: 1
[M] month 1-12 default: 6
W Path of File for Weather Data *.wea to Set Location
p.e. C:\Program Files (x86)\Autodesk\Ecotect Analysis 2011\Weather Data\Germany-Hannover.wea

alternative input:
[N] North offset
rotation of North in ° starting from the y-axis
[S] Scalefactor to adapt to the model size

output:
C "Compass"
S Sunpath as a Curve
T time(s) for sunrise and sunset of the current day(s) of the year
D : True if North offset is changed

component EcoSunRay



Retrieves the diffuse solar radiation [W] for the specified day(s), month(s) and hour(s) in the current weather data
important: weather data file has to be set before toggle to true

setting boolean toggle to true:
export project data - import sun path

input:

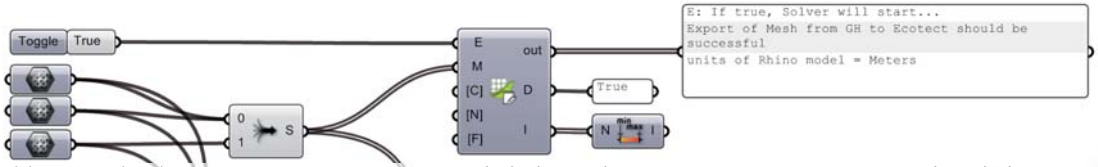
[D] day 1-31 default: 1
[M] month 1-12 default: 6
[T] from sunrise to sunset, g.e. 6.00 - 18.30

alternative input:
[S] Scalefactor to adapt to the model size

output:

F Focus of the Sun as Point
S: Sunposition for the specified day and time
V SunRay for the specified day and time
W diffuse solar radiation[W] for the specified day and time for in the current weather data

component EcoMeshExport



send the connected mesh geometry to ecotect

important: control meshfacenormals, g.e. when the meshobject is closed the facenormals have to be set outwards (straightened to the sun)

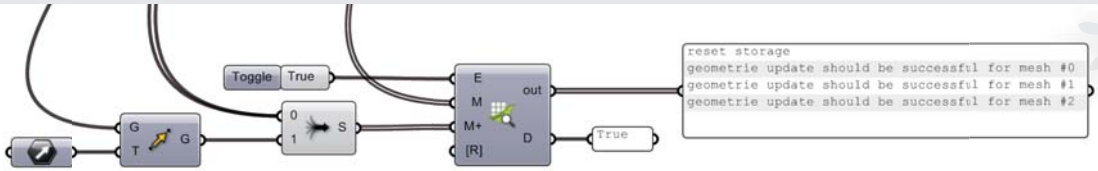
setting boolean toggle to true:
meshfaces will be send to ecotect

input:
M : the meshobject to export

alternative input:
[C] if you are not working in metric space please input your scale
[N] option for sending geometry
0 model new - delete all object
1 delete only in ecotect selected object
2 delete nothing
[F] boolean toogle for fitgrid to object: default true

ouput:
I : index number of the object in ecotect
D : True if Vertices export is done

component EcoMoveMeshVertices



check for unequality Vertices of 2 meshes and send the changed coordinates to ecotect

important: the meshobject for input M is already exported to Ecotect
meshobject count and meshobject vertices count must be the same for both mesh inputs

setting boolean toggle to true:
changed vertexcoordinates will be sent to ecotect

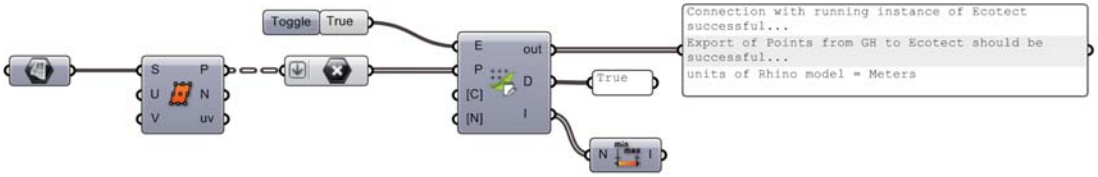
input:
M : the original meshobject
M+ : the manipulated/deformed meshobject

alternative input:
[R] to reset storage if necessary

ouput:

I : index numbers of the objects in ecotect
D : True if Vertices update is done

component EcoPointExport



export the referenced points to ecotect

setting boolean toggle to true:
points will be send to ecotect

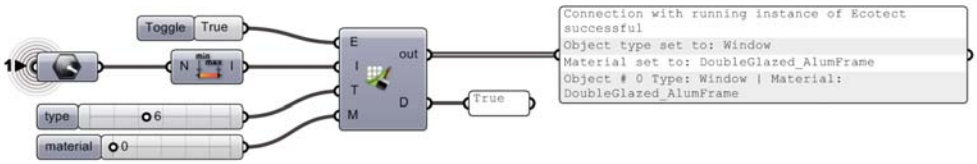
input:
P : Points to export

alternative input:
[C] if you are not working in metric space please input your scale
[N] option for sending geometry
0 model new - delete all object
1 delete only in ecotect selected object
2 delete nothing

ouput:

I : index numbers of the objects in ecotect
D : True if Points export is done

component EcoSetMaterial



Sets the the object's type and primary material

material data table is default

setting boolean toggle to true:

each object will be redifened according to the provided type and material

input:

I The zero-based index of the object to set.
T Either a token or value corresponding to the Element Types table
M Either a material name or an integer, being the zero-based index of the material to be assigned from within the material list

ouput:

D : True if Calculation is done

elementtype: void
Void

elementtype: roof
ClayTiledRoof
ClayTiledRoof_Ref_Foil_Gyproc
ConcreteRoof_Asphalt
CorrugatedMetalRoof
CorrugatedMetalRoof1
MetalDeck
MetalDeck_Insulated
Plaster_Foil_HeatRetention_CeramicTile

elementtype: floor
ConcFlr_Carpeted_Suspended
ConcFlr_Suspended
ConcFlr_Tiles_Suspended
ConcFlr_Timber_Suspended
ConcSlab_Carpeted_OnGround
ConcSlab_OnGround
ConcSlab_Tiles_OnGround
ConcSlab_Timber_OnGround
ExposedGround
ExternalPaving
PoolWater
TimberFlr_Suspended
TimberFlrCarpeted_Suspended

elementtype: ceiling
AcousticTileSuspended
Plaster_Insulation_Suspended
Plaster_Joists_Suspended
SuspendedConcreteCeiling

elementtype: wall
BrickCavityConcBlockPlaster
BrickConcBlockPlaster
BrickPlaster
BrickTimberFrame
ConcBlockPlaster
ConcBlockRender
DoubleBrickCavityPlaster
DoubleBrickCavityRender
DoubleBrickSolidPlaster
FramedPlasterboard
FramedTimberPlaster
RammedEarth_300mm
RammedEarth_500mm
ReverseBrickVeneer_R15
ReverseBrickVeneer_R20
TimberCladMasonry

elementtype: part
Framed_Plasterboard_Partition
Framed_Plywood_Partition

elementtype: window
DoubleGlazed_AlumFrame
DoubleGlazed_LowE_AlumFrame
DoubleGlazed_LowE_TimberFrame
DoubleGlazed_TimberFrame
SingleGlazed_AlumFrame
SingleGlazed_AlumFrame_Blinds
SingleGlazed_TimberFrame
Translucent_Skylight

elementtype: panel
Cork
Fabric
Glass
Linoleum
Mirror
Plastic
Plywood
Slate
SolidTimber
StainlessSteel

elementtype: door
FoamCore_Plywood
GlassSlidingDoor
HollowCore_Plywood
SolidCore_OakTimber
SolidCore_PineTimber

elementtype: point
Cardiod_Microphone
Figure8_Microphone
Point_Receiver

elementtype: speaker
ColumnSpeakers_1000Hz
ColumnSpeakers_500Hz

elementtype: light
FloodlightNoShielding
FlouroRecessedDroppedDiffuser
FluoroFlatPrismaticLense
FluoroLampStripUnit
HalogenUplight
HighBayNarrowBeam
IncandescentBareGlobe
IncandescentPendantDiffuseSphere
LowBayLenseReflector
SimpleLight

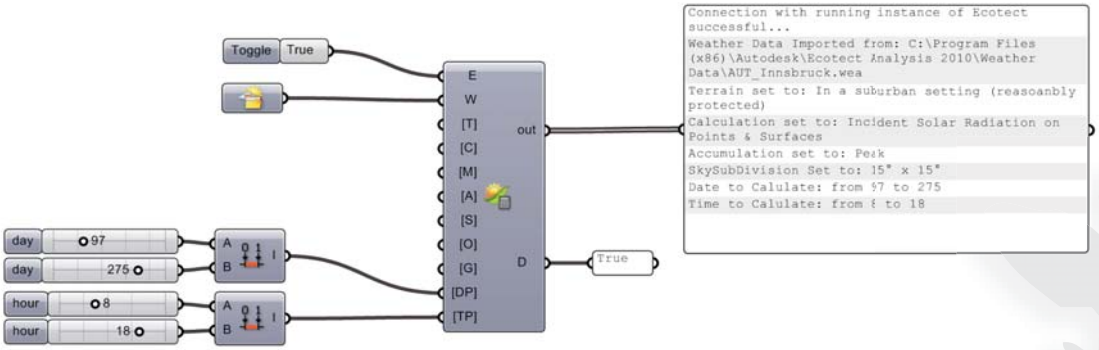
elementtype: appliance
BarFridge140L
ComputerAndMonitor
FaxMachine
FridgeFreezer440L
FridgeFreezer690L
Photocopier
WashingMachine6kg

elementtype: line
ConstructionLine
Downpipe
GenericCable

elementtype: SolarCollector
SolarCollector

elementtype: camera
Camera_Normal
Camera_Parallel
Camera_WideAngle

component EcoSolCal



Calculates incident solar radiation levels (insolation) over the current analysis grid or objects within the model

important: the facecount and the skysubdivision [S] influences the calculation time. The internal timeout for the component is set to 5 minutes but the calculation in ecotect will continue until it is finished

To change the accuarcy of the calculation change the angular increments into which the sky dome will be divided, but calculation will likely take much longer

input [S]	recommended from Ecotect	
2	2x2	Highest
5	5x5	Medium
15	15x15	Lowest

setting boolean toggle to true:

calculation starts

input:

W : Path of File for Weather Data *.wea to Set Location

p.e. C:\Program Files (x86)\Autodesk\Ecotect Analysis 2011\Weather Data\Germany-Hannover.wea

alternative input:

[T] Relevant Data Table(Terrain Types)
- 0 In a location exposed to the wind
- 1 In a rural setting (reasonably open)
- 2 In a suburban setting (reasoanbly protected)
- 3 In a dense urban setting (very protected)

[C] Available Insolation Calculations:
- 0 Incident Solar Radiation on Points & Surfaces
- 1 Solar Absorbtion/Transmission of Object Surfaces
- 2 Sky Factor & Photosynthetically Active Radiation
- 3 Shading, Overshadowing and Sunlight Hours
- 4 COMPARE VALUE- Reference (Before)
- 5 COMPARE VALUE- Comparison (After)

[M] Available Insolation Metrics
must be set if Insolation Calculations: is set to Reference

[A] Available Insolation Accumulations
- 0 Cumulative
- 1 Average Daily
- 2 Average Hourly
- 3 Peak

[S] SkySubDivision default : 15x15

[O] If connected, calculation will restart when changing the object
connect the exported mesh

[G] Switch between Objects and Grid default : object

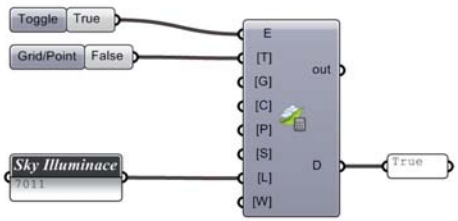
[DP] Determines the start and end day of the year for the calculation
this are two integer values between 1 and 365

[TP] Determines the starting and ending time for the calculation
this are two decimal values between 0.00 and 23.99

ouput:

D : True if Calculation is done

component EcoLightCal



Calculates natural and artificial light levels at specific point or the current analysis grid within the model

important: the facecount influences the calculation time. The internal timeout for the component is set to 5 minutes but the calculation in ecotect will continue until it is finished

setting boolean toggle to true:
calculation starts

input:
[T] Target - the lighting calculation is performed over
0 the analysis GRID
1 the POINT objects

alternative input:
[G] When calculating over the analysis grid
0 calculates lighting just for the current 2D slice
1 calculates lighting for the entire 3D volume of the grid
When calculating over objects
0 calculates lighting for all visible POINTs
1 calculates lighting only for selected POINTs in the model

[C] Available Lighting Calculations
0 daylight - Natural Light - Daylight Factors
1 overall - Overall Light - Daylight and Electric Levels
2 compare - Comparison against previous calculation

[P] Available Calculation Precisions
0 Full Precision
1 Very High Precision
2 High Precision
3 Medium Precision
4 Low Precision

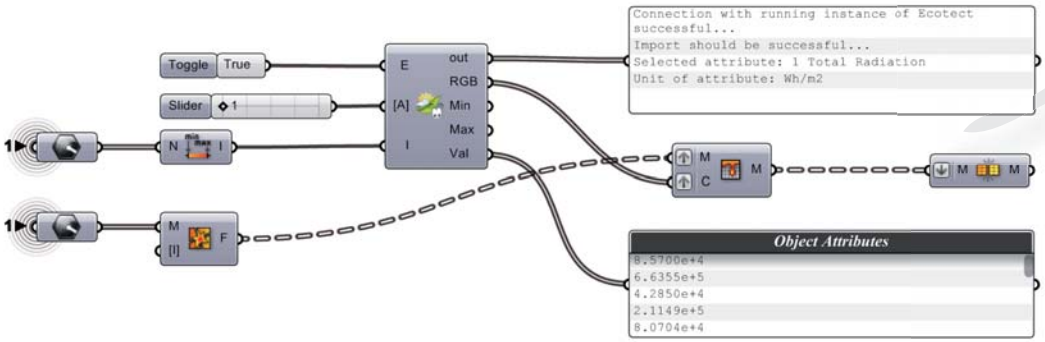
[S] Available Sky Types
0 CIE Overcast Sky (Recommended!!
1 CIE Uniform Sky

[L] Sky(lux)Illuminance
the best way to obtain the Design Sky value for any location is from a published source, if this is not readily available, use calculation from Tregenza formula!
default value: 8500lux

[W] Window Cleanliness Values
0 Clean Windows (x 1.00)
1 Average Windows (x 0.90)
2 Dirty Windows (x 0.75)

ouput:
D : True if Calculation is done

component EcoSolRequest



receive Calculated incident solar radiation or lighting levels from Objects or Points
important:
solar radiation level values can only be stored on objects (like meshfaces) or grid
solar lighting analysis attributes can only be stored on points or gridi

to receive values from grid use the GridRequestComponent

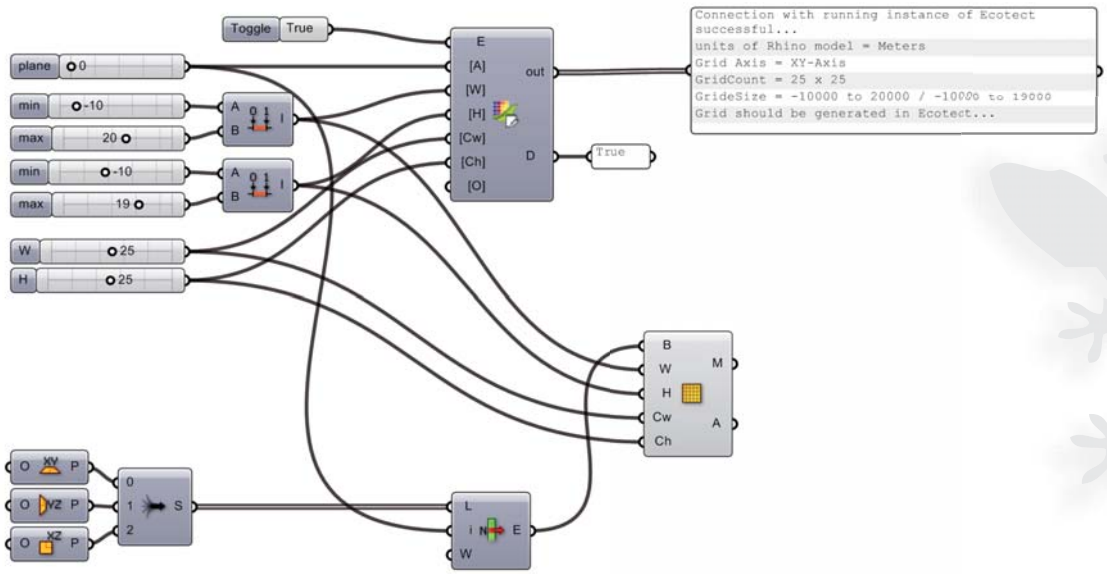
setting boolean toggle to true:
receiving

I Interval of indices of object to Import the attribute

alternative input:
[A] Available Attributes for Solar Access Analysis in [Wh/m2]
1 Total Radiation
2 Total Direct Radiation
3 Total Diffuse Radiation

Available Attributes for Lighting Analysis
1 Daylight Factor [%]
2 Daylight Level [lux]
3 Sky Component [%]

component Eco2DGrid



Generate 2D analysis grid

setting boolean toggle to true:

2d Grid will be generated...

input:

[A] Sets the grid axis:

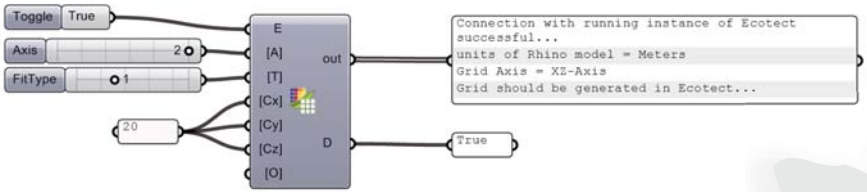
0 xy axis
1 yz axis
2 xz axis

[W] Domain of width
[H] Domain of height
[Cw] Count of faces in (W) direction
[Ch] Count of faces in (H) direction
[O] 2D slice position from origin

ouput:

D : True if Grid export is done

component EcoFitGrid



Fits the analysis grid to the extents of currently selected objects in Ecotect

setting boolean toggle to true:
Fit Grid will be generated...

input:
[A] Sets the grid axis:
0 xy axis
1 yz axis
2 xz axis

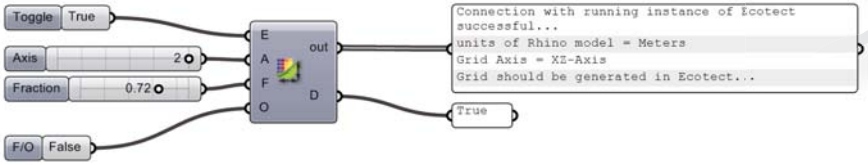
[T] Type of Fit
0 Within
1 Arround
2 3D FormFit
3 3D Air-flow

input:
[Cx] Count of faces in (X) direction
[Cy] Count of faces in (Y) direction
[Cz] Count of faces in (Z) direction

[O] 2D slice position from origin

ouput:
D : True if Grid is generated in Ecotect

component Eco3dGridFraction



Setting the grid base offset when animating through 3D data.

setting boolean toggle to true:
animating

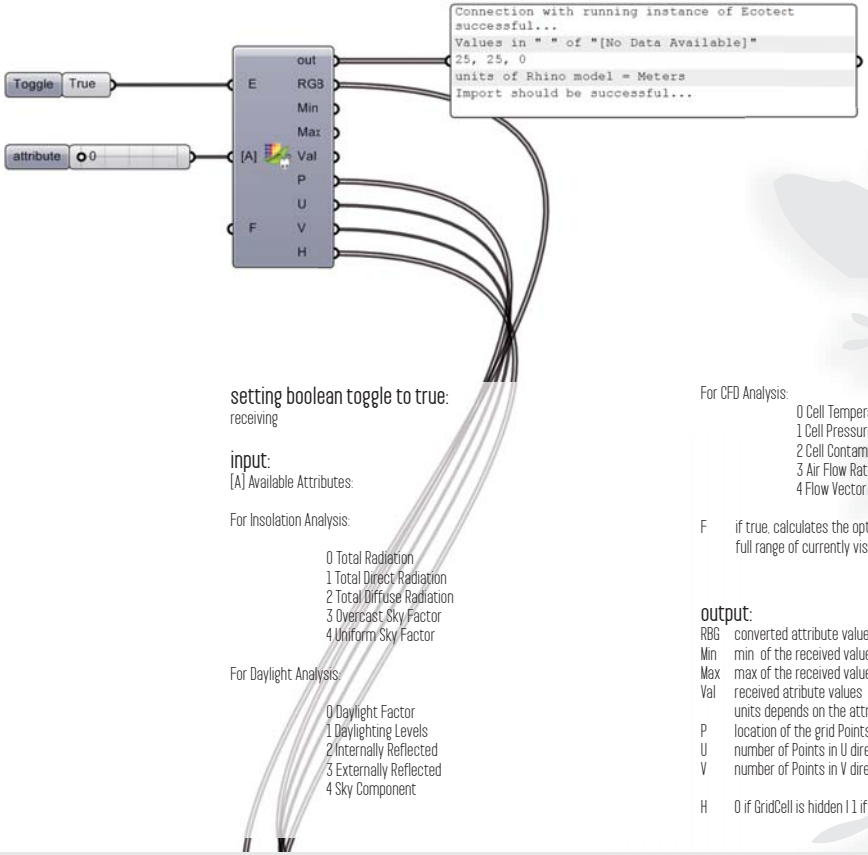
input:
A Sets the grid axis:
0 xy axis
1 yz axis
2 xz axis

T if "O" is set to Fraction
A decimal number between 0.0 and 1.0 to set the grid base offset between min and max
if "O"is set to Offset
the grid base offset in [unit of Rhino model]

input:
O Change between Fraction (min to max - 0-1) and Offsetdistance
false - Fraction
true - Offset

output:
D : True when finished

component EcoGridRequest



receive 2D analysis grid data

setting boolean toggle to true:
receiving

input:
[A] Available Attributes:

For Insolation Analysis:

0 Total Radiation
1 Total Direct Radiation
2 Total Diffuse Radiation
3 Overcast Sky Factor
4 Uniform Sky Factor

For Daylight Analysis:

0 Daylight Factor
1 Daylighting Levels
2 Internally Reflected
3 Externally Reflected
4 Sky Component

For CFD Analysis:

0 Cell Temperature
1 Cell Pressure
2 Cell Contamination
3 Air Flow Rate
4 Flow Vector

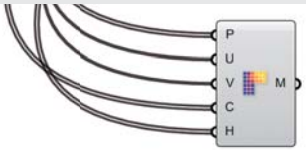
F if true, calculates the optimum scale required to fit the full range of currently visible grid values

output:

RBG converted attribute values to RBG for visual feedback
Min min of the received values
Max max of the received valuen
Val received atribute values
units depends on the attributes
P location of the grid Points
U number of Points in U direction
V number of Points in V direction

H 0 if GridCell is hidden I 1 if GridCell is visible

component EcoMeshGrid



generates "geometrie fitted" mesh from analysis grid points

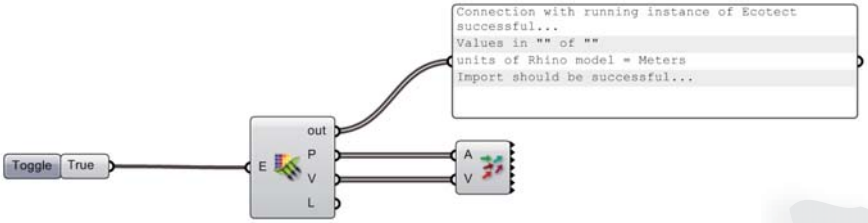
input:

P Point location
U number of Points in (U) direction
V number of Points in (V) direction
C Optional Vertex colours
H cull hidden Grid Cells
0 - hidden
1 - visible

output:

M the constructed mesh

component EcoGridVectorRequest



Import analysis grid vector

setting boolean toggle to true:
receiving

output:
P location of Vector as Point
V Vector
L VectorLength