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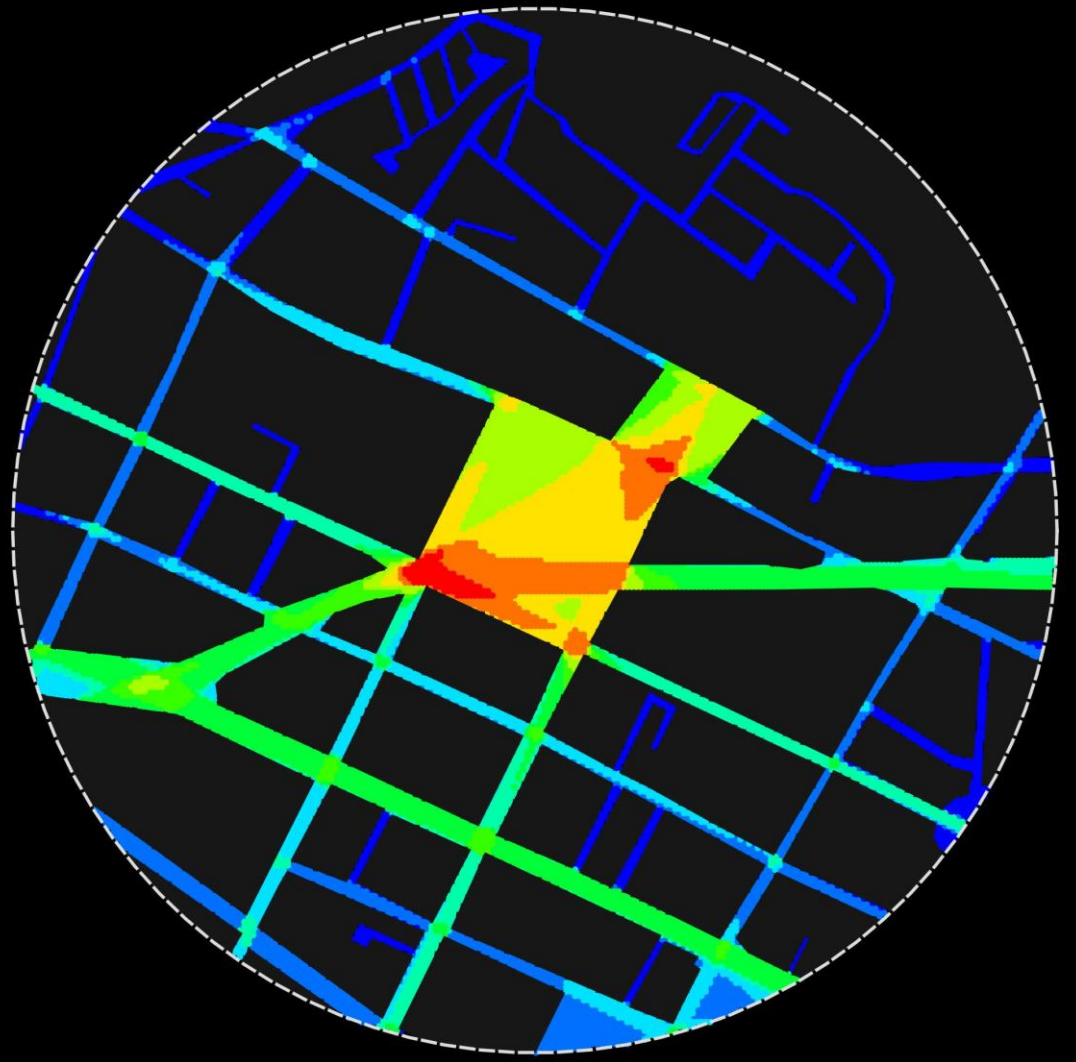
visibility graph analysis using depthmapx



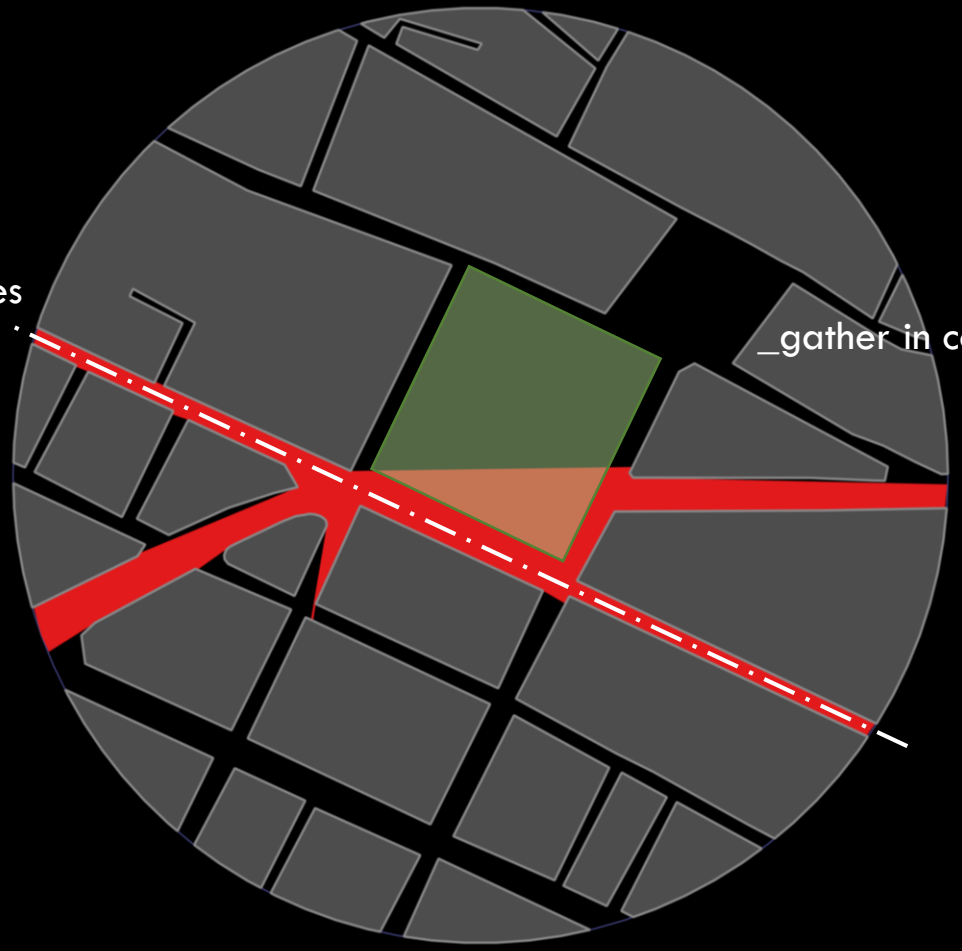
Alexandre Castro
PhD student in Architecture and Urbanism/ UFRN

[introduction]

basic principles from space syntax theory [karimi, 2012]

people...

_move in straight lines

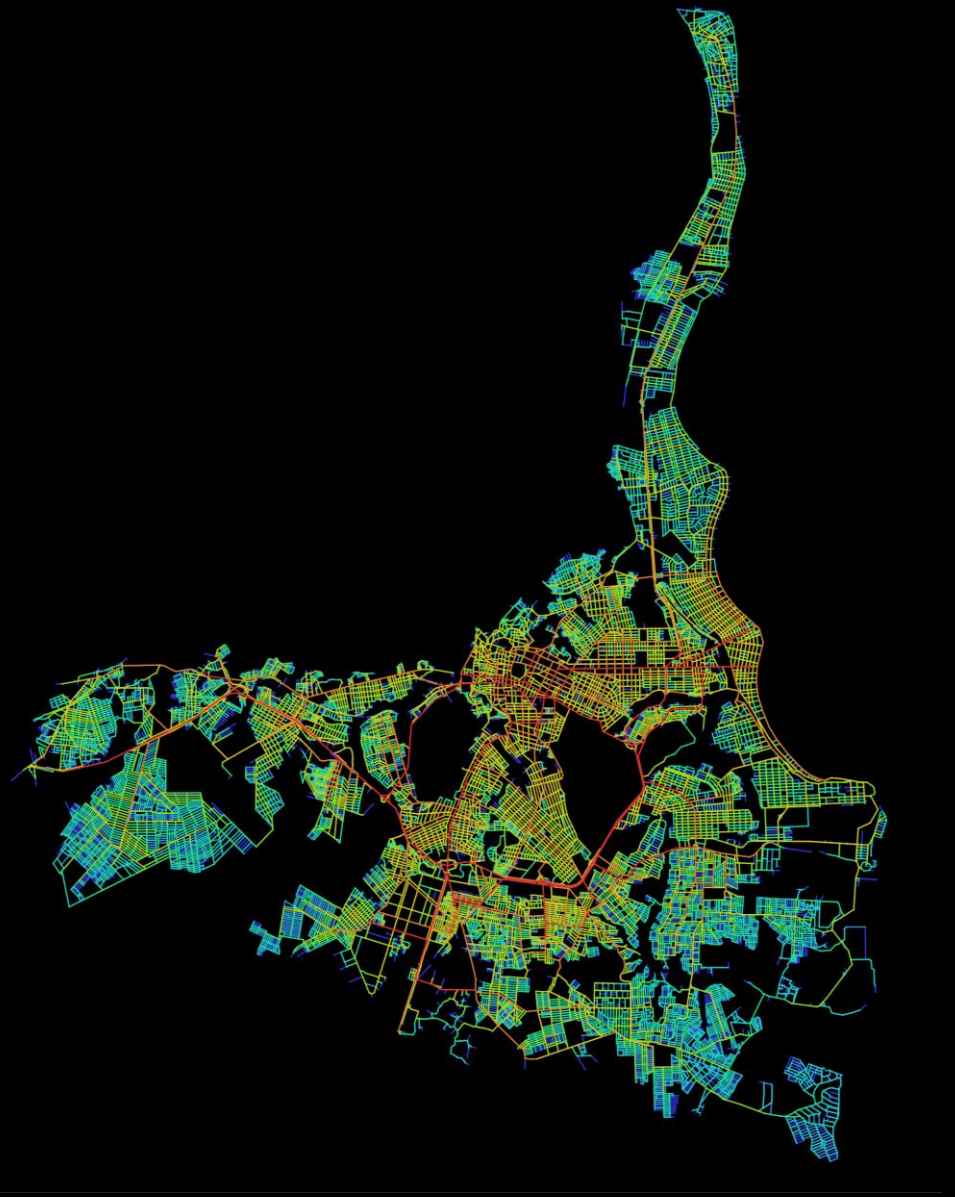


_gather in convex spaces

_perceive the built environment
through visual fields

[introduction]

Linear representation: one dimension [lenght]



[introduction]

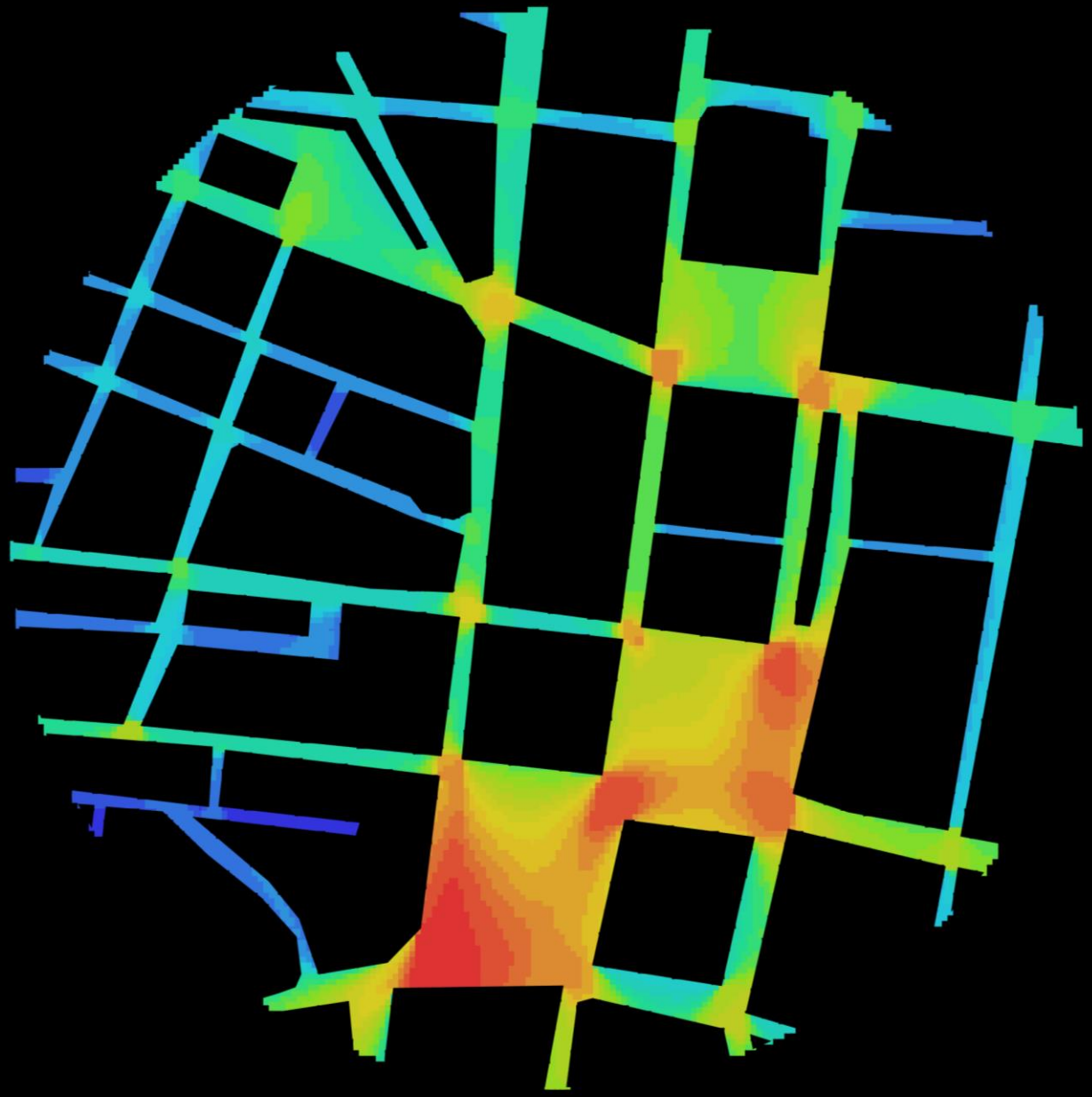
urban space plan: two dimensions [lenght and width]

how to represent urban space?

[vga: short review]

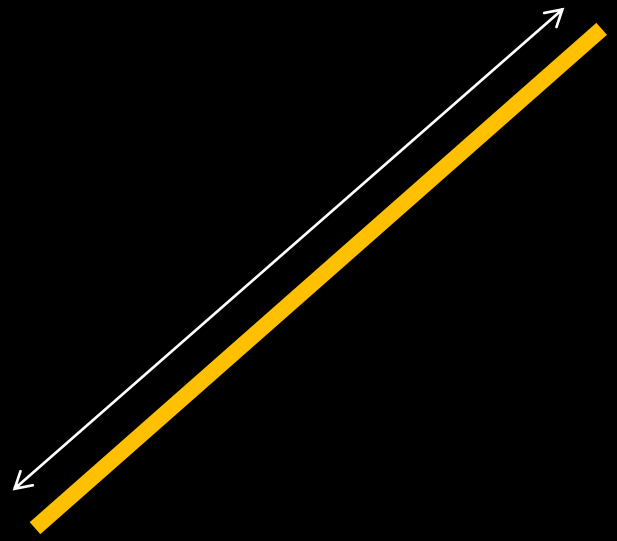
vga: visibility graph analysis

_turner et al [2001]: vga investigates the visibility graph properties derived from a spatial environment.

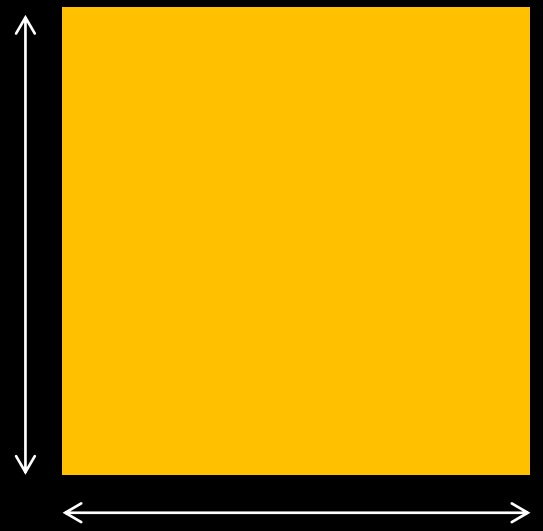


[vga: short review]

vxial representation: one dimension
[lenght]



vga representation: two dimensions
[lenght and width]



[vga: short review]

types of visual fields [turner, 2004]:

_eyesovist: considers visual barriers [despise ways, fences, etc.]

_kneesovist: considers physical barriers [tables, fences etc.]

[vga: metrics]

_connectivity: quantity of directly visible spaces from one point [turner, 2004];

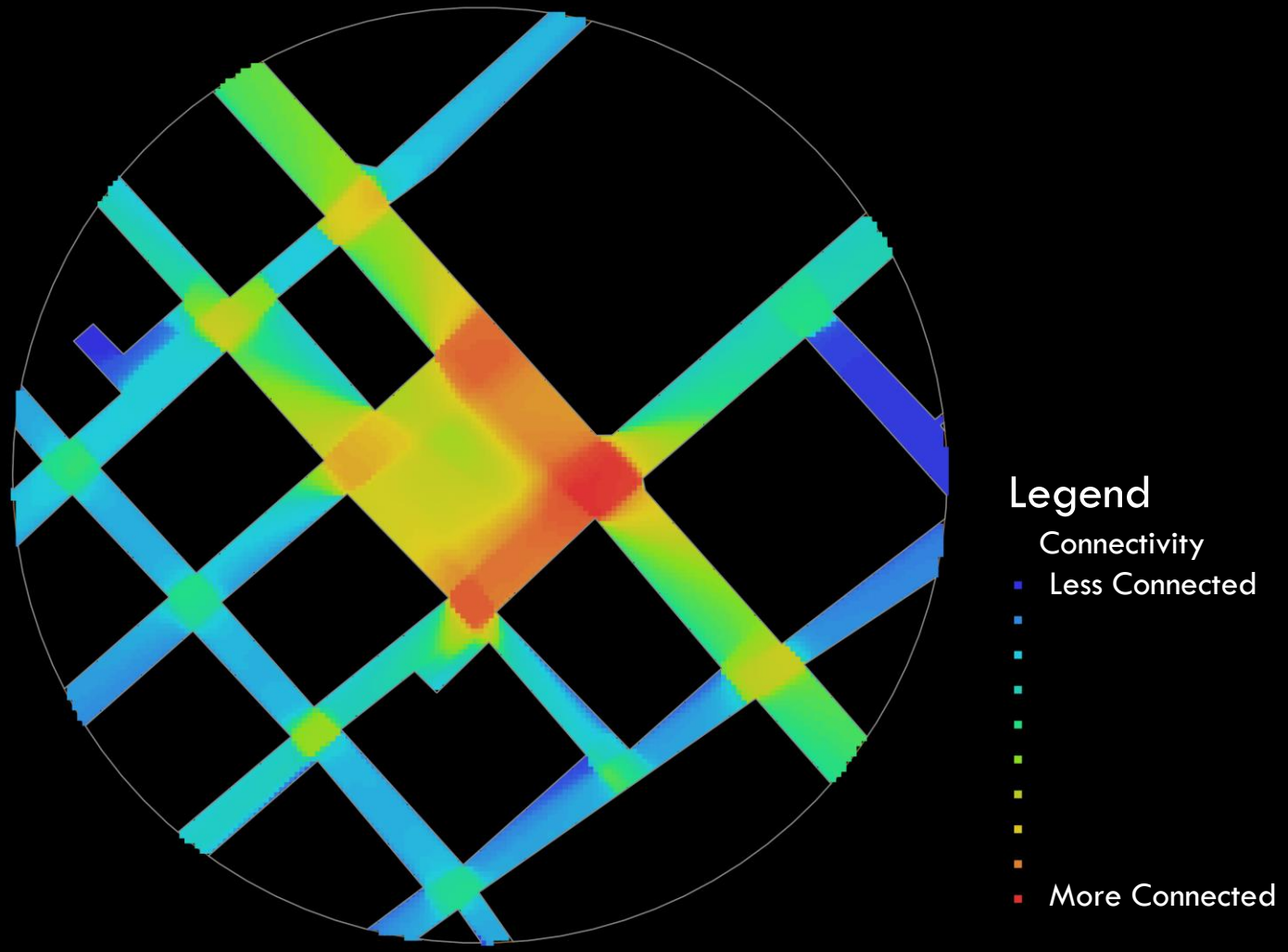
_integration: measures the visual distance from one space for all others, even that not directly visible [hillier, 2007];

_intelligibility: measures the degree that the urban system can be understood for your parts [hillier et al, 1987];

_gate counts: counting of people flow moving around a particular location [vaughan, 2001].

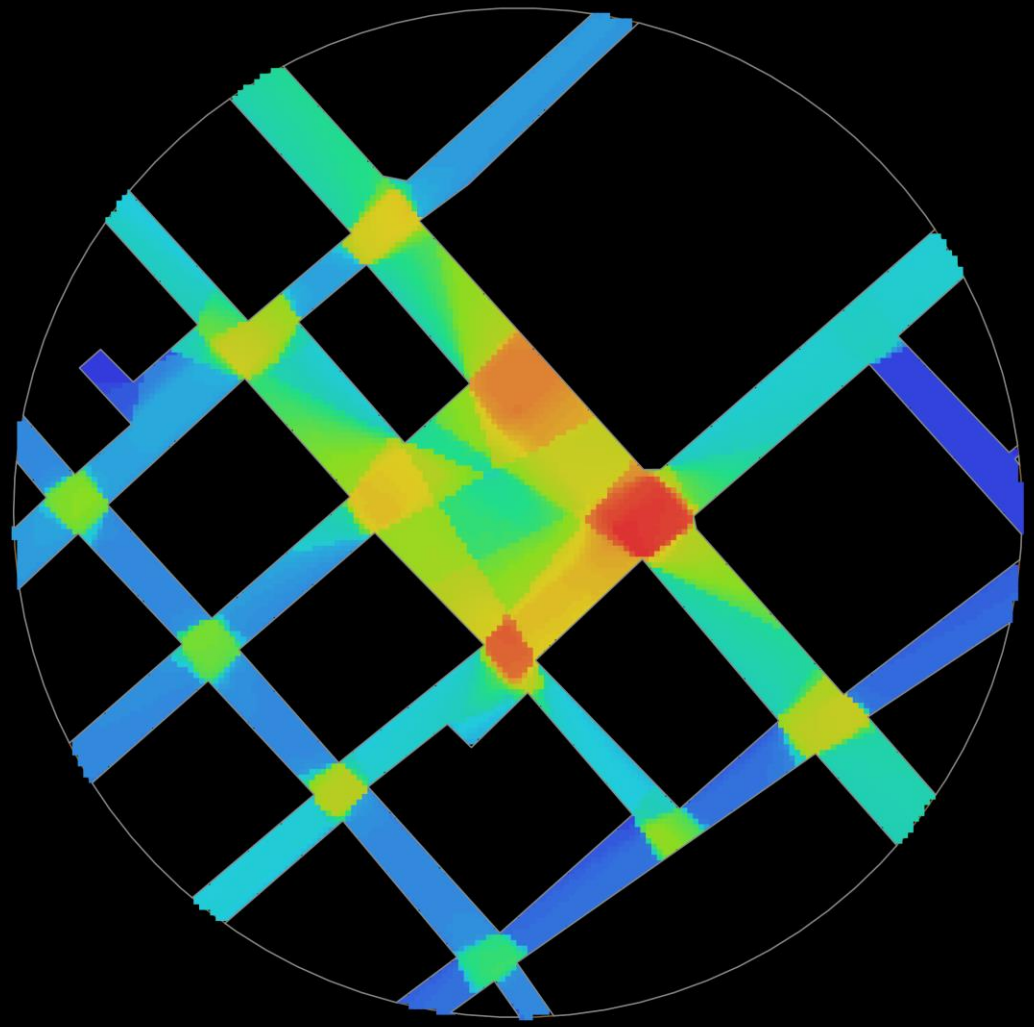
[vga: metrics]

_connectivity



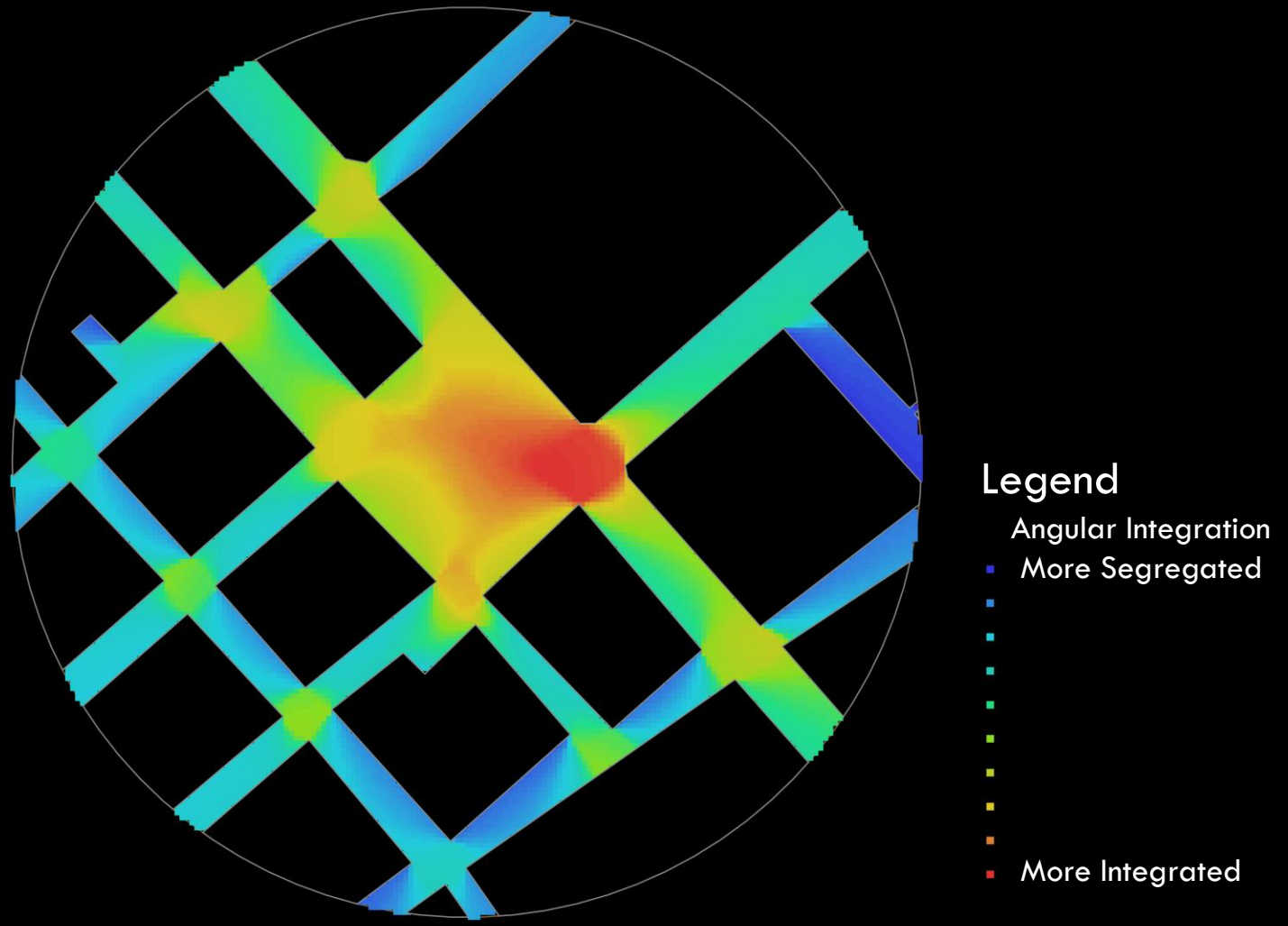
[vga: metrics]

_visual integration



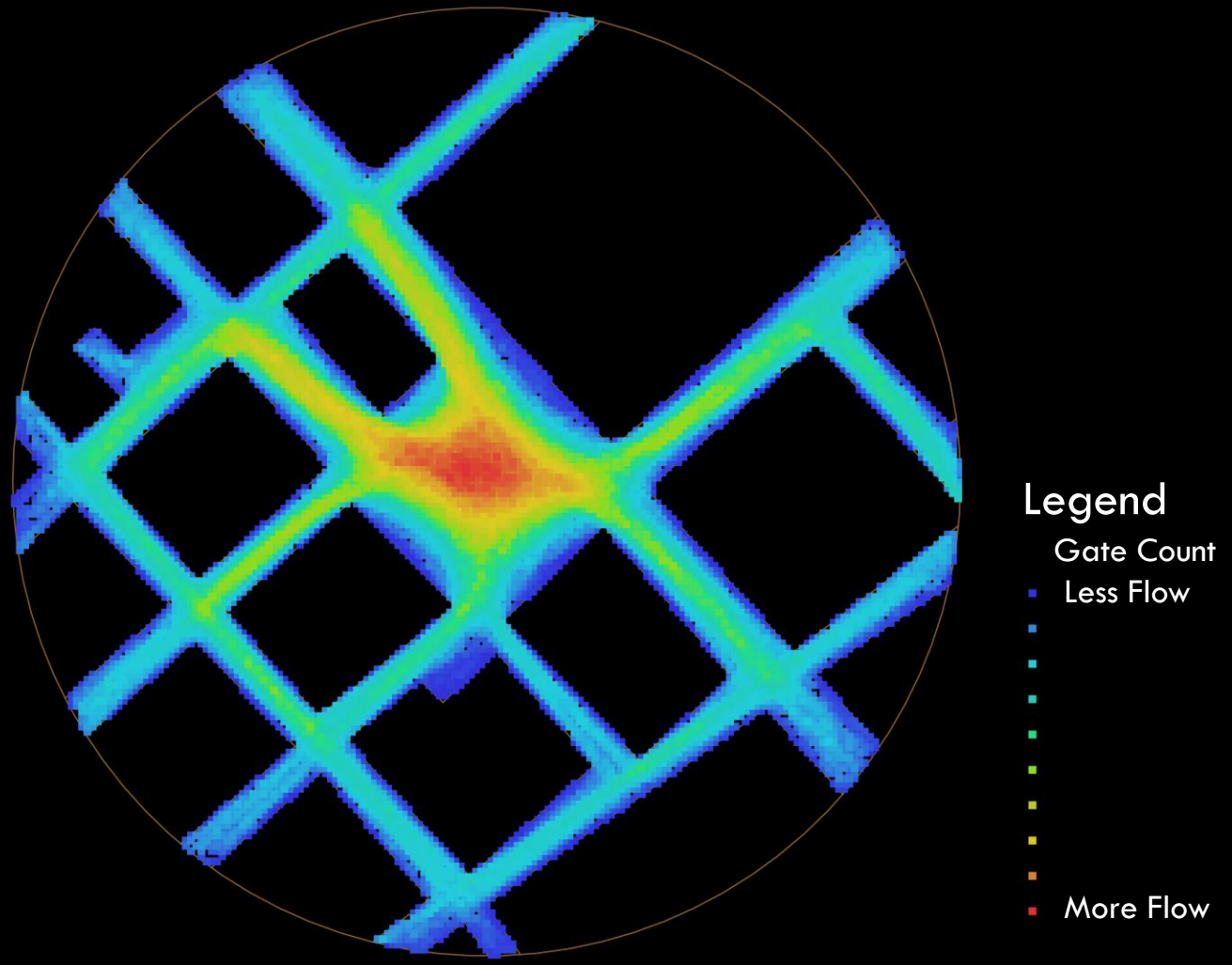
[vga: metrics]

_angular integration

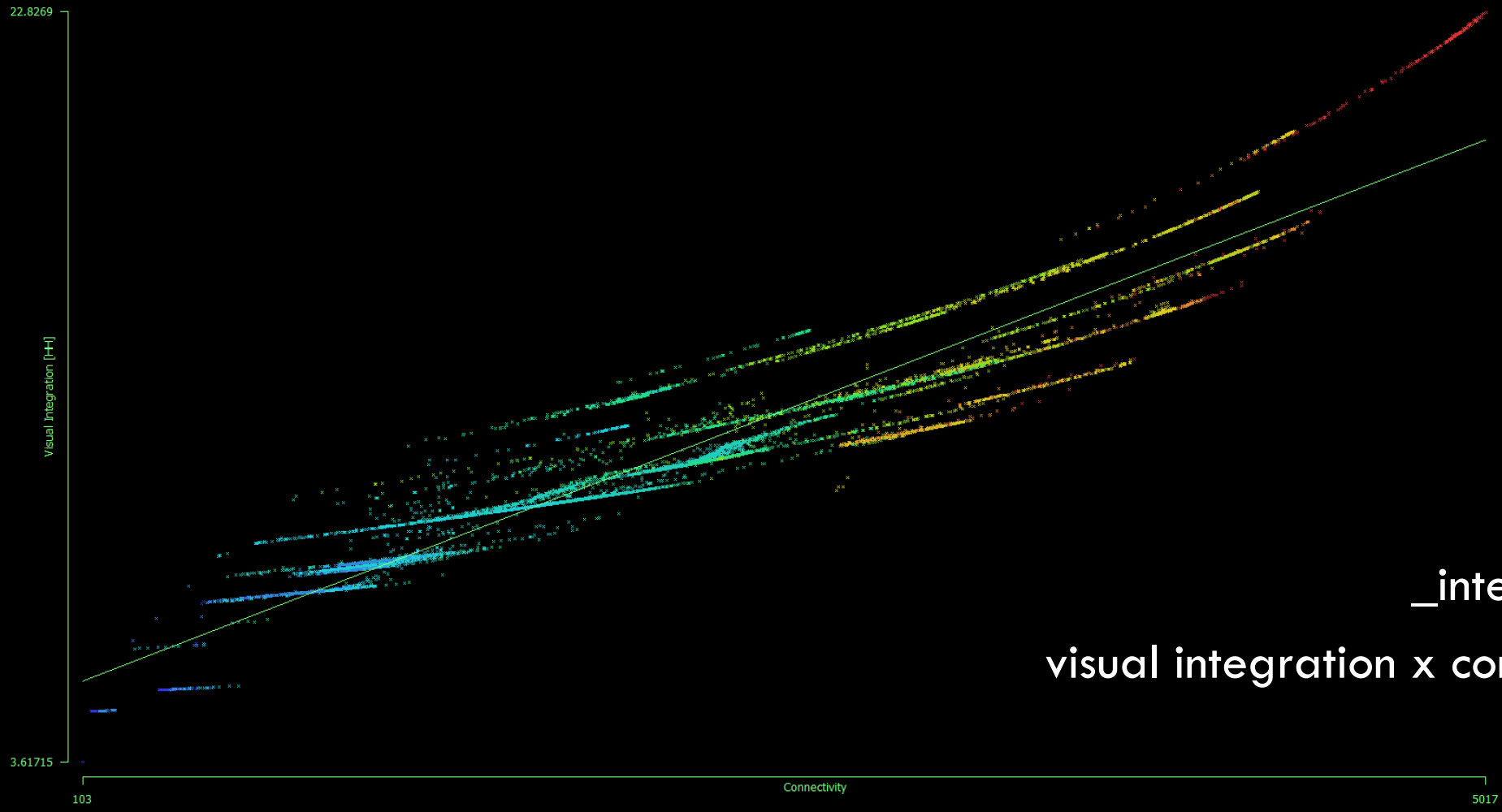


[vga: metrics]

_gate count



[vga: metrics]

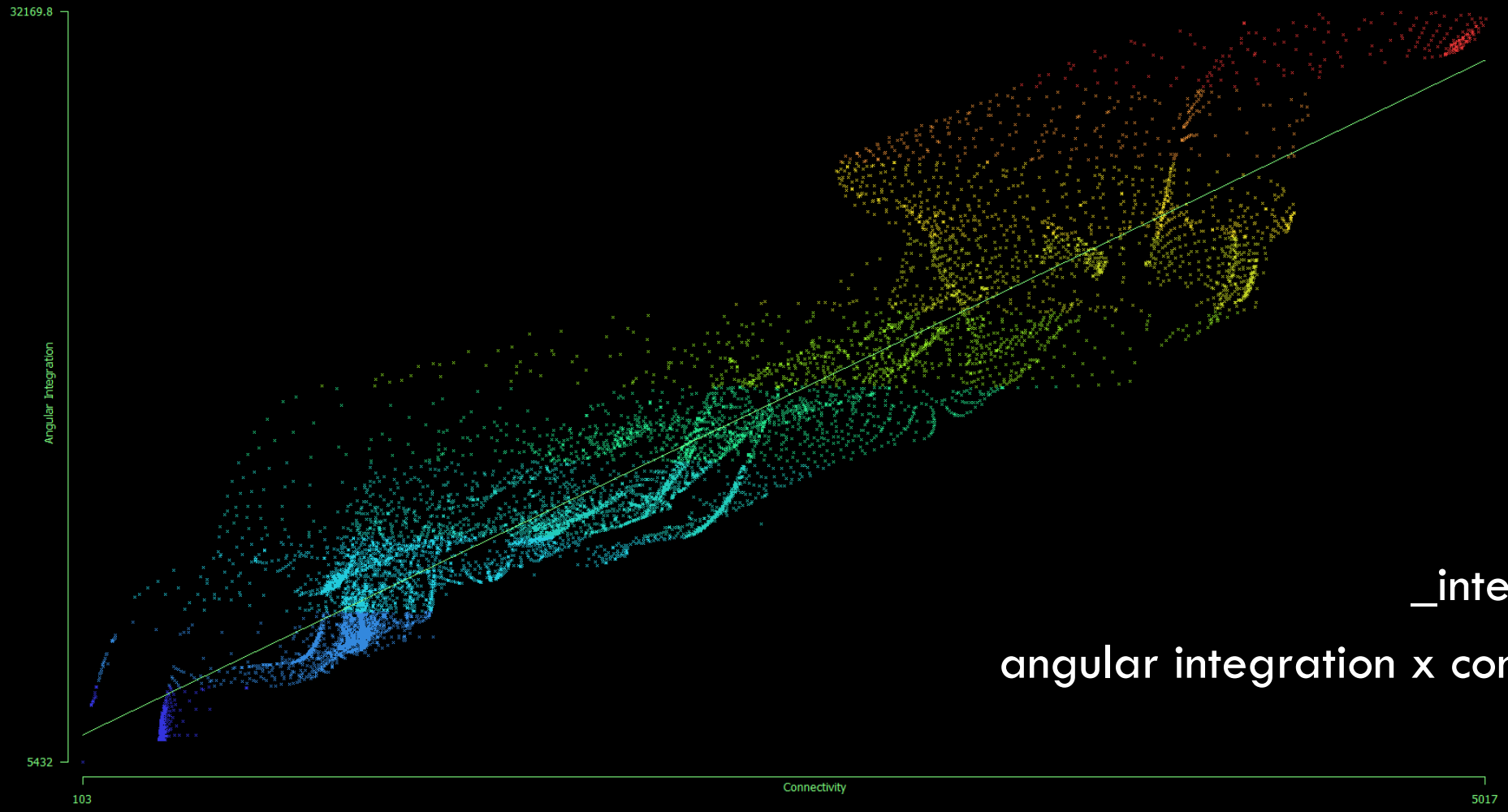


$R^2 = 0.92$

_intelligibility

visual integration x connectivity

[vga: metrics]

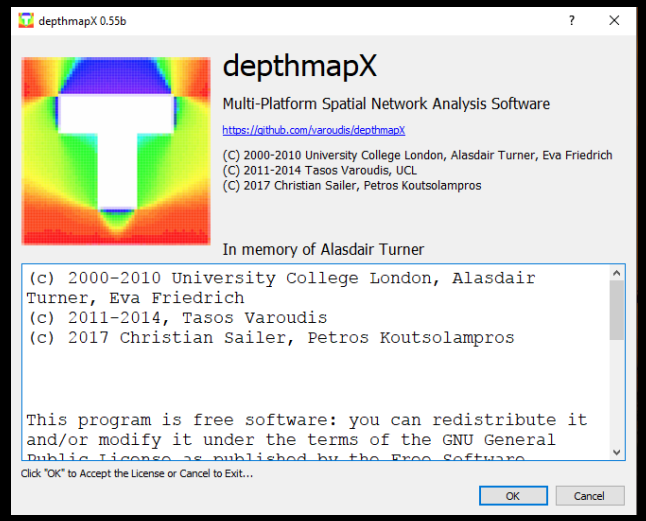


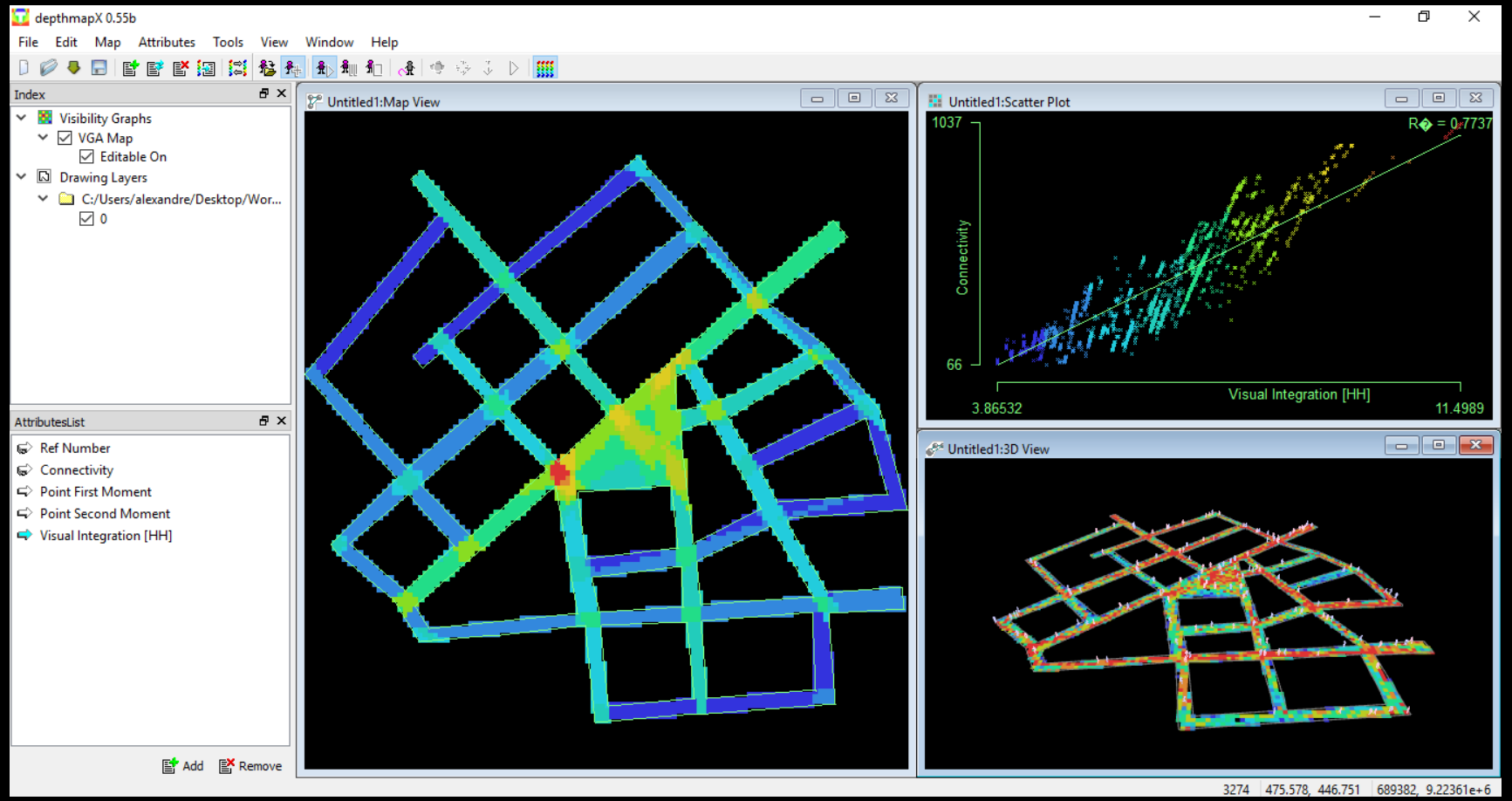
$R^2 = 0.86$

_intelligibility

angular integration x connectivity

[depthmapx]


depthmapX 0.55b
depthmapX
Multi-Platform Spatial Network Analysis Software
https://github.com/varoudis/depthmapX
(C) 2000-2010 University College London, Alasdair Turner, Eva Friedrich
(C) 2011-2014 Tasos Varoudis, UCL
(C) 2017 Christian Sailer, Petros Koutsolampros
In memory of Alasdair Turner
(c) 2000-2010 University College London, Alasdair Turner, Eva Friedrich
(c) 2011-2014, Tasos Varoudis
(c) 2017 Christian Sailer, Petros Koutsolampros
This program is free software: you can redistribute it and/or modify it under the terms of the GNU General
Click "OK" to Accept the License or Cancel to Exit...
OK
Cancel

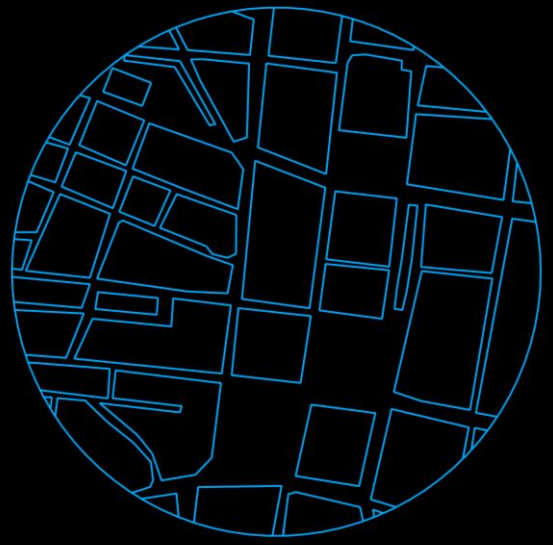

depthmapX 0.55b
File Edit Map Attributes Tools View Window Help
Index
Visibility Graphs
VGA Map
Editable On
Drawing Layers
C:/Users/alexandre/Desktop/Wor...
0
AttributesList
Ref Number
Connectivity
Point First Moment
Point Second Moment
Visual Integration [HH]
Add
Remove
Untitled1:Map View
Untitled1:Scatter Plot
1037
66
Connectivity
3.86532
Visual Integration [HH]
11.4989
Untitled1:3D View
3274
475.578, 446.751
689382, 9.22361e+6

[modeling]

_dethpmapx imports .dxf files;

_isolate the study area;

_define barriers and permeabilities;

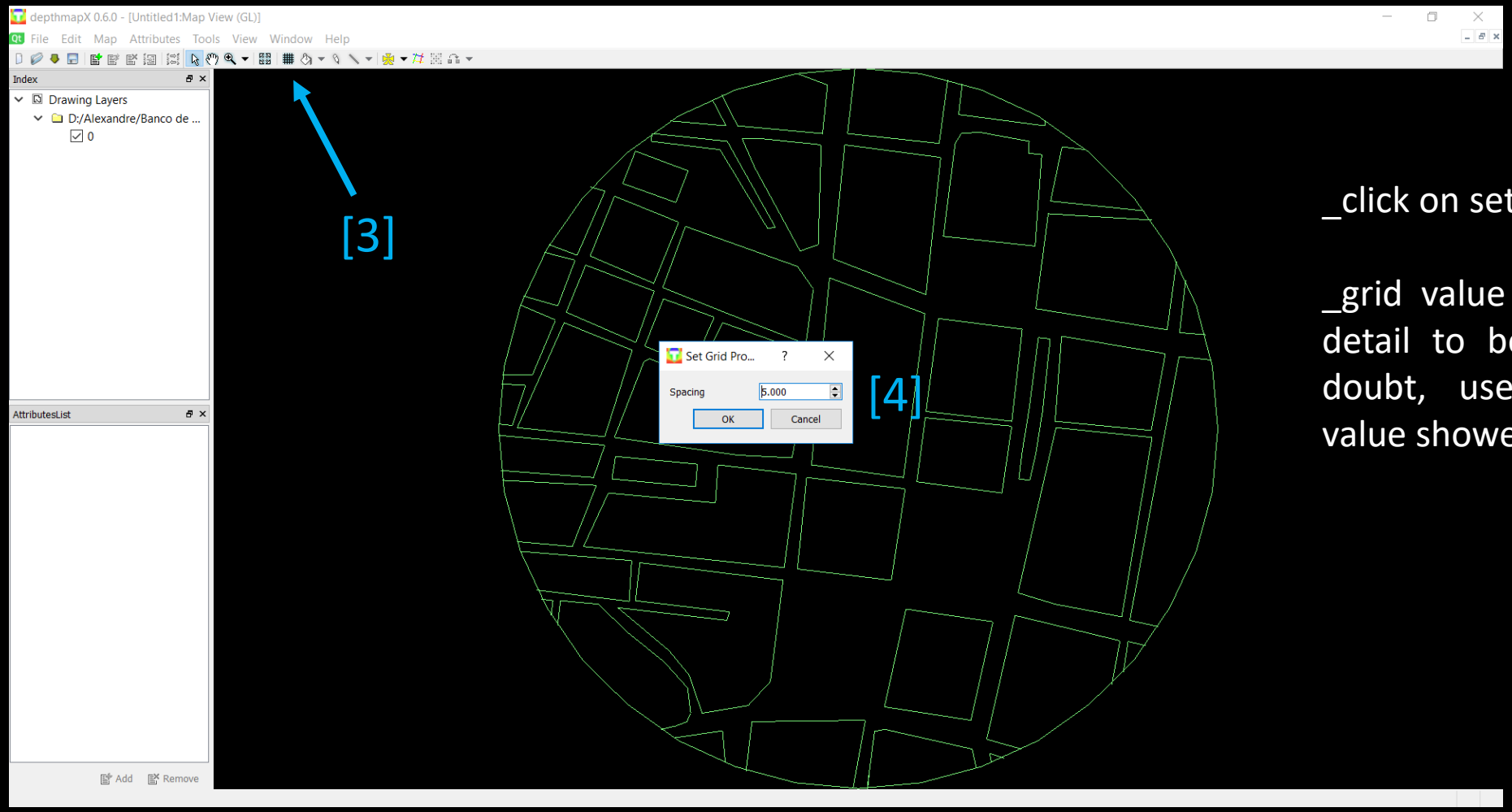


[modeling]

_after opening depthmapx, click on new [1];

_after creating a new projetc, click on import [2];

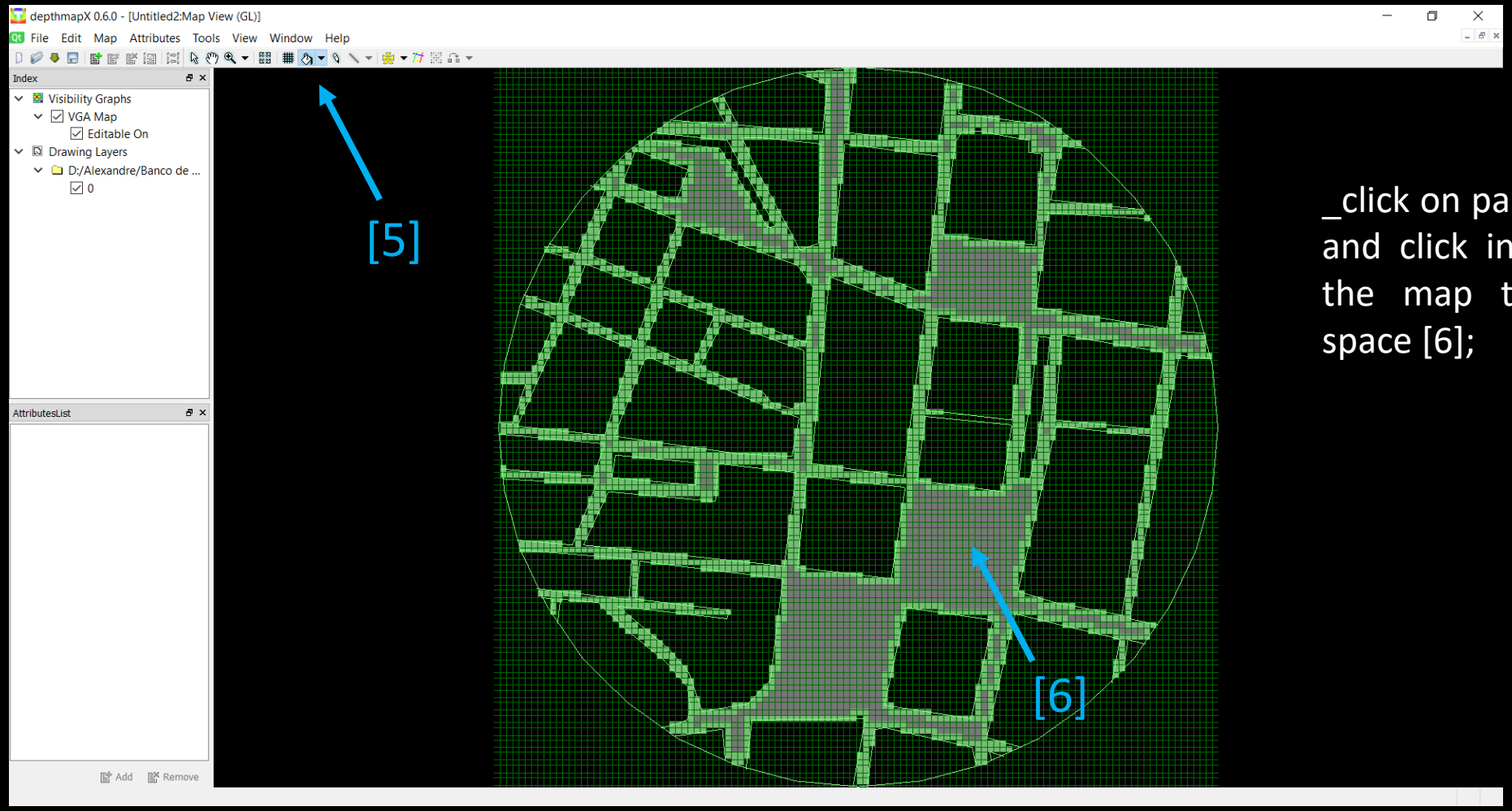
[modeling]



_click on set grid [3];

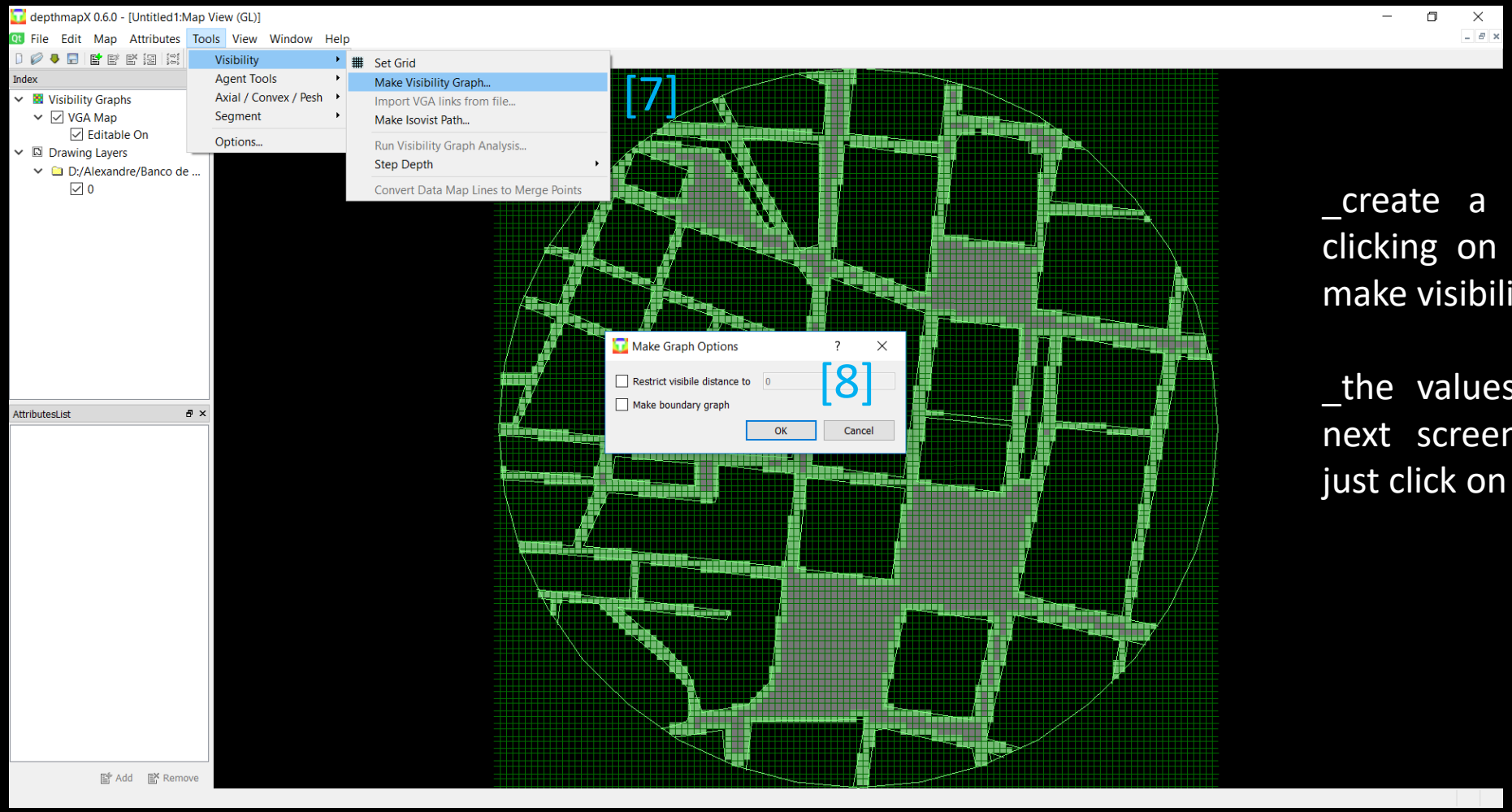
_grid value depends o the detail to be studied; if in doubt, use the standard value showed [4];

[modeling]



_click on painting bucket [5] and click in some point of the map that be a free space [6];

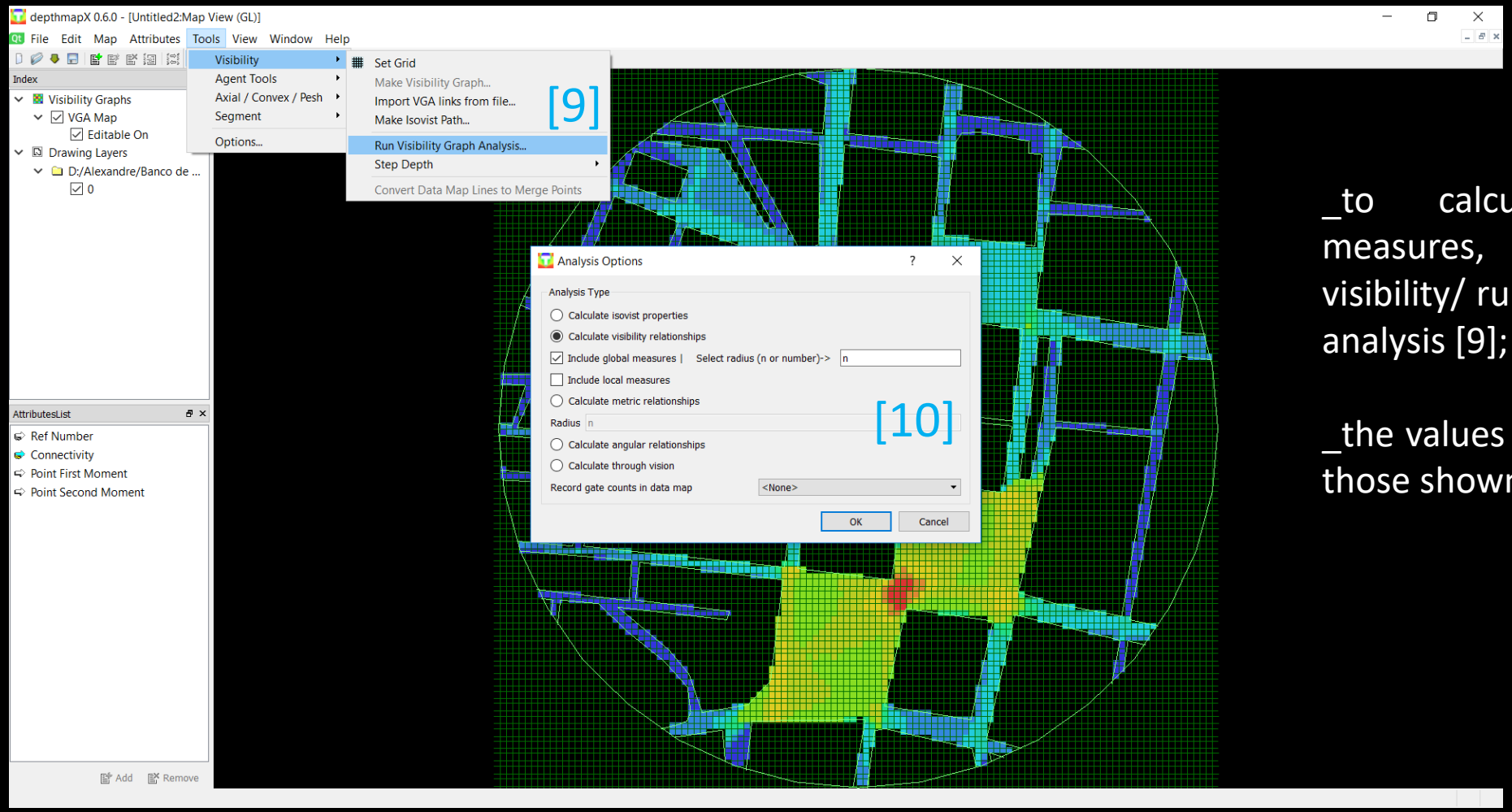
[modeling]



_create a visibility graph, clicking on tools/ visibility/ make visibility analysis [7];

_the values shown in the next screen are standard, just click on “ok” [8];

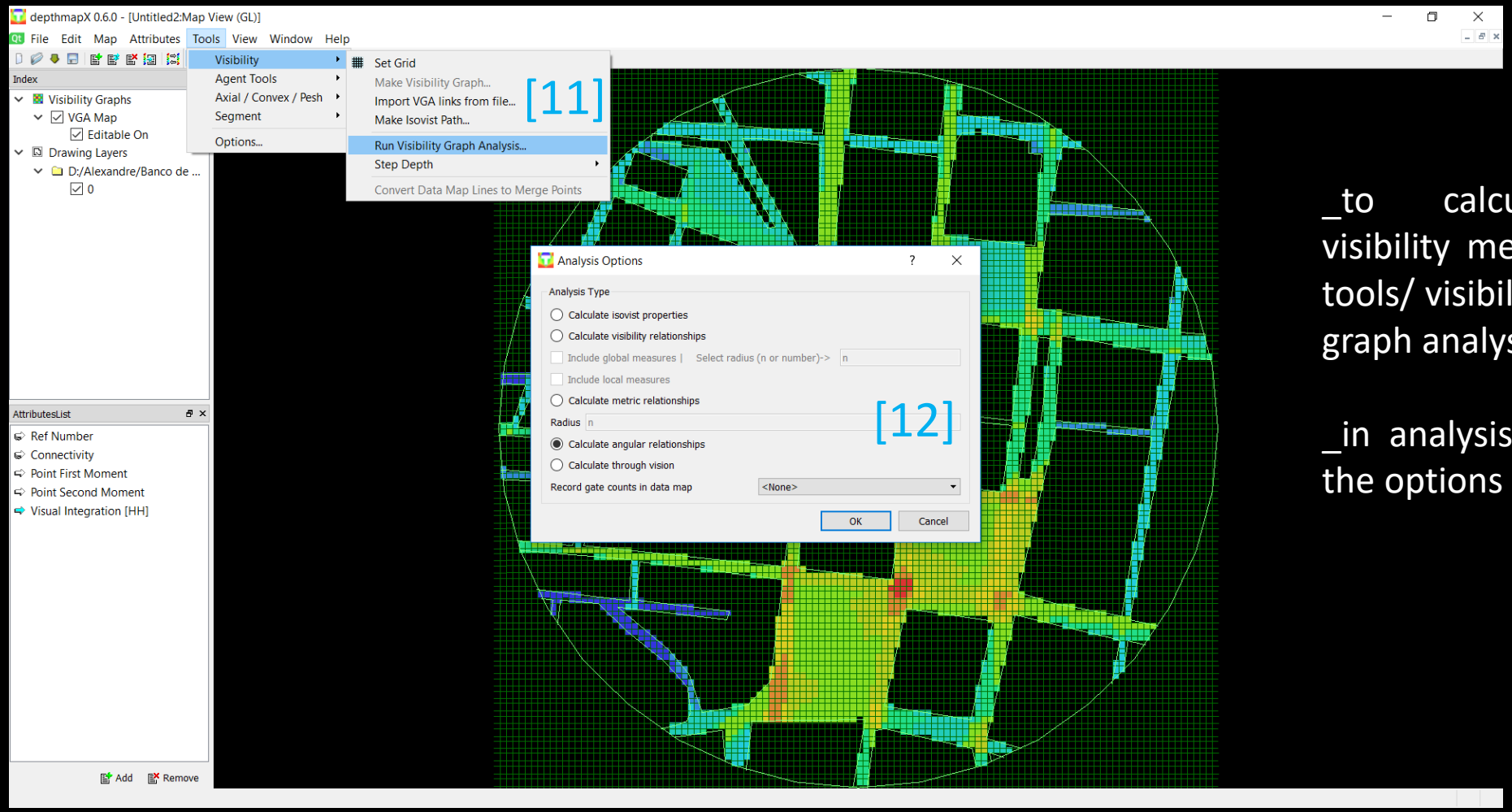
[modeling]



_to calculate visibility measures, click on tools/ visibility/ run visibility graph analysis [9];

_the values to configure are those shown [10];

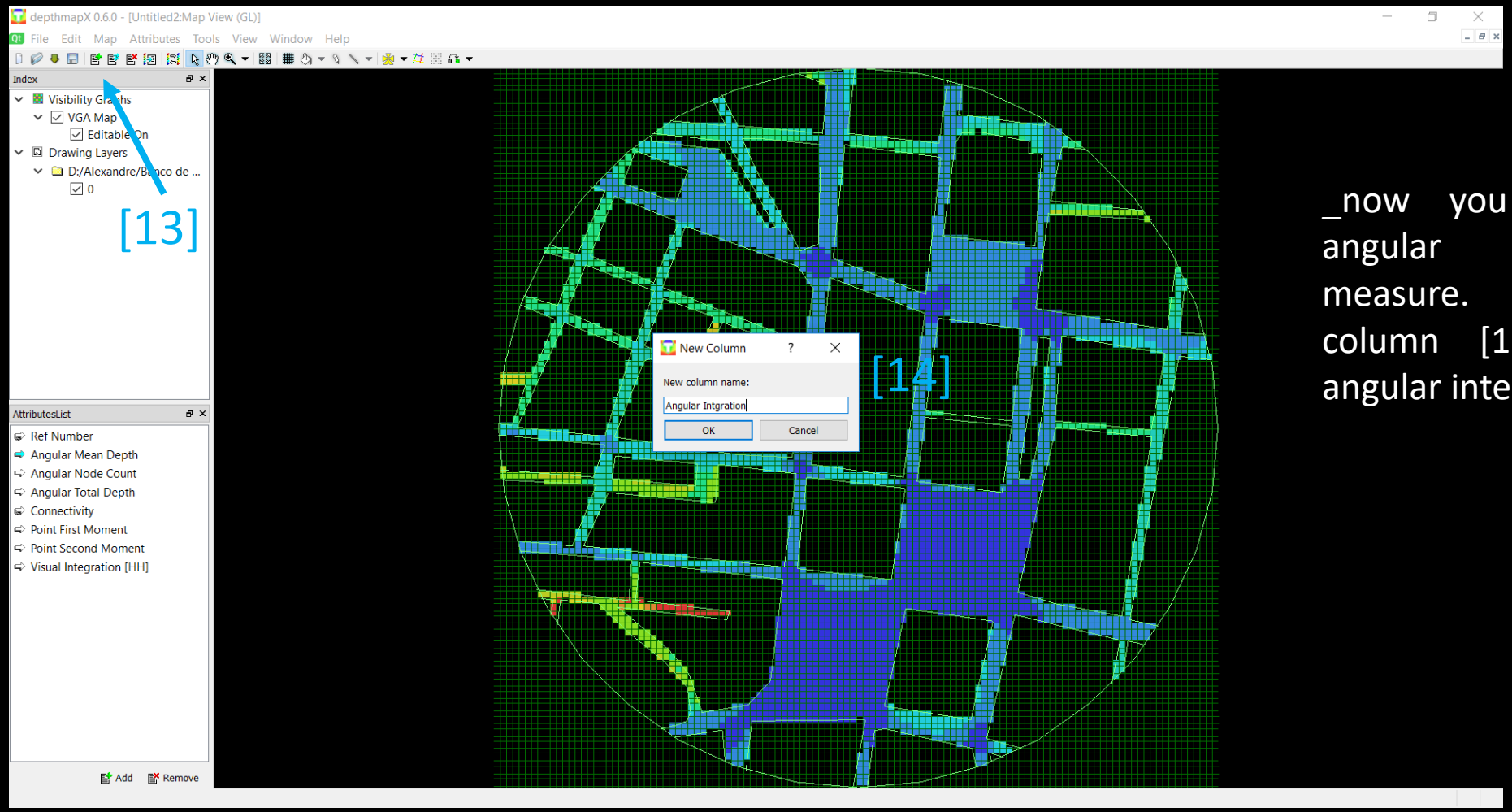
[modeling]



_to calculate angular visibility measures, click on tools/ visibility/ run visibility graph analysis [11];

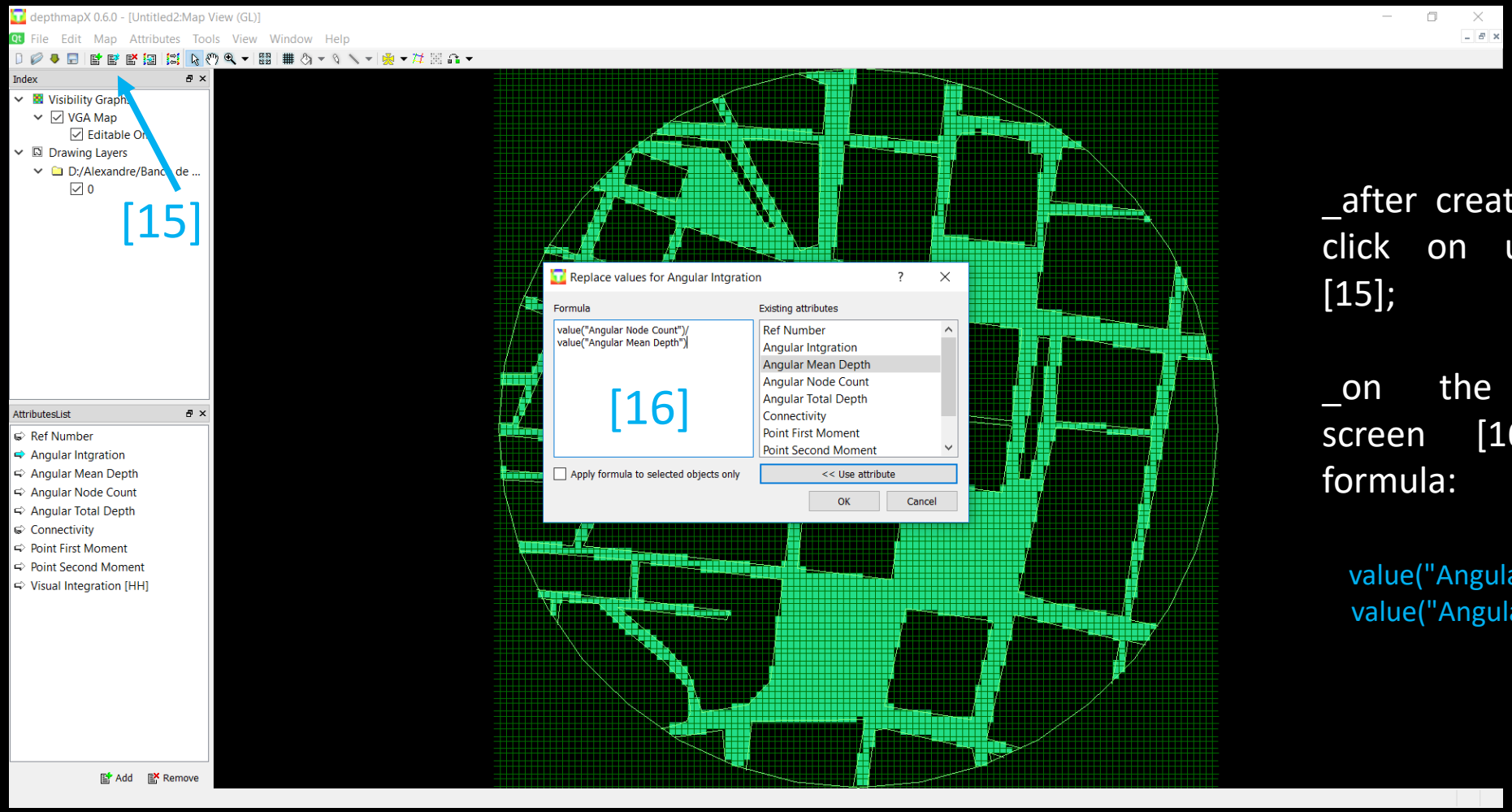
_in analysis options, select the options shown [12];

[modeling]



_now you must mount angular integration measure. click on add column [13] and name angular integration [14];

[modeling]

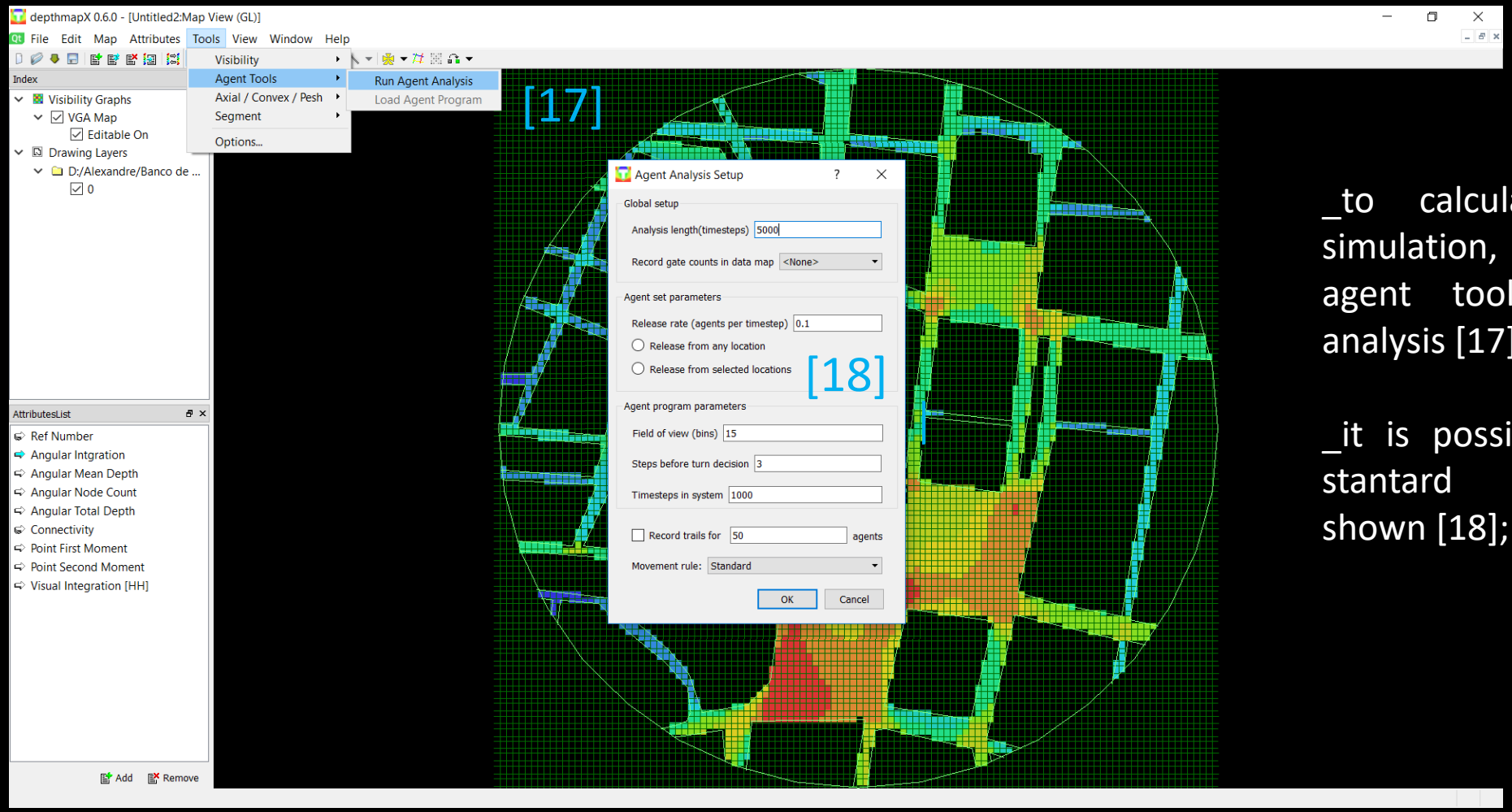


_after create the measure, click on update column [15];

_on the measurement screen [16], type the formula:

value("Angular Node Count")/
value("Angular Mean Depth")

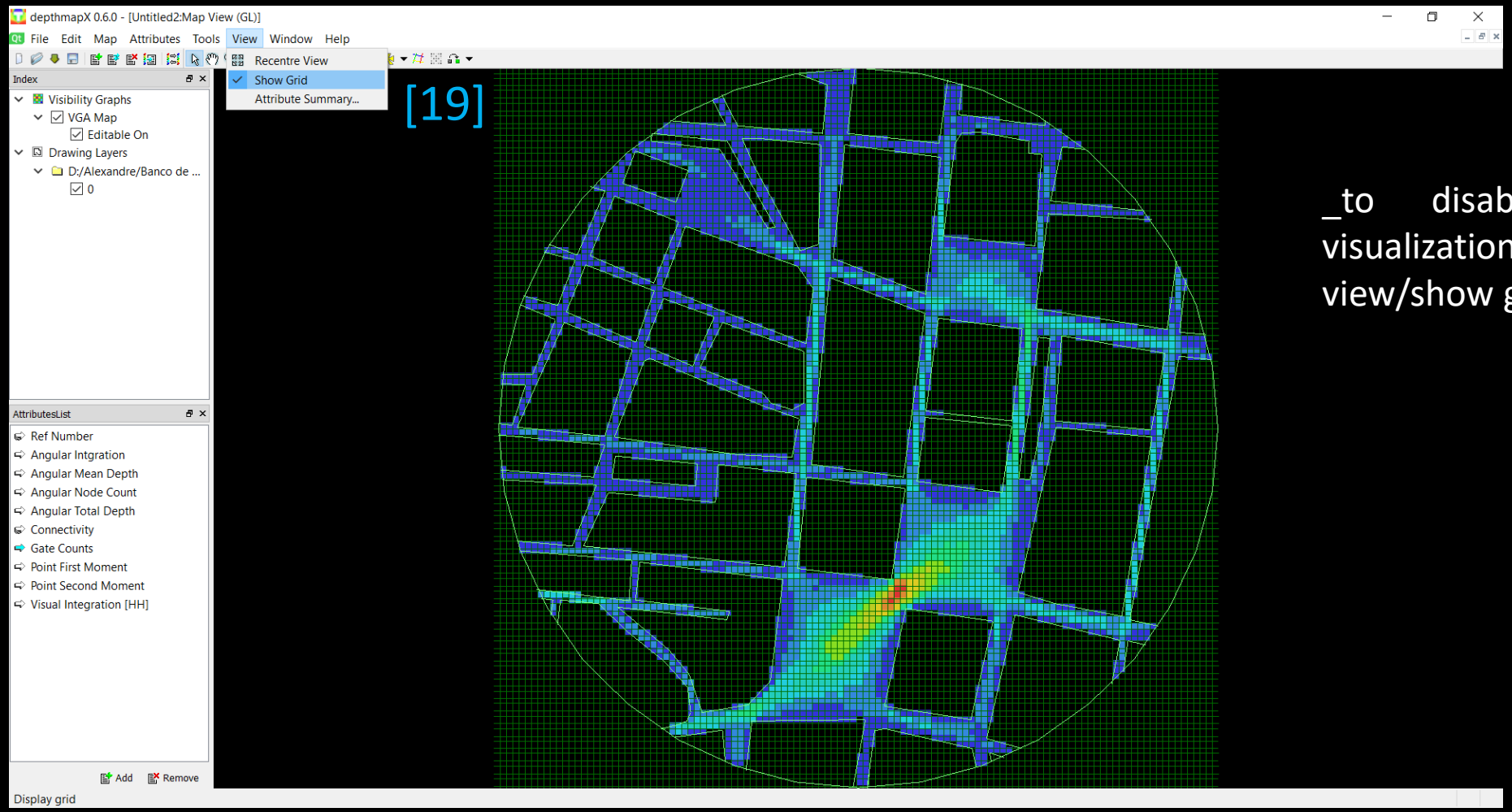
[modeling]



_to calculate the flow simulation, click on tools/ agent tools/ run agent analysis [17];

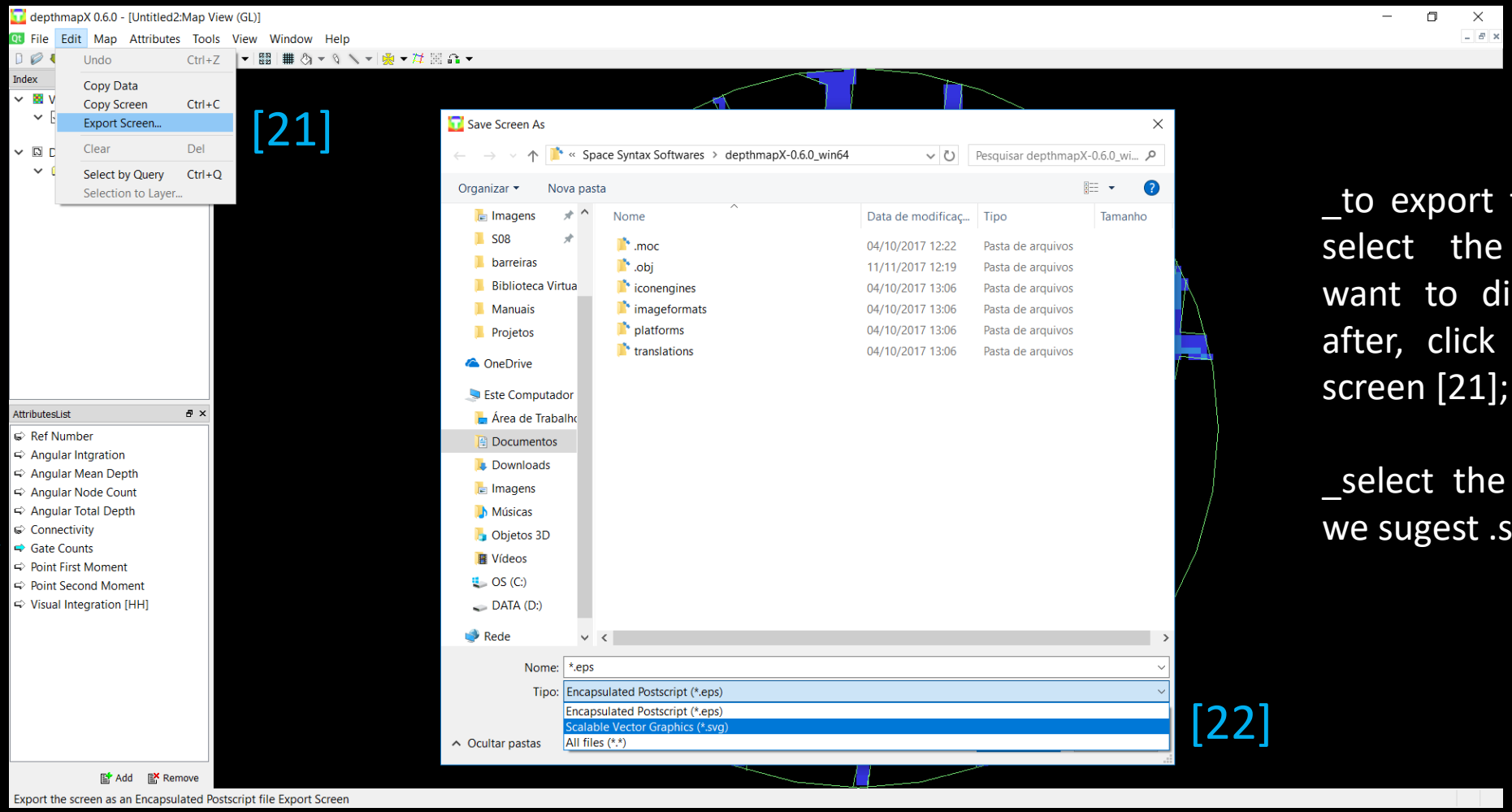
_it is possible to use the stantard configuration shown [18];

[modeling]



_to disable the grid visualization, click on view/show grid [19];

[modeling]



_to export the map image, select the measure you want to display [20], and after, click on edit/explort screen [21];

_select the output format; we sugest .svg format [22]

references

HILLIER, B. (2007). **Space is the Machine: A Configurational Theory of Architecture**. London: Space Syntax.

HILLIER, B.; BURDETT, R.; PEPONIS, J.; PENN, A. (1987). Creating Life: Or, Does Architecture Determine Anything? **Architecture et Comportement/Architecture and Behaviour** , 3 (3), 233-250.

KARIMI, K. (2012). A Configurational Approach to Analytical Urban Design: 'Space Syntax' Methodology. **Urban Design International,** 17 (4), 297–318.

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_this material is avaliable in:

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