Intro to Applications of Spatial Analysis

(Software and Research Methodology)

Review: What is it for?

- What is Spatial Analysis?
  - A means to explore and extract cultural and social implications embedded in spatial configuration
  - Analytical methodologies that examine architectural and urban spaces in a systematic and quantitative manner

- Quantitative / Objective Description of Space!

NOT Objective Descriptions

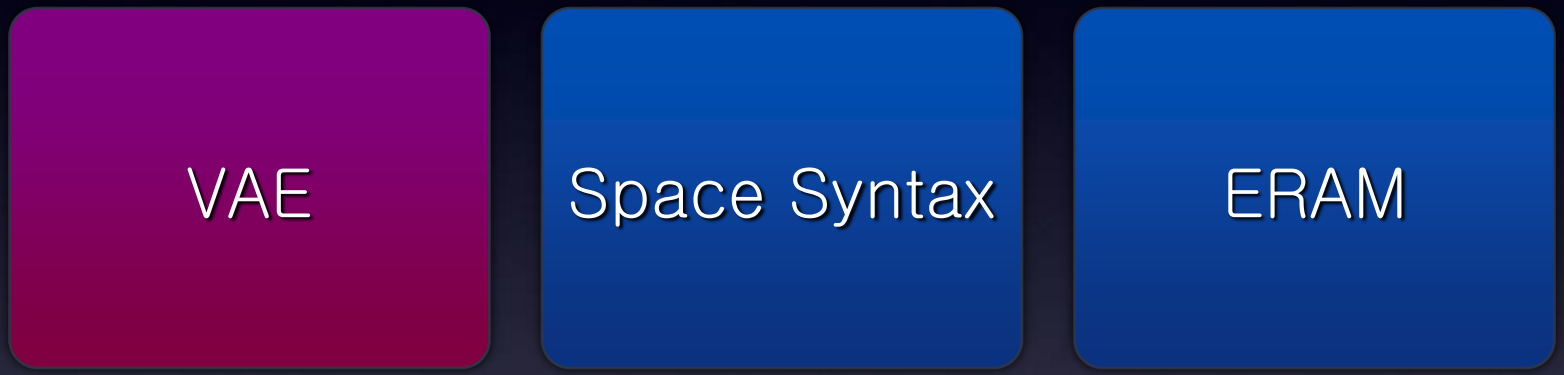
- Overwhelming!
- Remarkable!
- Timeless!
- Awe-Inspiring!
- …

➔ “I don’t think so!”

Objective Description is one that

EVERYONE can Agree on

(Although not on the Interpretation)

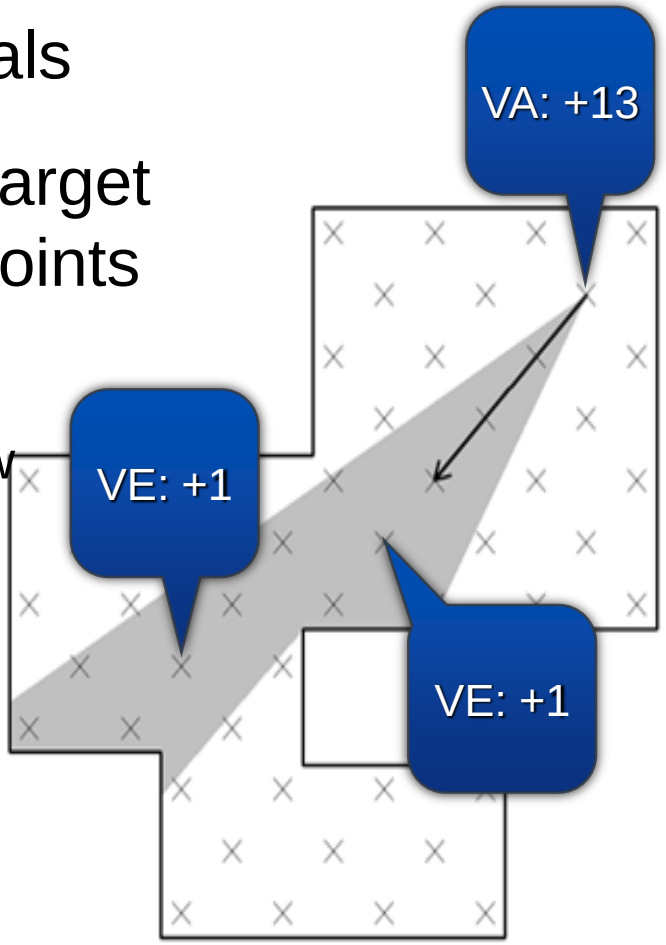

VAE
Space Syntax
ERAM

Visual Access & Exposure

Quantitative/Objective Description of Visual Encounter

VAE Model: Steps

- STEP1: Set a grid at fixed intervals
- STEP2: For a certain viewpoint-target point pair, count the number of points in the field of view
  - VP gets 1 VA for every point in the view
  - Each points in the view gets 1 VE for that VP-TP pair
- STEP3: Repeat Step2 for every possible VP-TP pair

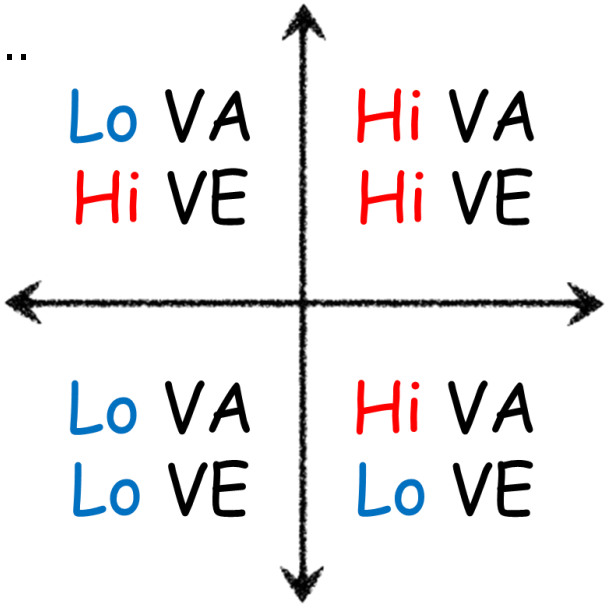


VAE Model: The Table

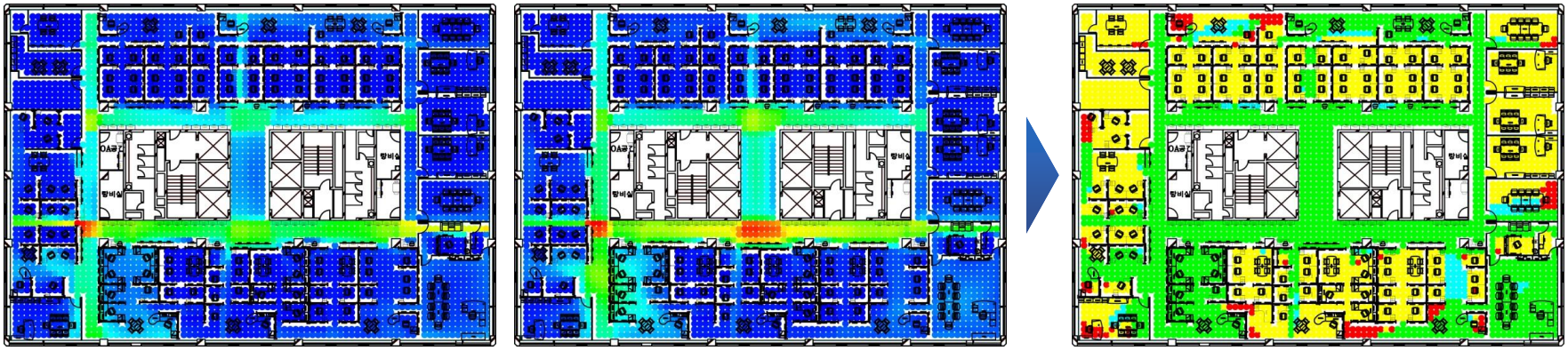
	Point 1	Point 2	Point 3	Point 4	...
VA	271	478	45	56	...
VE	32	311	59	354	...

VAE Model: Optional Step

- STEP4: Quadrant Analysis (Optional)
  - Hi VA-Hi VE: Lots of visual communication!
  - Lo VA-Hi VE: Feels like being watched...
  - Lo VA-Lo VE: For the shy people
  - Hi VA-Lo VE: Do whatever I want (no one will notice)
- But you don't have to agree with this interpretation

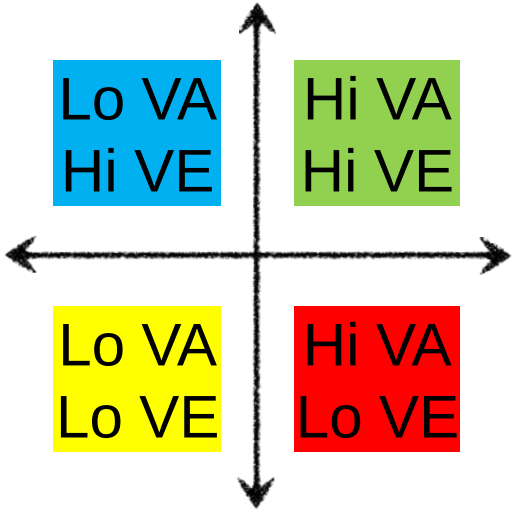


VAE Model: Example



VA VE Quadrant

- Green Hi VA-Hi VE
- Cyan Lo VA-Hi VE
- Yellow Lo VA-Lo VE
- Red Hi VA-Lo VE



SaVisibilityUtd

A tool for spatial analysis, implementing:

Isovist, Directed Isovist, VAE, Layered VAE, Directed VAE, VGA, Visibility ERAM, Evacuation Cost Evaluation Method, Angular & Cellular VGA.

Download it from http://ladonara.blogspot.kr

How to Install

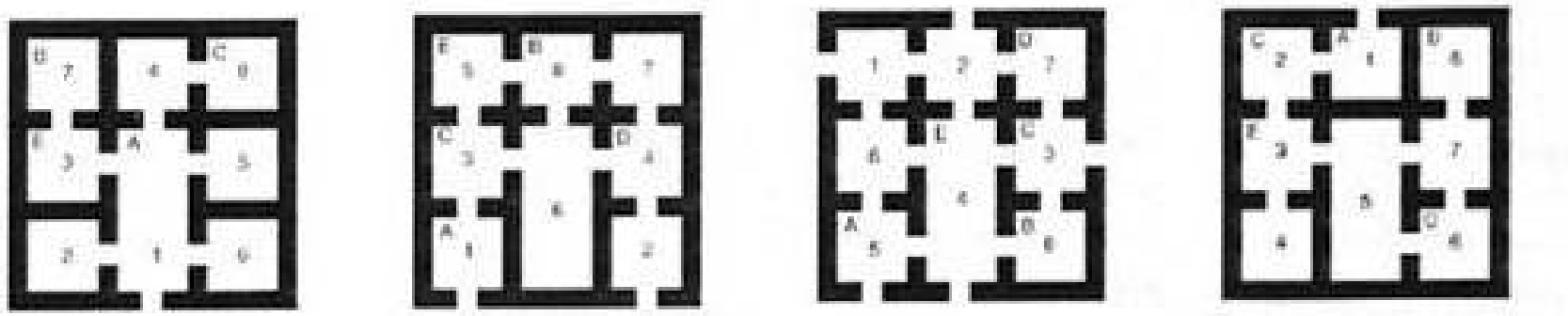
- Install AutoCAD 2016
- Extract ‘SaVisibilityUtd_v1.zip’ to any folder
- *(Copy files from ‘Icon’ folder to the parent folder)*
- Open ‘x64’ or ‘x86’ folder, according to your Windows version
- Run AutoCAD and drag-and-drop ‘SaVAE20.arx’ file into AutoCAD window

How to Use

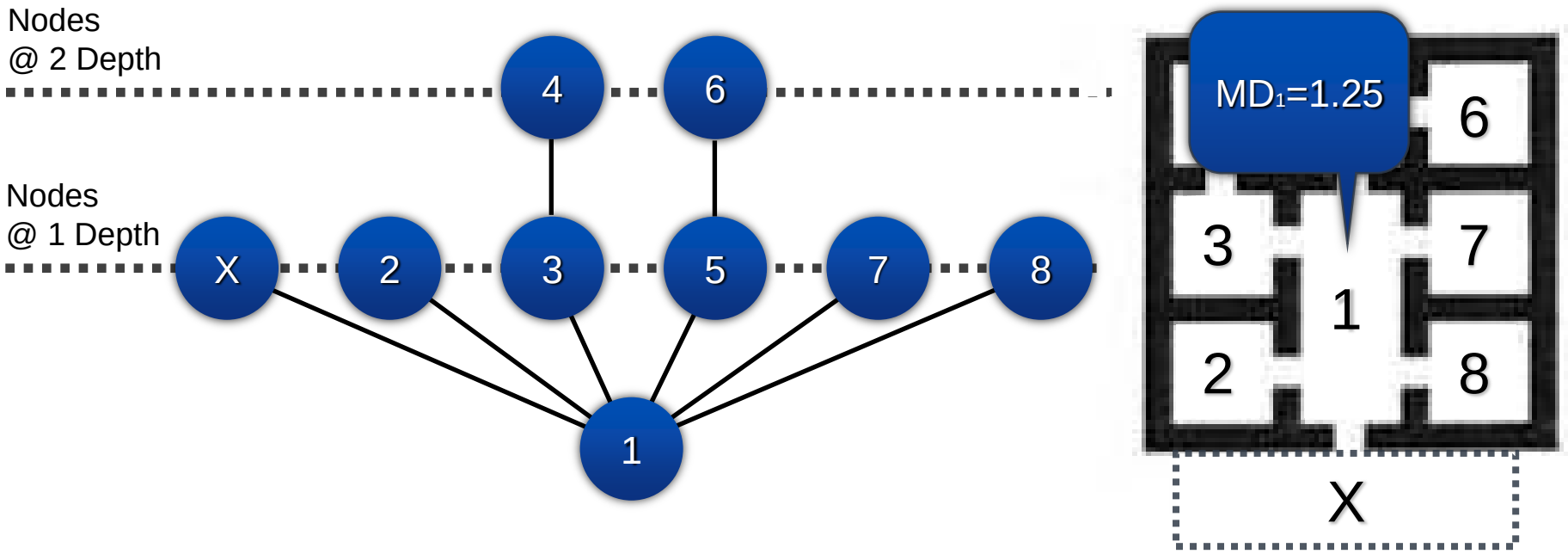
- ‘Initialize’ to start
- Draw barrier lines on ‘SA_VBarrier’ layer; LINES only
- ‘Array Points’ to create vantage points
  - You can ‘delete points’ without disturbing barrier lines.
- ‘VAE…’ VAE to Run VAE Analysis
  - Use default settings for original VAE
- ‘Generate Result…’ to see the result
- ‘Export Result…’ to get the numbers; *(Set the format to CSV)*
  - Use SA_SPID layer to associate the points with their location

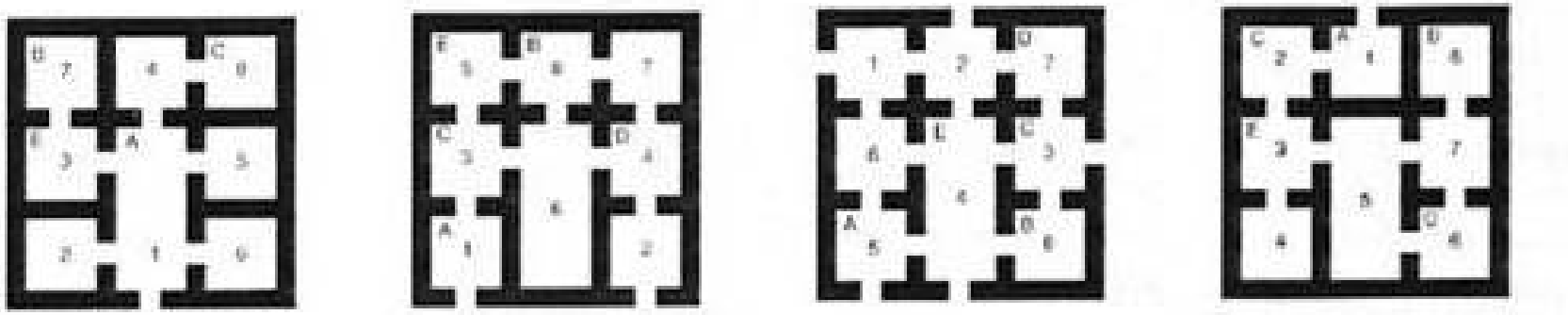

VAE
Space Syntax
ERAM

Mean Depth



- Same composition (Main hall + 7 small rooms)
- Different connections between rooms
- Therefore, different centrality


Nodes
@ 2 Depth
Nodes
@ 1 Depth
4
6
X
2
3
5
7
8
1
MD1=1.25
6
3
7
1
2
8
X



A: 1.25 B: 1.75 C: 1.25 D: 2.00

- Mean depth of main rooms
- Main Rooms of Plans A & C have the greatest centrality

Lower MD = Greater Centrality

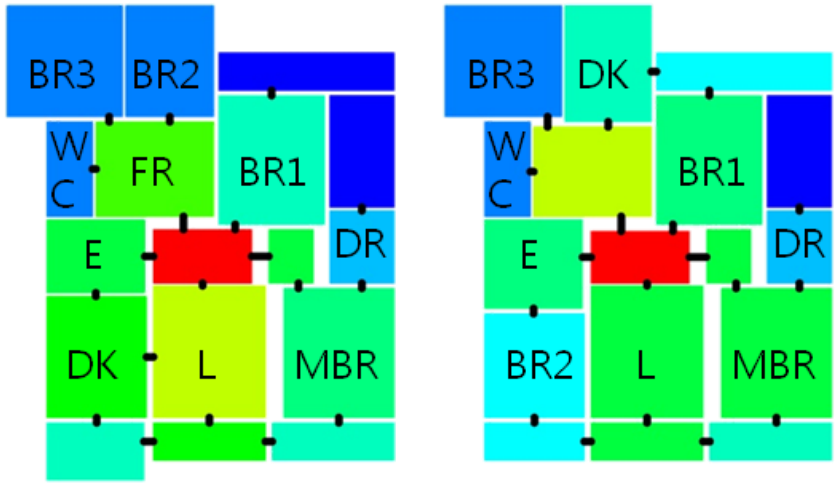
But what does that means?
How do we interpret it?

Application Example

- Operational Definition: Greater Centrality(Lower MD) means ‘Public’ and Lesser Centrality means ‘Private’
- Two Different Extension Plans: Plan 53A being the popular one
- Maybe because 53A better reflects the ideals of public/private?

Application Example

- Integration (Modified Index of MD)
  - Lower MD = Greater Integration
  - Greater Integration = Greater Centrality (= Public)
- Public Rooms are more Public
  Private Rooms are more Private

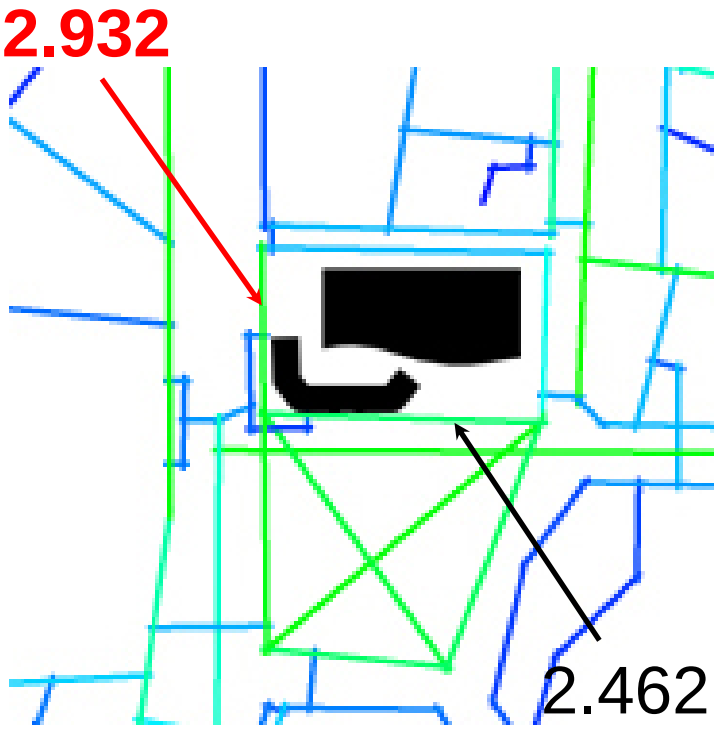


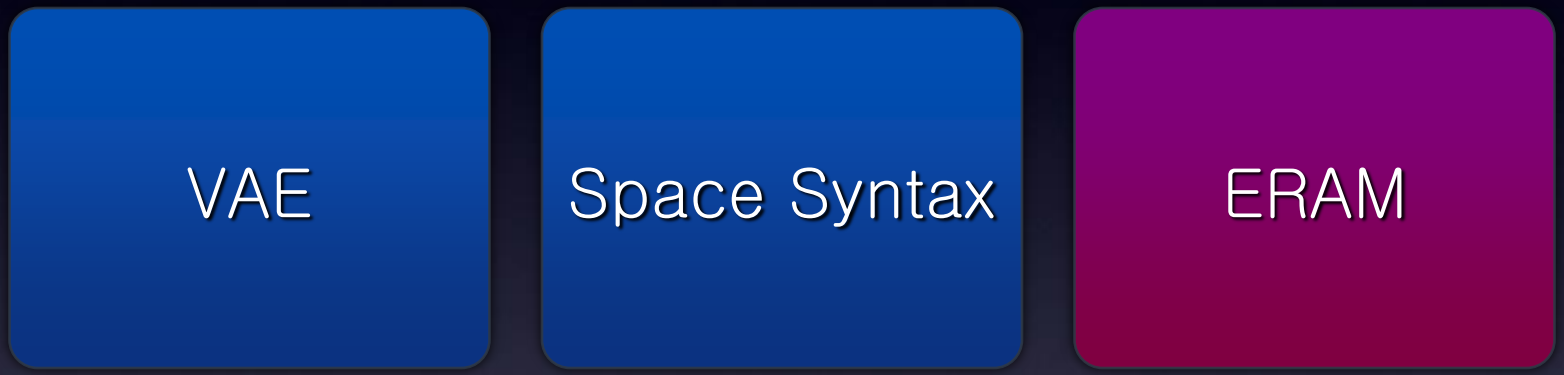
	Plan 53A	Plan 53B
Entrance	1.084	1.084
Corridor	1.829	1.829
Living Room	1.273	1.171
Dining/Kitchen	0.861	0.813
Master Bedroom	1.045	1.045
Bedroom 1	1.009	1.045
Bedroom 2	0.732	0.813
Bedroom 3	0.732	0.751
Public WC	0.732	0.751
Master WC	0.523	0.523
Dress Room	0.714	0.714
SW Balcony	0.751	0.751
Living Balcony	1.045	1.045
MBR Balcony	0.836	0.836
Rear Balcony	0.665	0.770

Application Example

- Operational Definition:
  Greater Integration = Greater Centrality = More People

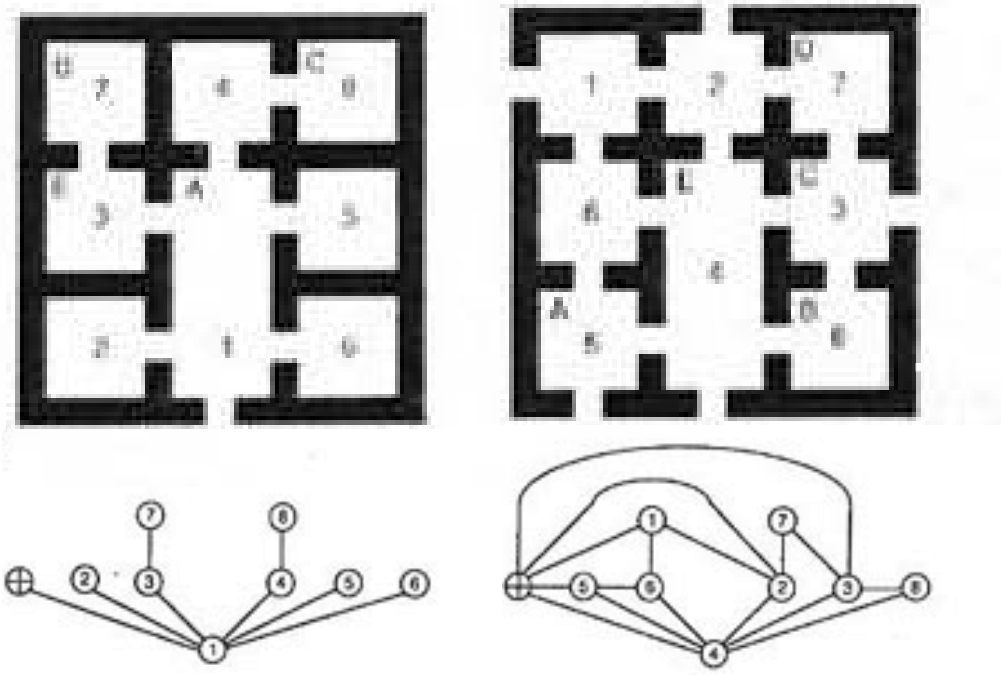
http://blog.seoul.go.kr/3827




VAE
Space Syntax
ERAM

The Problem

- Main Rooms have Identical MD
  - Therefore, same level of Centrality (and maybe Publicness)
- But Really?
  - What about the connections between the other rooms?

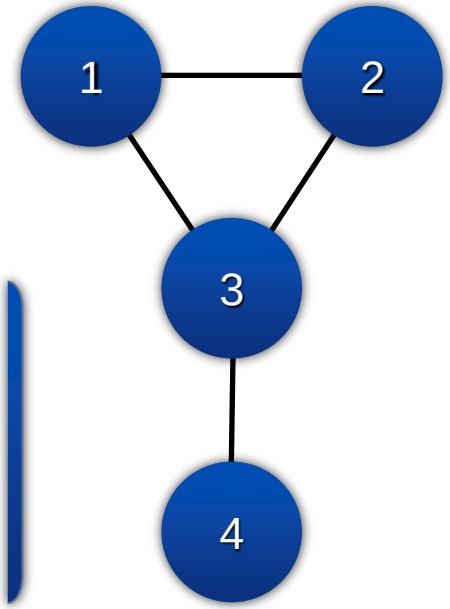


ERAM: Eigenvector Ratio of Adjacency Matrix

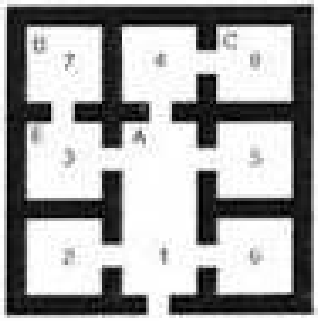
- By JP Choi and LAUS
- Eigenvector Centrality measures ‘Influence’ (NOT Mean Depth)
- Considers all possible routes (Not just the shortest path)

	1	2	3	4
1	1	1	1	0
2	1	1	1	0
3	1	1	1	1
4	0	0	1	1

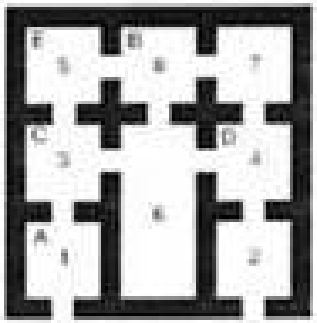
	1	2	3	4
1	.2696	.2696	.3154	.1454
2	.2696	.2696	.3154	.1454
3	.2696	.2696	.3154	.1454
4	.2696	.2696	.3154	.1454



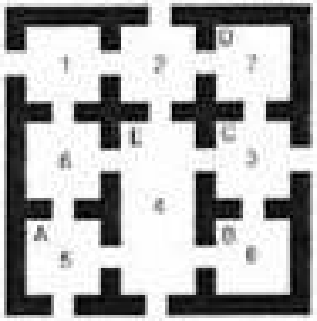
The Four Plans: for One Last Time



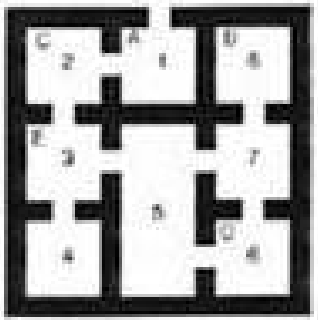
A: 2.137



B: 1.448



C: 1.293



D: 1.918

- ‘Influence’ of Main Rooms (Modified)
- Main Room of Plan C has the greatest Integration, too, but is just ‘one of many’ rooms to visit
- Main Room of Plan D is too ‘deep’ from other rooms, but still plays central role in overall configuration

S3 Analyzer

The Software for Space Syntax & ERAM Analysis

Download it from http://laus.snu.ac.kr