

## **Space syntax · Depthmap · Network Analysis tutorial**

### **Download depthmap software:**

<http://archtech.gr/varoudis/depthmapX/>

### **Simple online tutorial with dataset:**

<http://otp.spacesyntax.net/software-and-manuals/depthmap/urban-spatial-model/>

**Note:** You have 2 options for running your space syntax analyses.

**Option 1. Adapt existing street network in CAD. Export as dxf. Run analysis. (Ie follow tutorial steps exactly as outlined here).**

**Option 2. Adapt axial map directly in Depthmap using an existing .graph file. Start tutorial at step 3.**

**Remember that running space syntax analyses is an iterative process. Try one design proposal. Run analysis. Edit street network. Re-run analysis...**

**This tutorial has 8 steps.**

**Step 1. Create Depthmap file**

**Step 2. Create axial map**

**Step 3. Edit axial map**

**Step 4: Link/unlink lines**

**Step 5. Create segment map**

**Step 6. Analyse segment map**

**Step 7. Look at results**

**Step 8. Export figures**

**Appendix:**

**What do space syntax measures mean**

**Using Depthmap: General tips & shortcuts**

## **Step 1. Create Depthmap file**

### **→ Prepare a street network file**

Each road is a SINGLE line

*TIP: Make sure you have set the correct units on your CAD file, as depthmap uses the same units. This is important when you want to run your analysis using a metric radius (eg. radius 2500m). You can check whether the units are correct in depthmap by selecting “segment length” and making sure this is realistic.*

### **→ Export street network as .dxf**

### **→ Import .dxf into Depthmap**

Open Depthmap

File-New (always!)

Map-Import

You have now imported the .dxf into Depthmap and should see the road network on the main window (“Map view”).

*TIP: If depthmap crashes when you try and import your dxf, it may have too many classes/layers. You can test whether this is the case by opening a simple dxf (eg the one in the online tutorial mentioned at top of page) and make sure that a simple dxf file can be imported without problems.*

### **→ Save .graph file**

File-Save.

You have now created a .graph file with your network.

## **Step 2. Create axial map**

### **→ Create axial map**

Map-Convert Active map

The “Create new map” window pops up

New Map Type: select “Axial map”

“OK”

You have now created an axial map.

*TIP: Creating the axial map is important if you have any bridges/tunnels you want to link/unlink in your proposal. You can only edit and create links/unlinks on Axial maps (and not for segment maps).*

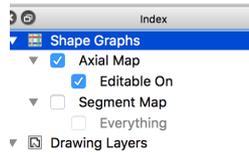
*TIP: The “Covert Active Map” converts whatever file is selected in Index window.*

### Step 3: Edit axial map

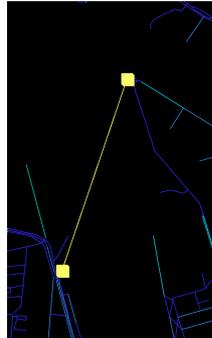
You can only edit axial maps (not segment maps).

#### → Create axial map

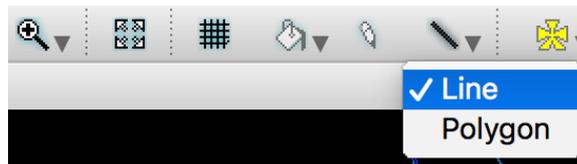
Click “Editable On”



Click on a line to edit it.



Add new lines by using “line” tool.



Delete lines by selecting them and pressing “delete” on keyboard.

(Mac users may need an external keyboard for this function to work).

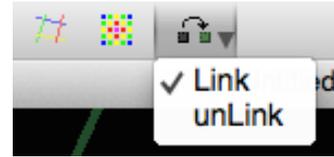
#### Step 4: Link/unlink lines

If you have lines that cross but are not meant to link, you will need to “unlink” these (eg. bridges, tunnels).

*TIP: The opposite of the unlink function is the link function.*

Click on the link/unlink tool.

Initially the “Link” tool is selected.



By clicking the arrow, you can select the “UnLink” tool.

*TIP. The tool button stays with the last performed function (eg. unLink) until changed.*

Select the 1<sup>st</sup> line that you want to unlink. (This line is now highlighted in yellow)

Select the line that you want to unlink it from.

A red circle now shows on the intersection between the 2 lines, indicating that they do not connect (this is illustrated in figure below).

*TIP: Made a mistake? Simply link the lines again.*

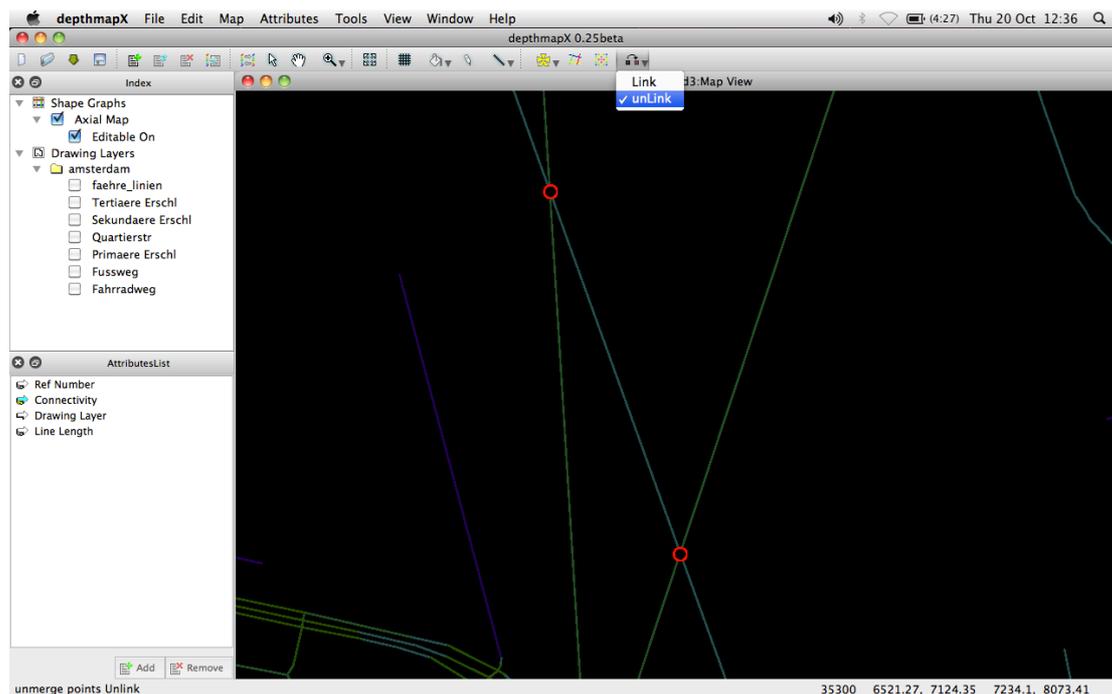
*Select the link tool (opposite of unlink tool)*

*Repeat the process as above;*

*select 1<sup>st</sup> line (highlighted yellow); select 2<sup>nd</sup> line;*

*Lines are no longer unlinked when red circle disappears.*

Repeat unlink process for all bridges/tunnels.



## **Step 5. Create segment map**

### **→ Create segment map**

Map-Convert Active map

The “Create new map” window pops up

New Map Type: select “Segment map”

*TIP: Make sure you have the correct map selected in the “Index” window, on left hand side of screen. You want your input data map to be selected in Data Maps.*

*TIP: If you many files in the “Index” window, make sure the correct one is selected. The “Covert Active Map” coverts whatever file is selected in Index window. The “Convert Drawing Map” command, always converts your imported .dxf file.*

*TIP: Selecting “remove axial stubs” means you can automatically delete any parts of a street that crossed over, but are not meant to be a new segment (useful when working with traditional axial maps, as opposed to road centre line data)*

## Step 6. Analyse segment map

Tools-Segment-Run segment analysis

The “Segment Analysis Options” window pops up

Select radius type-change to “Metric”

Click “OK” to run simple analysis (see appendix for what the different options mean)

“Performing segment analysis” window pops up, with an estimate length of time needed.

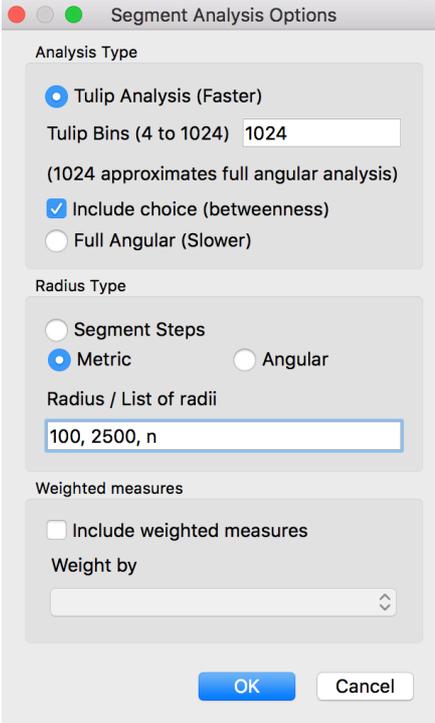
SAVE file, once analysis has run

(ie. once “Performing segment analysis” window disappears).

*TIP: Time needed for analysis depends on:*

- *how large the file is*
- *how many measures you choose to include*  
*(eg. running analysis without “Choice” is faster)*
- *the number and scale of radii you include*  
*(a small radius eg. 100m is faster than a large radius.*  
*The largest possible radius is “n”)*
- *computer processing speed.*

Suggested analysis options:



The screenshot shows a dialog box titled "Segment Analysis Options". It is divided into three main sections: "Analysis Type", "Radius Type", and "Weighted measures".

- Analysis Type:** Features a radio button for "Tulip Analysis (Faster)" which is selected. Below it is a text input field for "Tulip Bins (4 to 1024)" with the value "1024". A note below the field states "(1024 approximates full angular analysis)". There are two checkboxes: "Include choice (betweenness)" which is checked, and "Full Angular (Slower)" which is unchecked.
- Radius Type:** Features two radio buttons: "Segment Steps" (unchecked) and "Metric" (checked). There is also an unchecked radio button for "Angular". Below this is a text input field for "Radius / List of radii" containing the text "100, 2500, n".
- Weighted measures:** Features an unchecked checkbox for "Include weighted measures". Below it is a label "Weight by" followed by a dropdown menu.

At the bottom of the dialog are two buttons: "OK" and "Cancel".

### **Step 7. Look at results**

The analysis you ran now shows in the “Attributes” window, on the left hand side of the screen. By clicking on each “Attribute”, the map view changes.

What do the attributes mean: see appendix

You might want to run:

**Connectivity:**

**T1024 Integration**

**T1024 Choice**

*TIP: If you run the analysis at different radii (these are specified in the “Segment Analysis Options” window) these will appear as separate attributes in the “Attributes” window eg. “T0124 Integration R500 metric” shows the results for Integration radius 500m.*

### **Step 8. Export figure**

Edit-Export screen.

This allows you to save the current view as an .eps or .svg file.

*TIP: You want to change the background colour?  
View-Background. Choose your colour (eg. white). Click “OK”. Then click once anywhere on the screen.*

## Appendix: What do space syntax measures mean?

Choose your analysis to match your question.

An axial analysis will tell you something about movement flows in your network.

You might want to test:

**Connectivity.** Measures how many streets connect to that street

**Integration.** Measures how integrated (or central) a street is to network

**Choice.** Measures how important street is as a through-road for the network.

(Think of what would happen if you need to take a detour).

Try a local scale to suit your proposal (1000m? 2500m?) and a global scale (n).

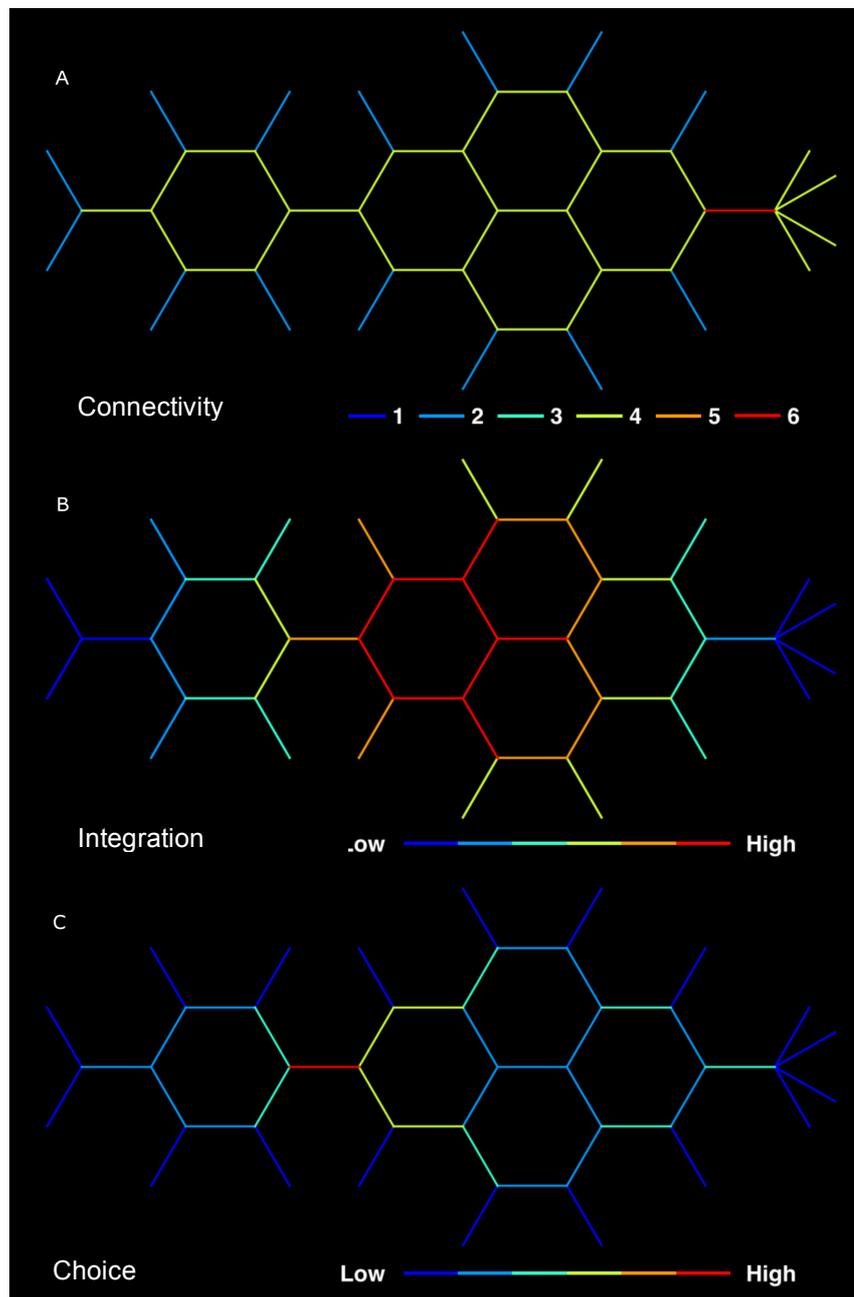


Figure illustrating the difference between connectivity, integration and choice for a sample network. Taken from: Javadi, A., et al. (2017) "[Hippocampal and prefrontal processing of network topology to simulate the future](#)". *Nature Communications*.

## Appendix: Using Depthmap: General tips & shortcuts

- Use a mouse with a scroller (the zoom function does not work so well with a Mac mouse)
- Right-click to pan/drag
- Hover over a line to see the value of the parameter (see figure below).
- File menu greyed out? Make sure the “Map view” window is selected. (The “Map view” window can become de-selected when you switch back to Depthmap from a different programme)
- Depthmap crashes when you import dxf? Test a simple dxf to make sure you have downloaded depthmap correctly (eg. simple axial dataset in online tutorial). If that opens fine, reduce the complexity (eg. try removing excess layers/classes/size) of the dxf you are trying to import.
- Can't delete axial lines? Make sure “editable on” is selected. Press “delete” key on keyboard (Mac users may need an external keyboard for this function to work).
- Many shortcuts common for other drawing software aren't available for Depthmap running on iOS.
- If your analysis is identical across scales, make sure your dxf file has the correct units. You can check if the depthmap file is using the correct units by selecting “segment length” and making sure that the number is realistic.
- Change colour scheme using Window-Colour range. Try Equal range and Depthmap Classic. “Apply all” selects the same colour range for all the analysis (it is important to export graphics that have a consistent colour scheme!).

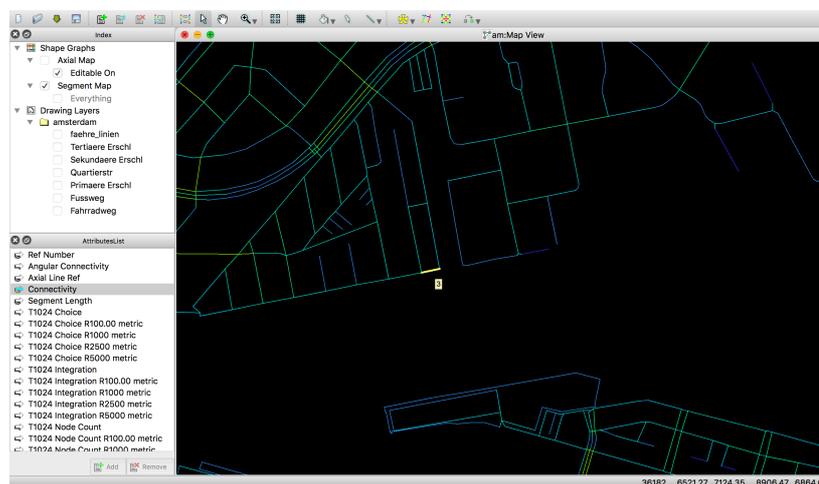


Figure illustrating a highlighted segment. The value corresponds to the selected attribute.