Chair of
Information
Architecture

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Lecture 3
Visibility in Space Syntax:
Isovist and Isovist Fields
(View Fields)
Analysing Urban Attractors –
Choice measures

Digital Urban Simulation

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Content

- Visibility in Space Syntax: Isovist

- Isovist Fields

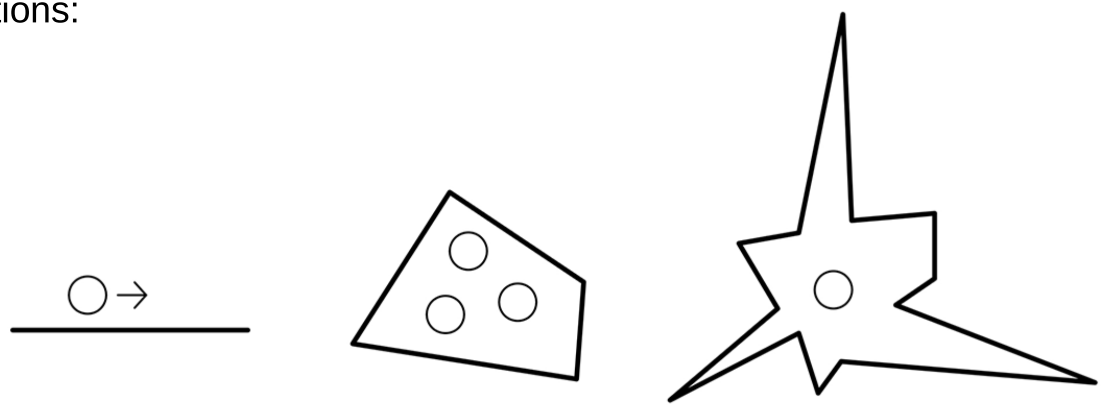
- Excercise:
- Segment Analysis (Choice measures)
- Isovist and Isovist field Analysis

- **DecodingSpaces Components in Grasshopper**

Network and Space Analysis >>> Space Syntax

- Represents streets as nodes and intersections as edges (in a topological representation)

- 3 main conceptions:

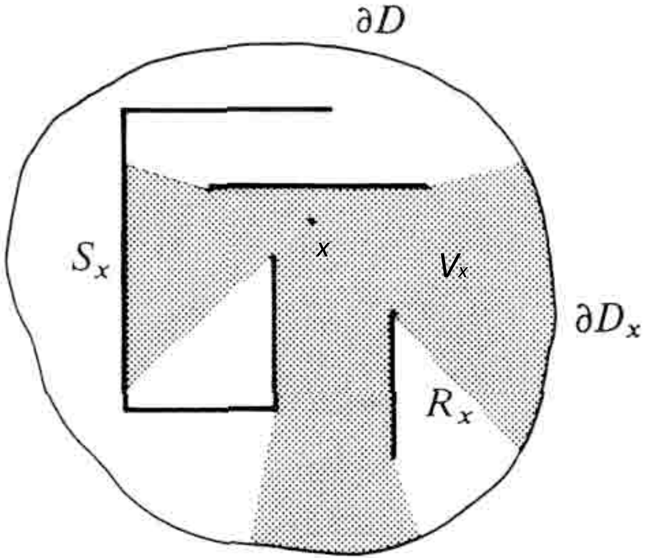


Axial Lines　　Convex Spaces　　Isovist – Visibility

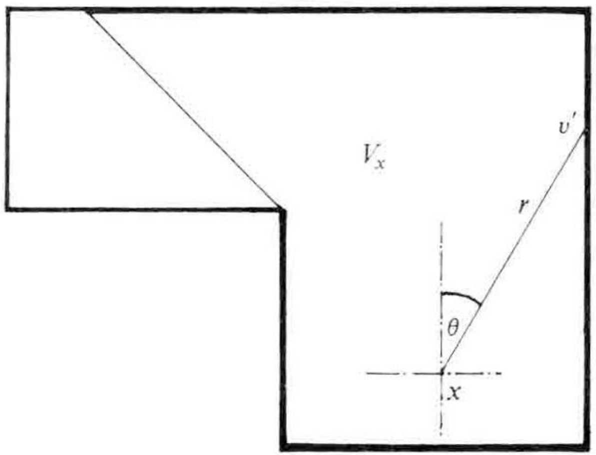
(Hillier and Vaughan, 2007).

Isovist

A Isovist (view field) contains all points which can be seen from a location in space.



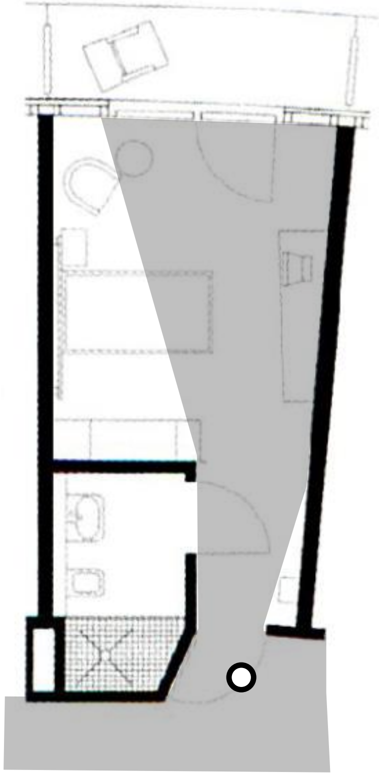
A Isovist *Vx* from a view point *x* in a Environment E in a Region D (from: Benedikt,1979)



Construction of a Isovist by intersection of beams with the environment, resp. The spatial borders. (from: Benedikt,1979)

Isovist – Tool for visibility testing

View into a patient’s room.



Isovist from the entrance of a patient’s room.

Properties of Isovists

Area area of a view field

Perimeter circumference of a view field

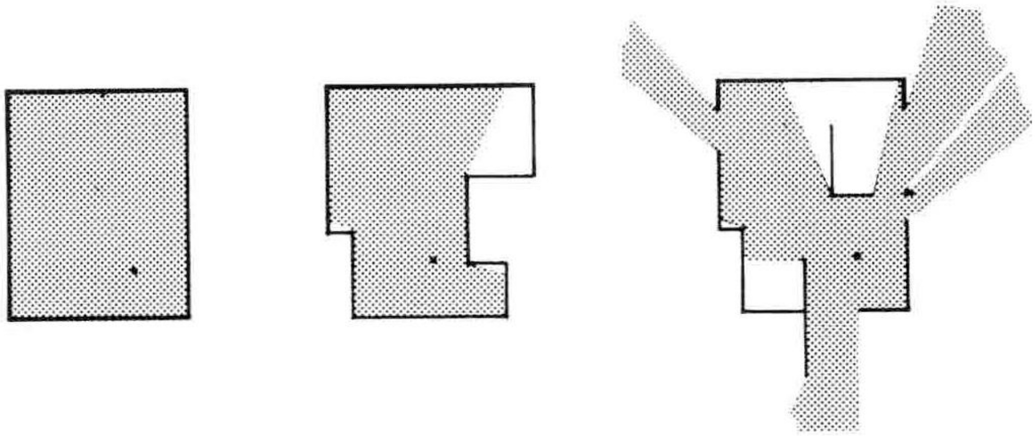
Compactness ratio of area to perimeter in relation to an ideal circle

Occlusivity length of the „open“ edges

Min Radial shortest view ray

Max Radial longest view ray

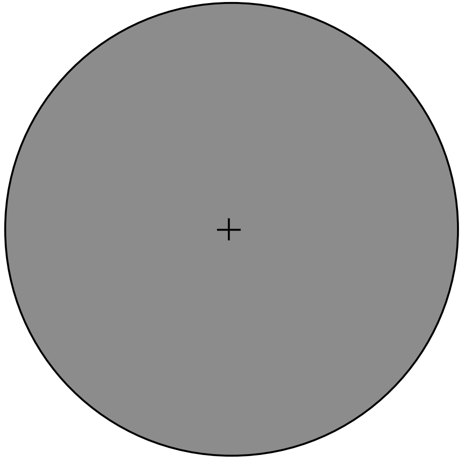
… many more (including secondary measures)
(see Benedikt, 1979
or Batty, 2001)

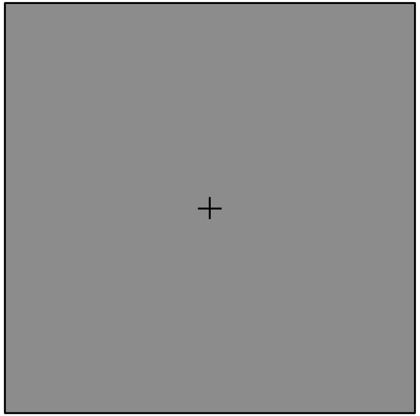


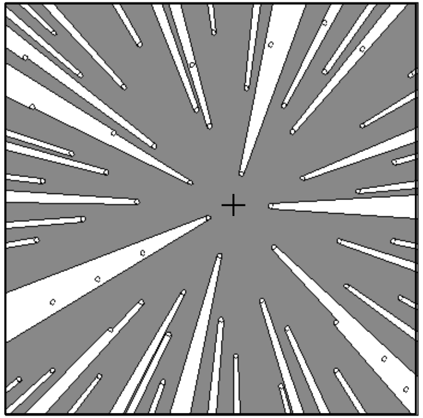
$Q_x = 0$ $Q_x > 0$ $Q_x \geqslant 0$

Qx = Degree of occlusivity (from Benedikt, 1979)

Properties of Isovists - Examples







	circle	square	forest
Area:	400	400	298.1
Perimeter:	70.8	80	486.6
Occlusivity:	0.0	0.0	416.5
Compactness:	1.0	0.78	0.015

Isovist Field

The analysis of a single field of view allows conclusions about a spatial configuration, starting from a certain view point. If a spatial configuration is evaluated as a whole, it is necessary a configuration to be considered not only from a point, but from all points of view. For this proposes Benedict (1979) created Isovist-Fields. In Isovist-fields the Isovist properties are calculated and displayed in color for all points within a configuration.

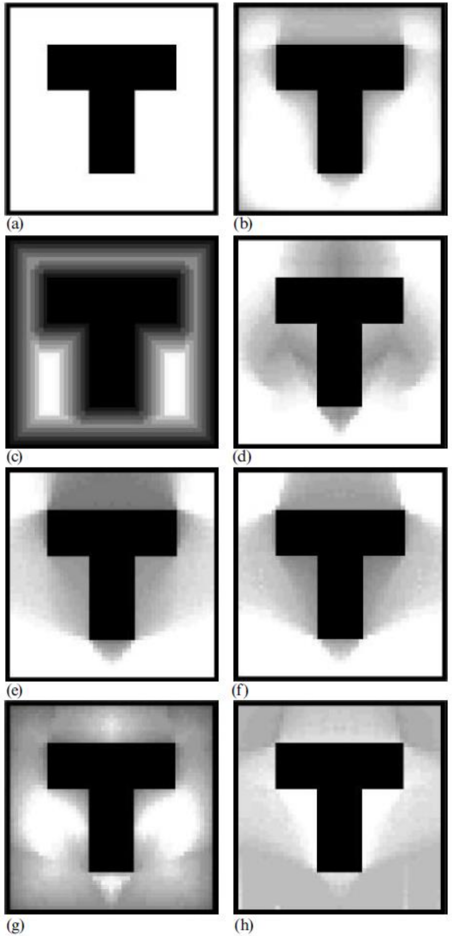
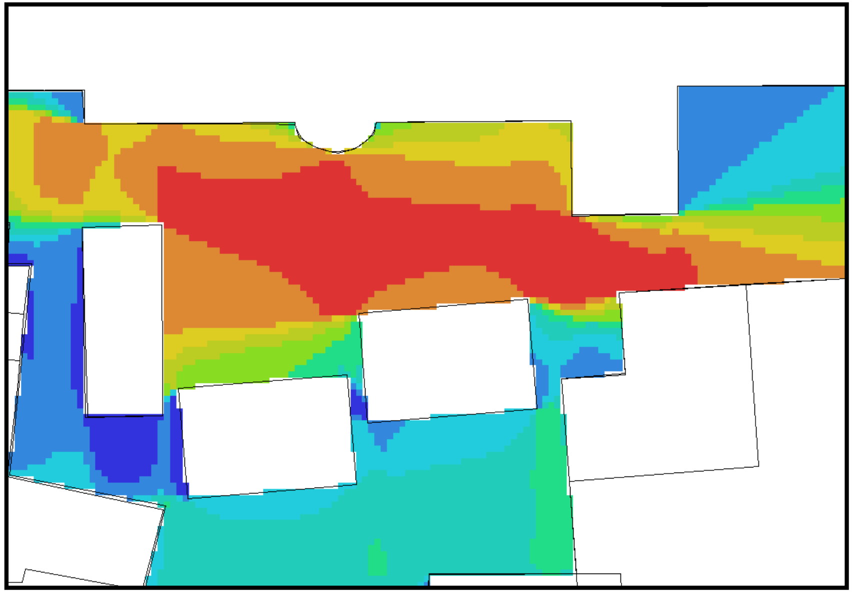
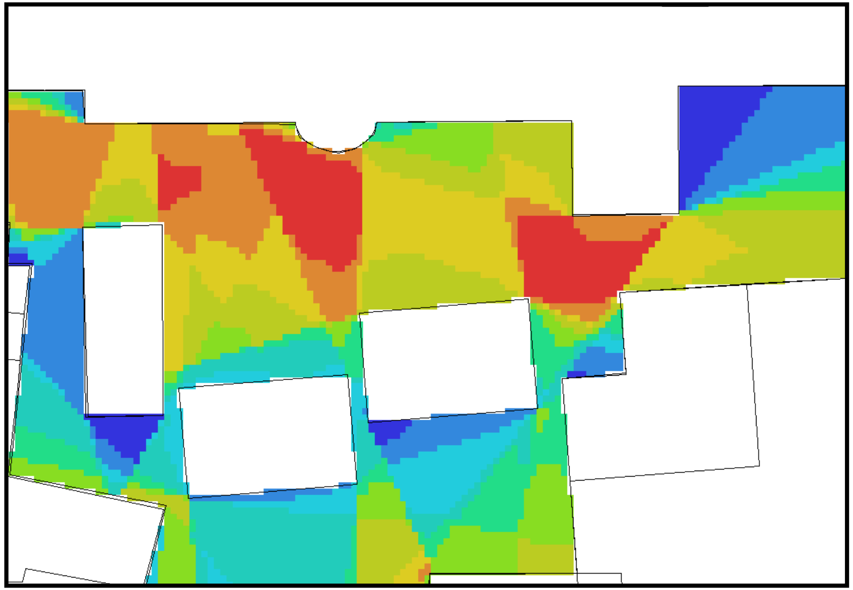


Figure 3. Isovist fields for the T-shape: (a) the basic T-shape; (b) the average distance; (c) the minimum distance; (d) the maximum distance; (e) the area; (f) the perimeter; (g) the compactness ratio; and (h) the cluster ratio.

Isovist Field – Example: BU Campus

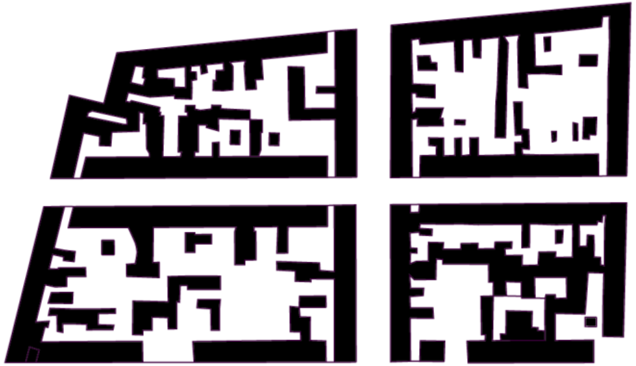


Isovist Area Values mapped on an Isovist Field



Isovist Perimeter Values mapped on an Isovist Field

Block structure vs. Solitaire buildings



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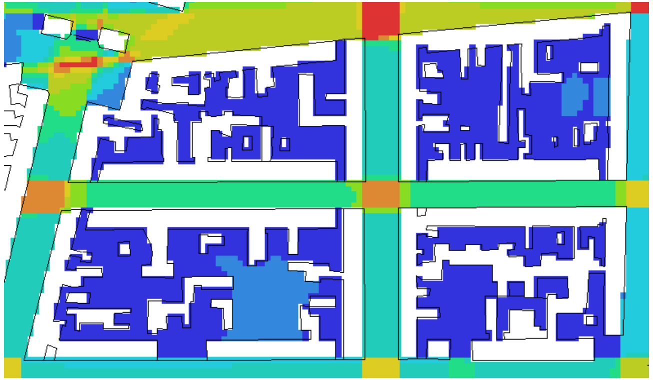
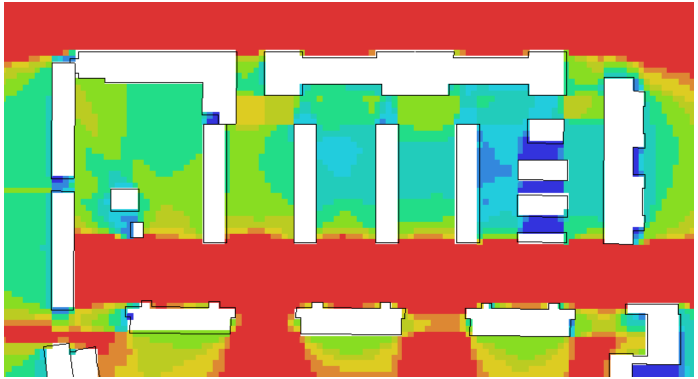
Block structure vs. Solitaire buildings

Isovist Area



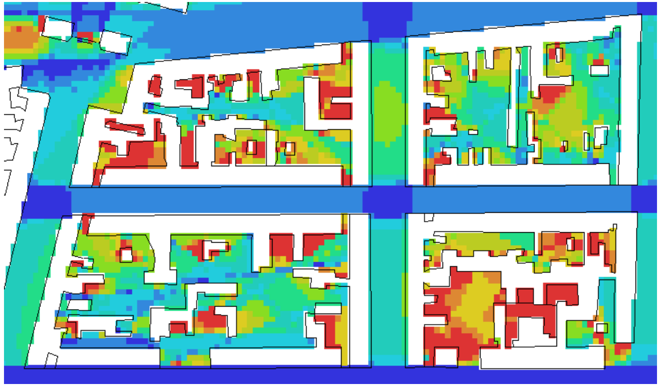
Average Area = 3381



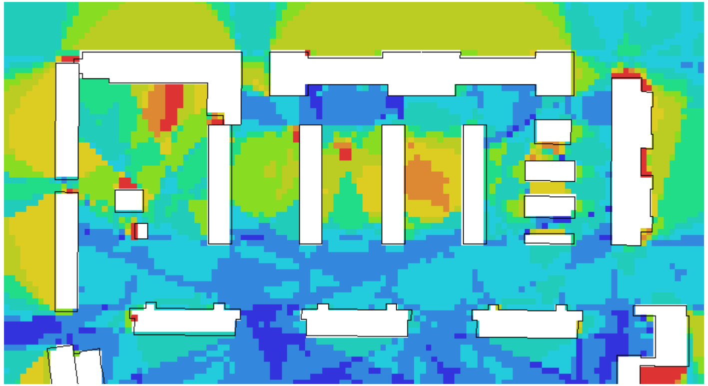
Average Area = 11174

Block structure vs. Solitaire buildings

Isovist Compactness



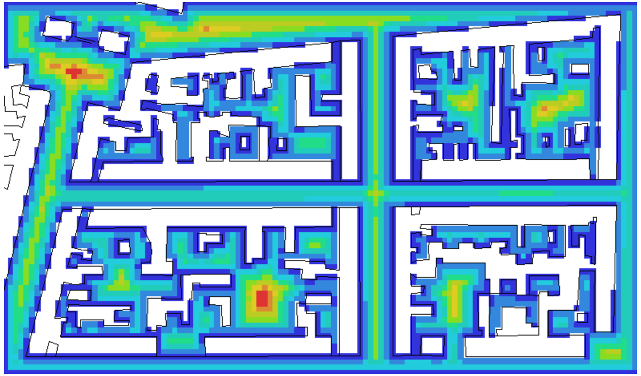
Average Compactness = 0.192



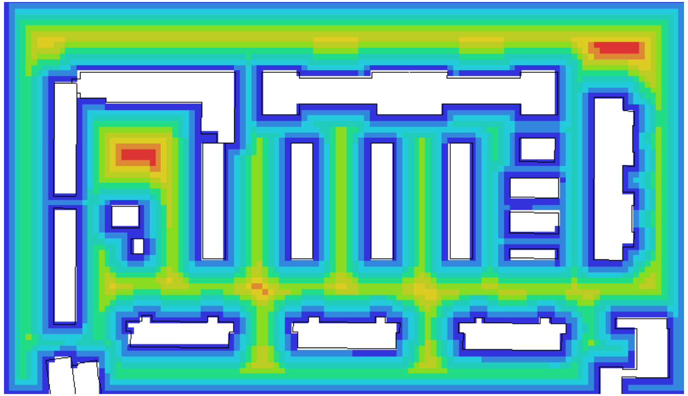
Average Compactness = 0.186

Block structure vs. Solitaire buildings

Isovist MinRadial



Average minRadial = 3.95



Average MinRadial = 8.37

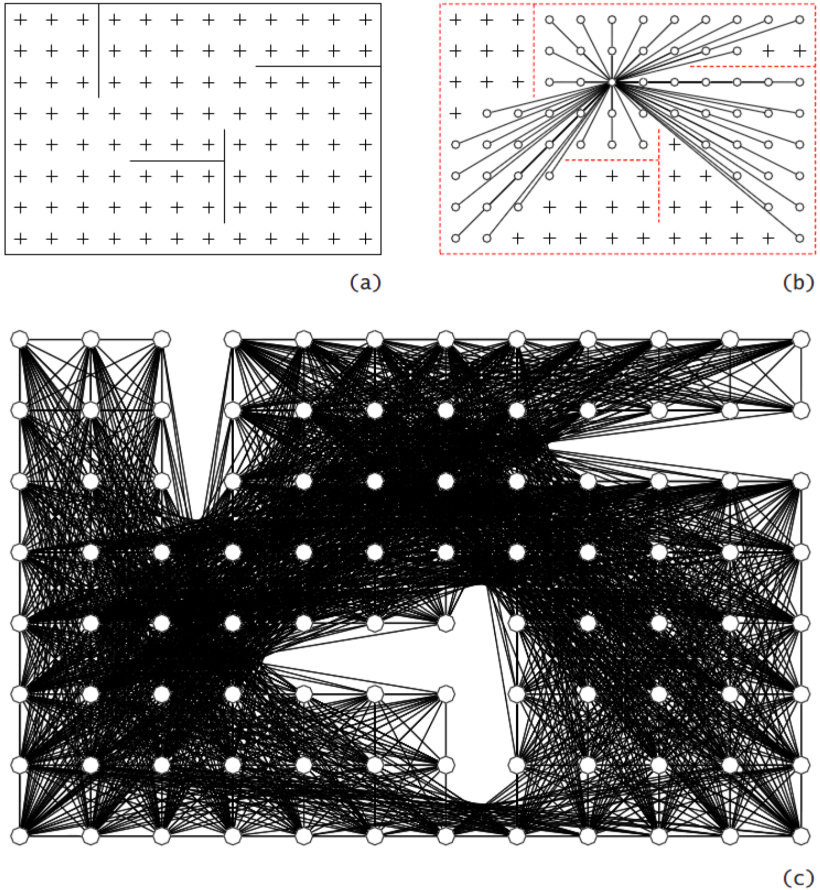
Visibility Graph

is a graph of mutually visible points in space

In mathematical terms, a graph consists of two sets: the set of the vertices in the Graph and the set of edge connections joining pairs of vertices.

The graph edges are undirected (that is, if v1 can see v2 , then v2 can see v1).

(see Turner et al, 2001)



Schematic plan and visibility graph (from: Krämer & Kunze, 2005)

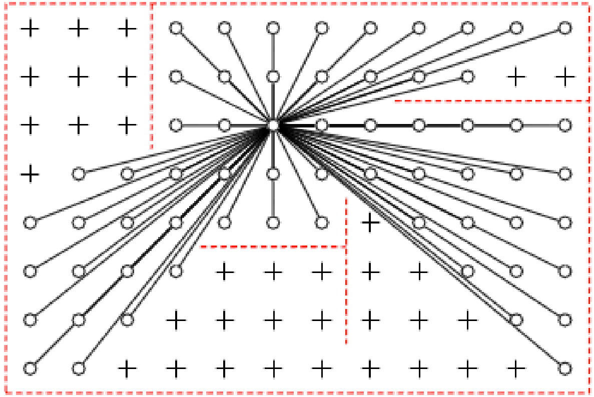
Visibility Graph - Measures

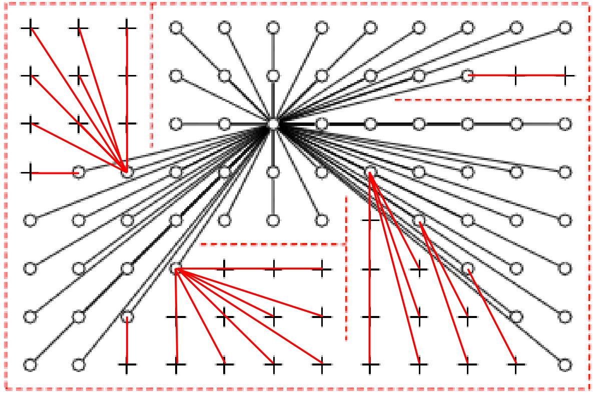
Connectivity

Defines how many points in a spaces are connected with a considered point (corresponds to Area of a Isovist)

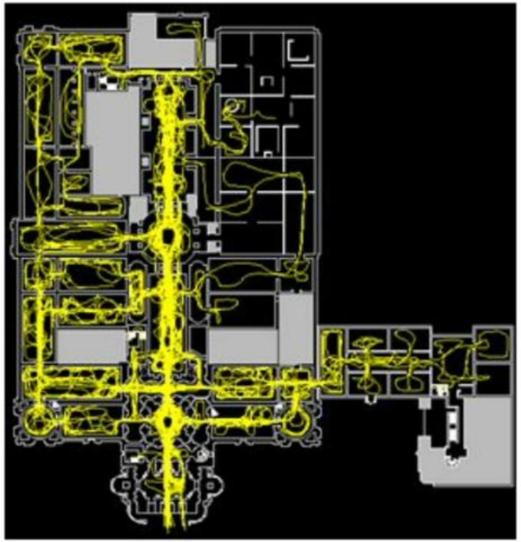
Integration

Defines the average visual distance of a considered point to all other points.

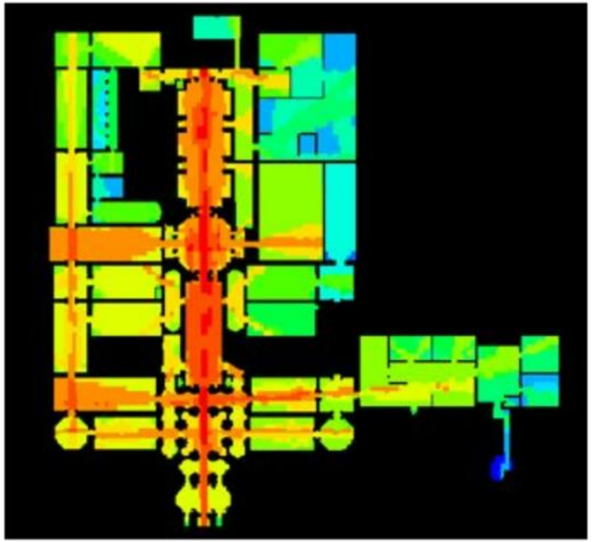




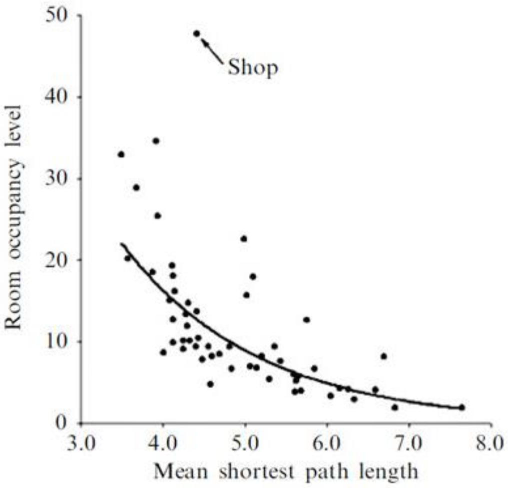
Correlation between Integration and movement flow (Tate Gallery)



Visitor Paths



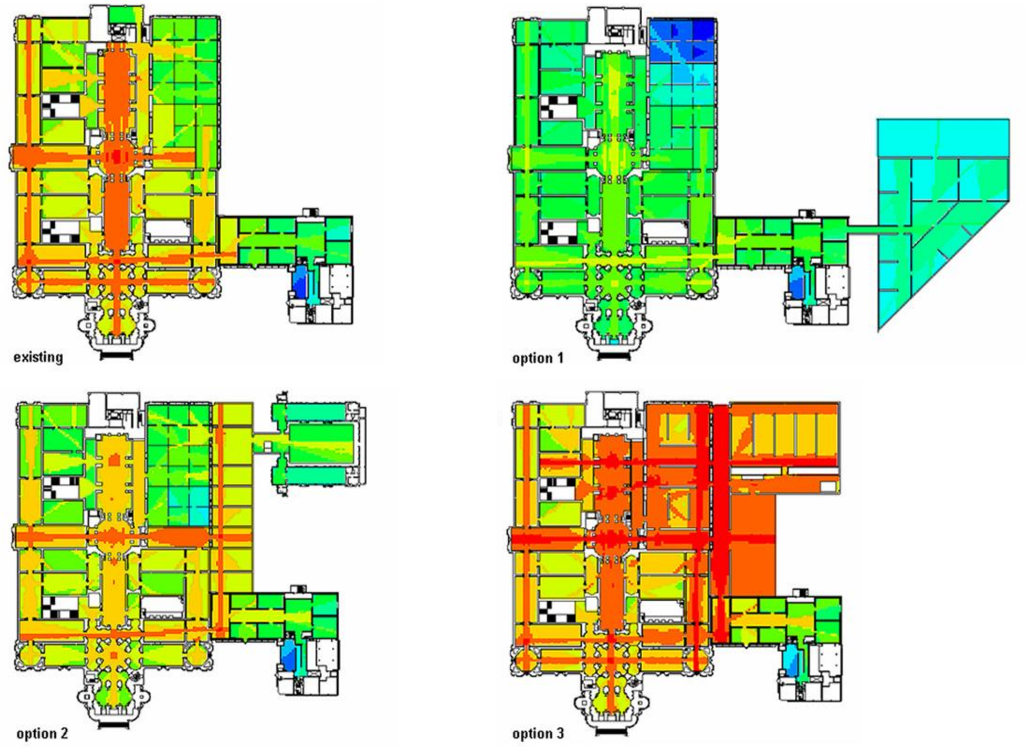
Visibility Graph (Integration)



Correlation diagram between visitor pathes and Depth

Taken from: http://www.slideboom.com/presentations/293659/Intro-to-Space-Syntax_Day-1

Comparing design options



Comparing different design variants according to integration (Dursun 2007)

Excersise 03:
Segment Analysis (Choice) and Isovist Analysis

- Continue working with the street network you already have or choose your own neighbourhood you know. Measure and try to identify local centres within selected parts of a network (using the Choice component from Decoding Spaces components). Try to intrepret the results, compare it with your own exeriences.

- Choose the neighbourhood you know, bring a couple of photographs of your prefered space in the city (from a pedestrian's point of view).

- Make the Isovist and Isovist Field analysis of your choosen neighbourhood (using Decoding Spaces Components) and intrepret the results. Compare them with the photographs.

Choice measurement (Local) using radial analysis

- **Choice** measures movement flows through spaces. Spaces that record high global choice are located on the **shortest paths** from all origins to all destinations. Choice is a powerful measure at forecasting pedestrian and vehicular movement potentials.

It literally shows how often a street happens to be on an shortest path between an origin and a destination.

Links & Literature

Introduction to Space Syntax (Stonor, 2010)

http://www.slideboom.com/presentations/293659/Intro-to-Space-Syntax_Day-1

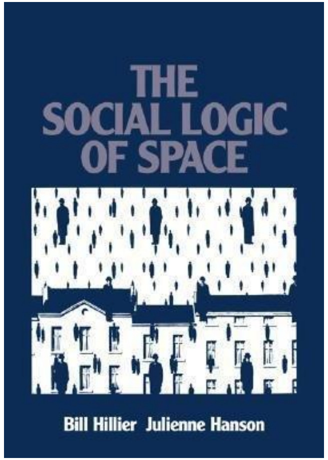
The Social Logic of Space (Hillier & Hanson, 1984)

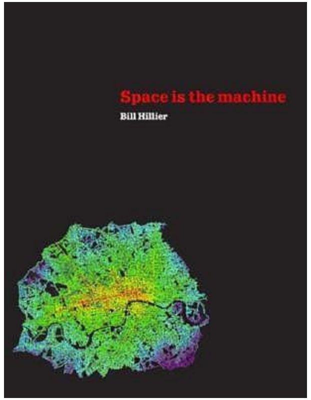
Space is the machine (Hillier, 1996)

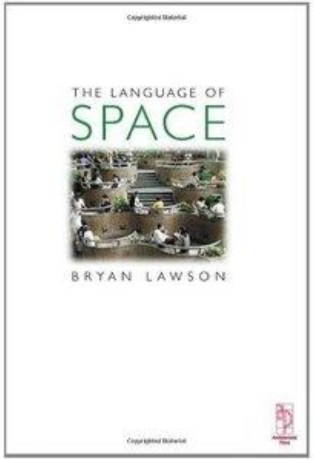
Space Matters (Rose et al, 2008)
In: ARCH+ 189

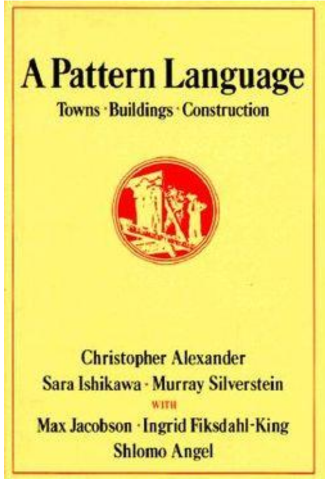
Further Literature:

The Language of space (Lawson, 2001)
A Pattern Language (Alexander et al, 1979)









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Lee, S., & Choi, J. (n.d.). DESIGN WITH SPACE SYNTAX ANALYSIS BASED Towards an interactive application of building information model in early design process.

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Hillier, B. (1996, 2007), *Space is the machine. A Configurational Theory of Architecture*, Space Syntax, London.

Dettlaff, W., Space Syntax Analysis: Methodology of Understanding the Space, PhD interdisciplinary journal, article

Hillier, B. and L. Vaughan (2007), ‘The City as One Thing’, *Progress in Planning*