

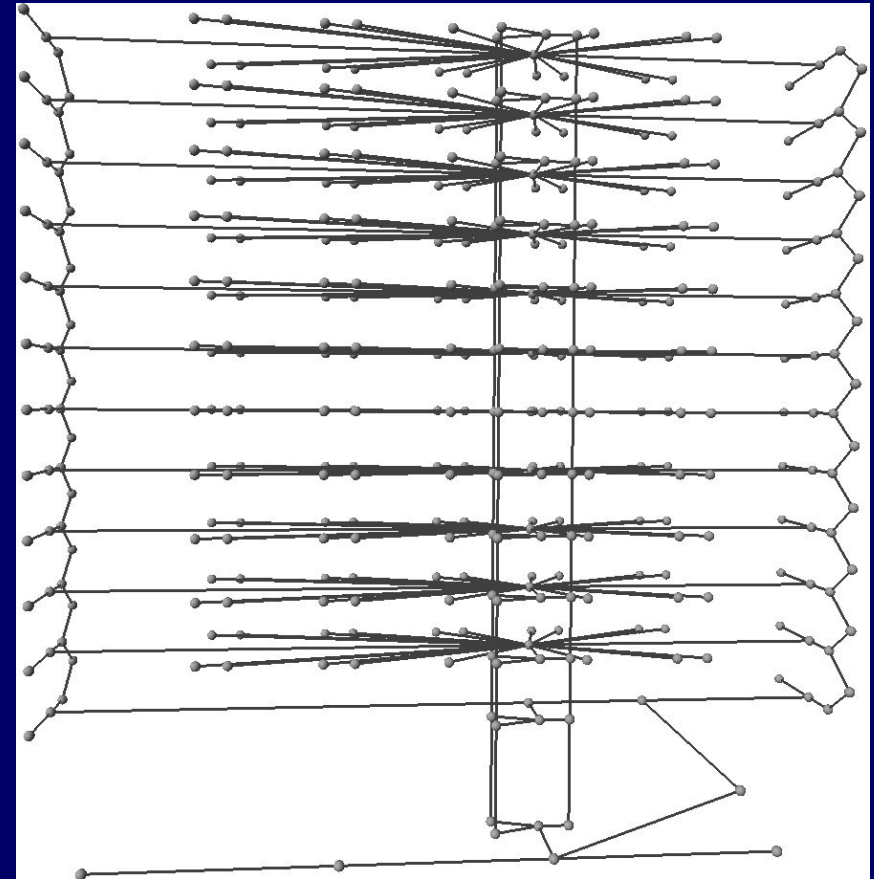
3D Geo-information indoors: Structuring for evacuation

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3D Geo-information indoors: Structuring for evacuation

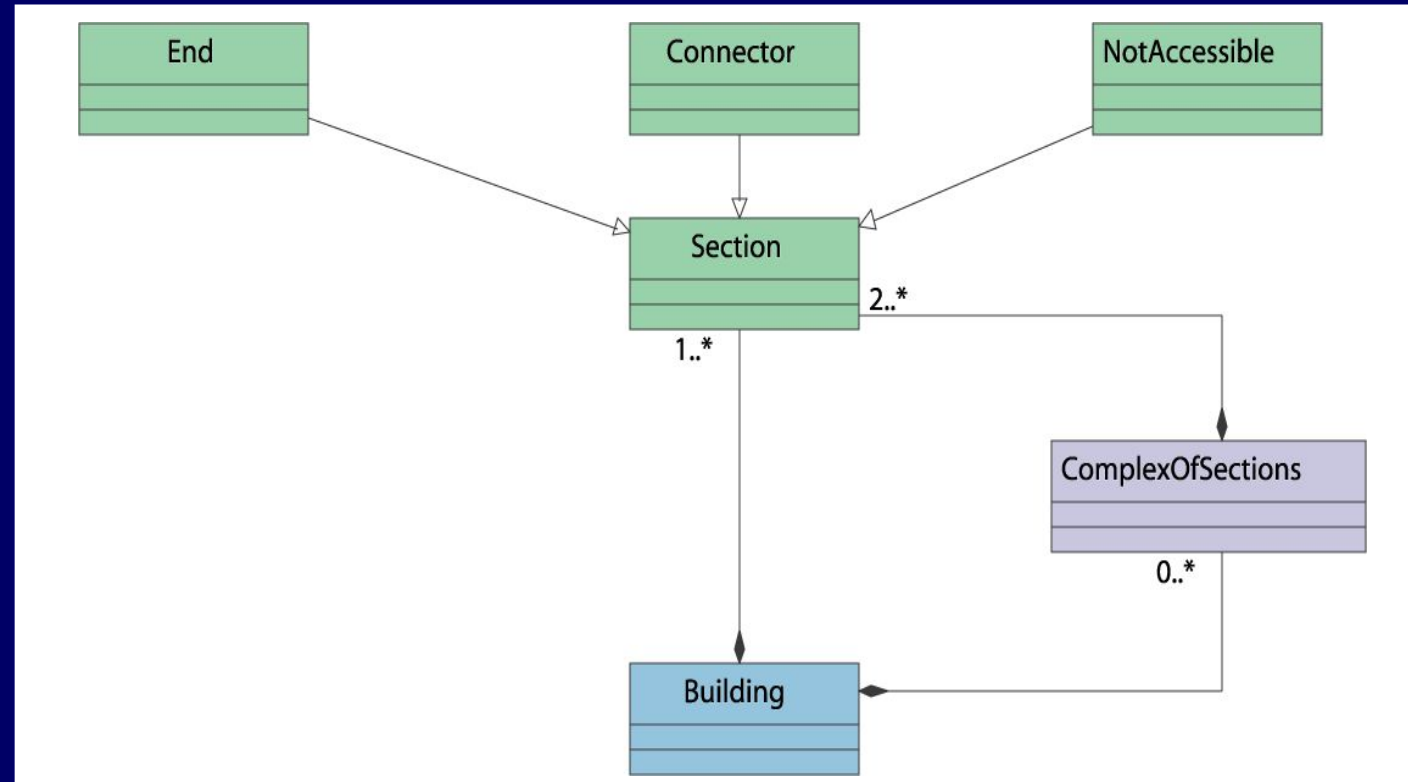


The research

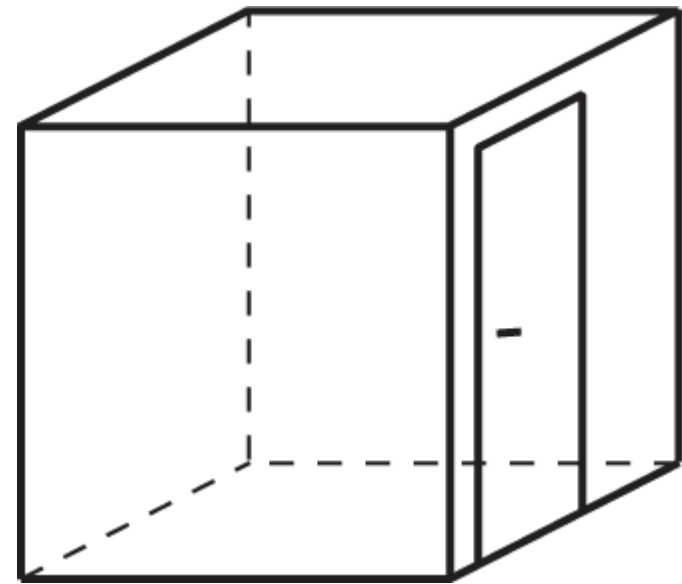
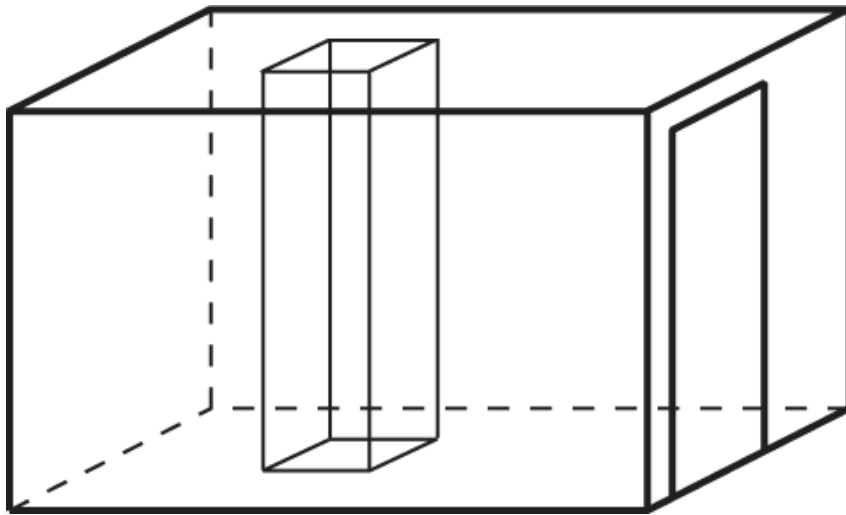
- Space Partitioning Concept (SPC)
 - 2 levels: section (3d) & polygon (2d in 3d)
- Mapping to a graph structure
 - Some methods
- Storing model in a Geo-DBMS

SPC: Section Level

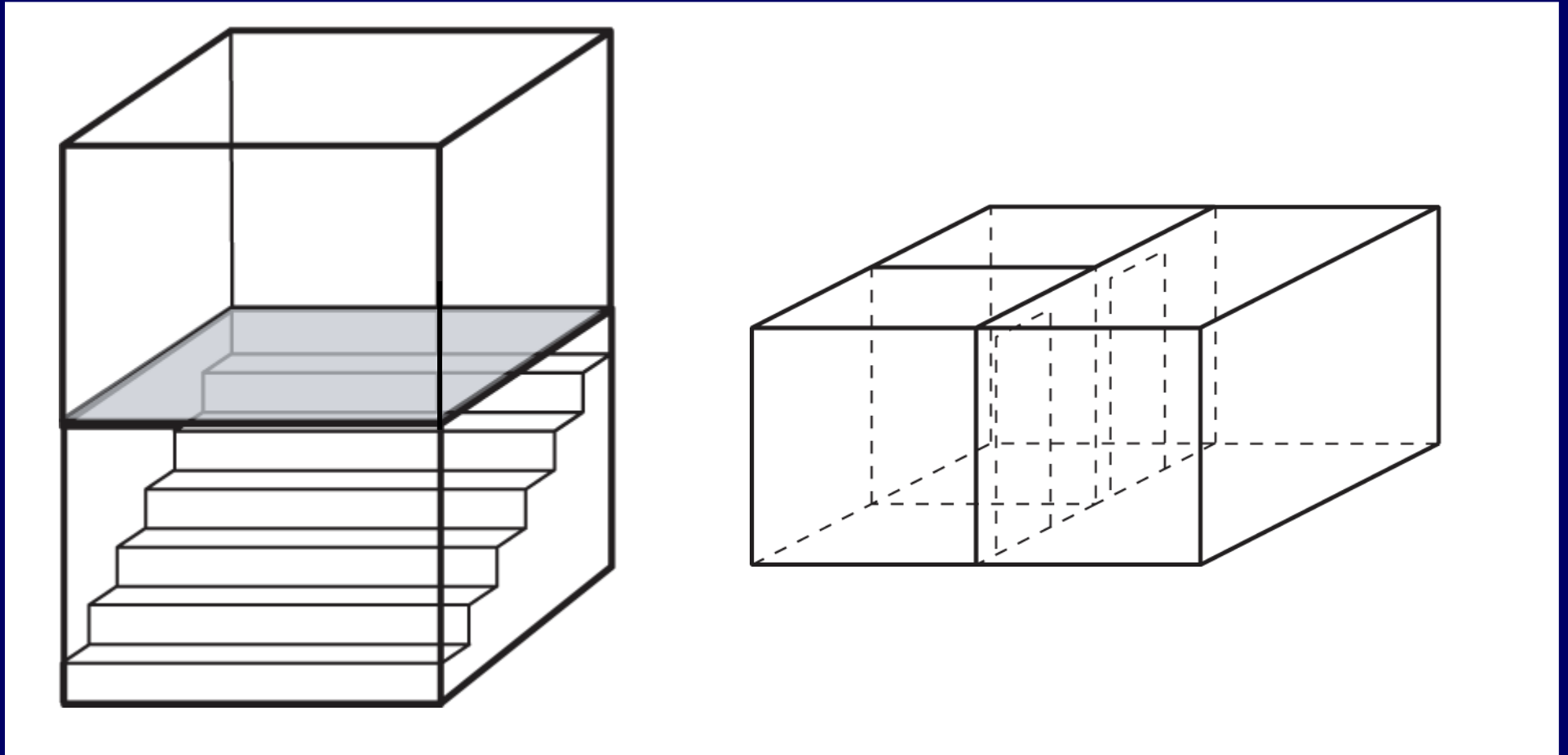
- End
- Connector
- Not Accessible



Not Accessible & End Section

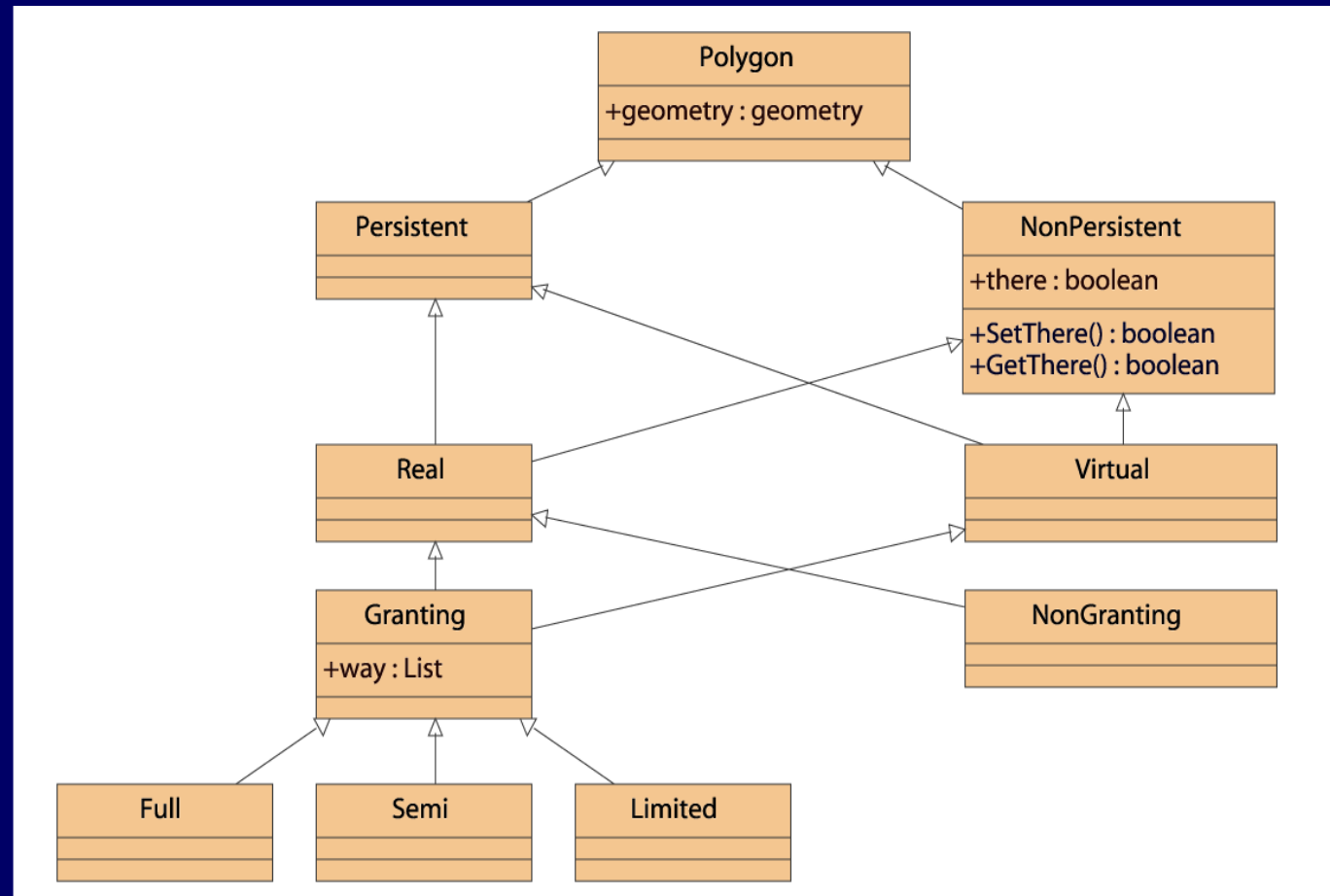


Connector sections

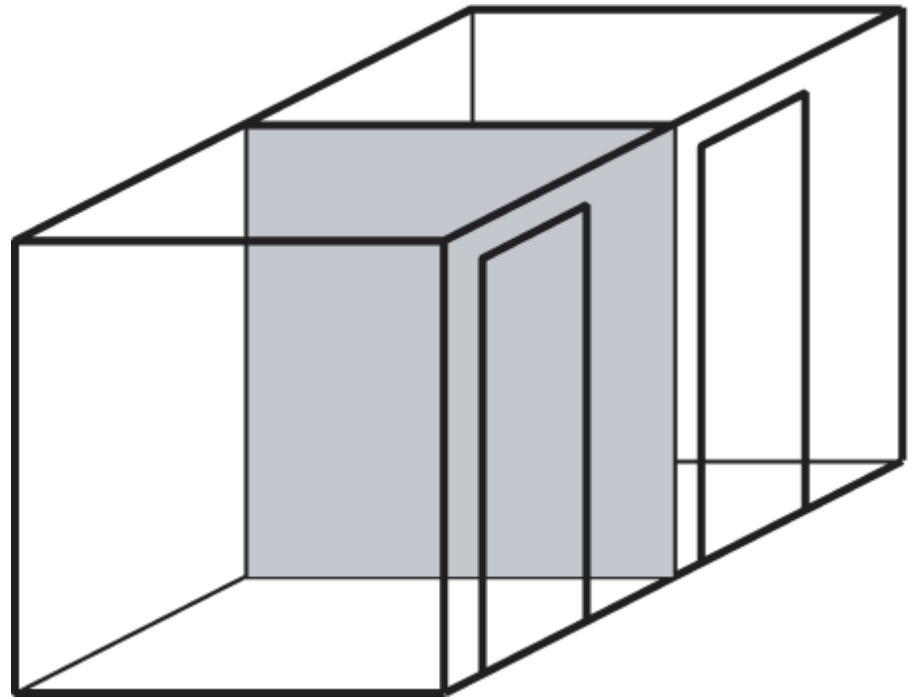


SPC: Polygon Level

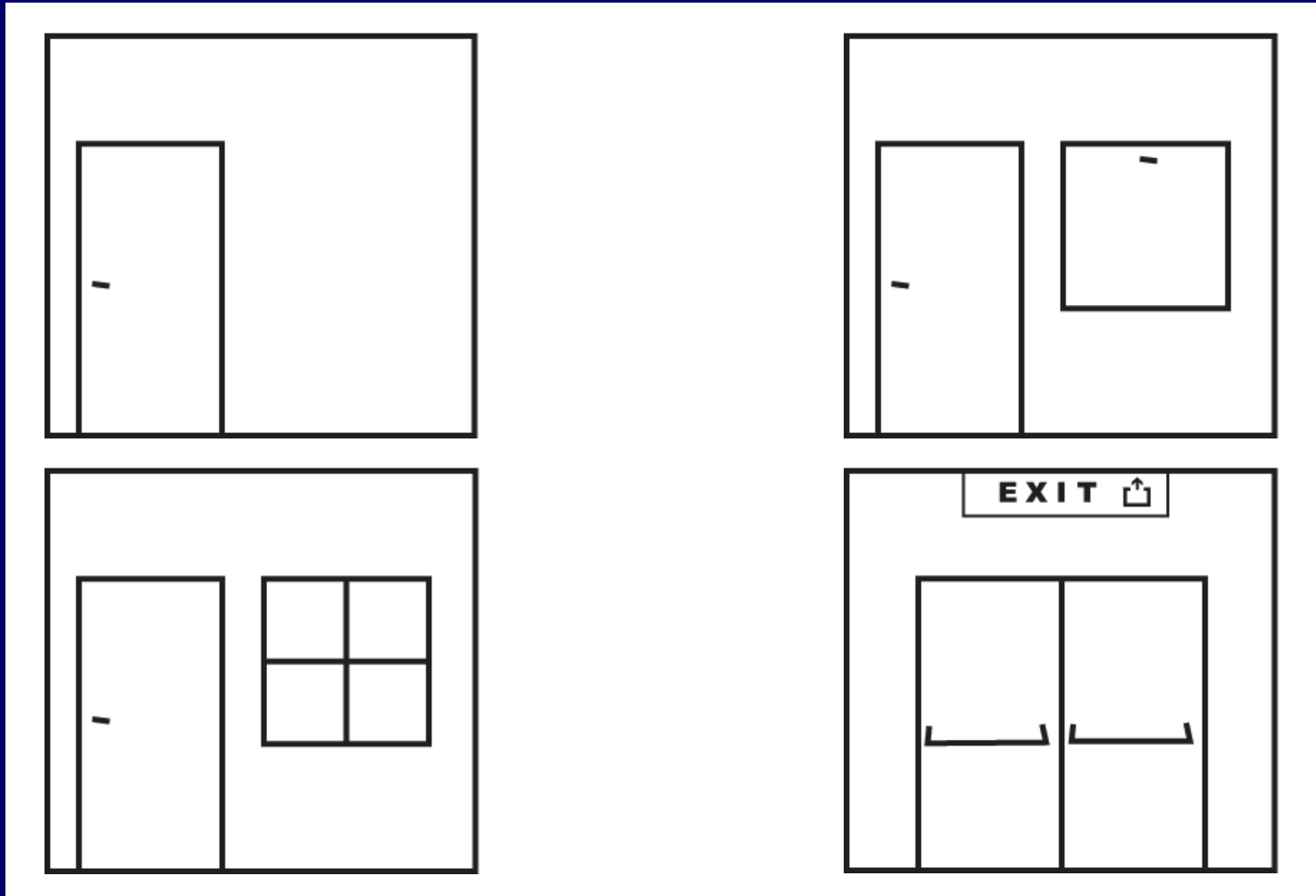
- Persistence
- Existence
- Access-granting
- Types of passing



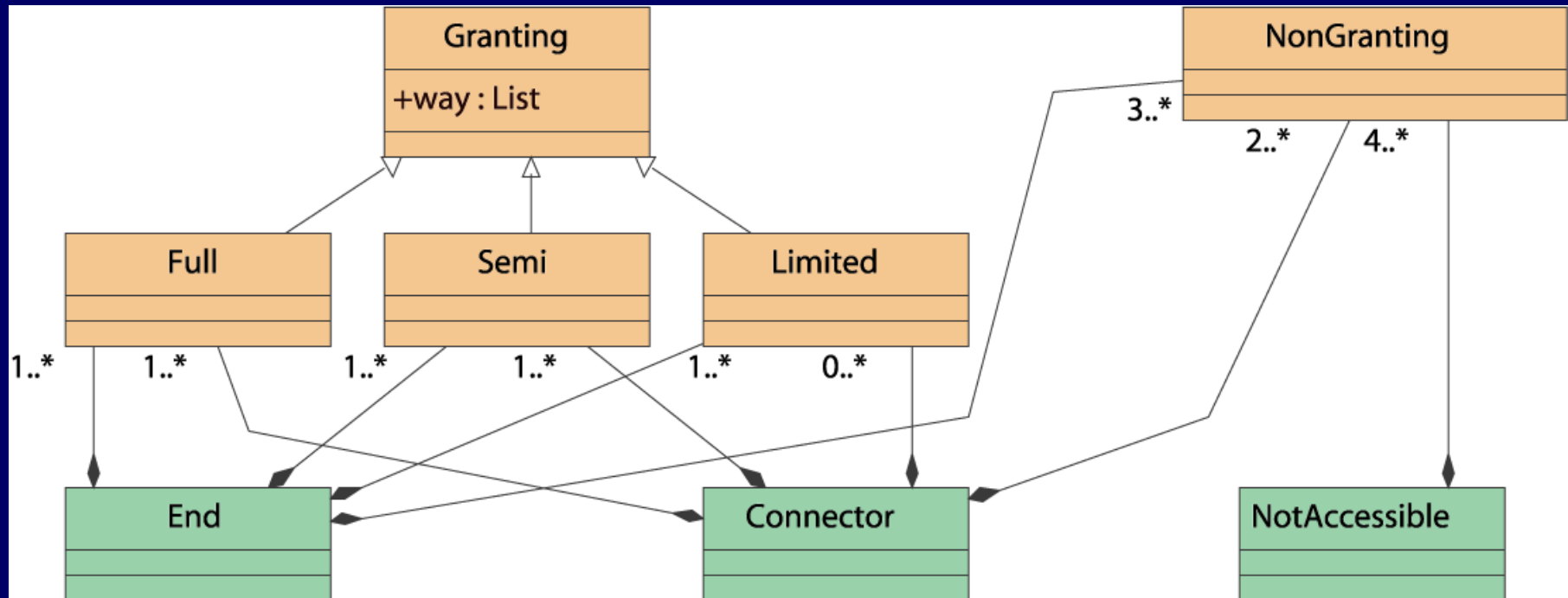
Persistence



Existence, access granting & type of passing



SPC: Section & polygon level combined



Space Partitioning Concept & Calculation of evacuation routes

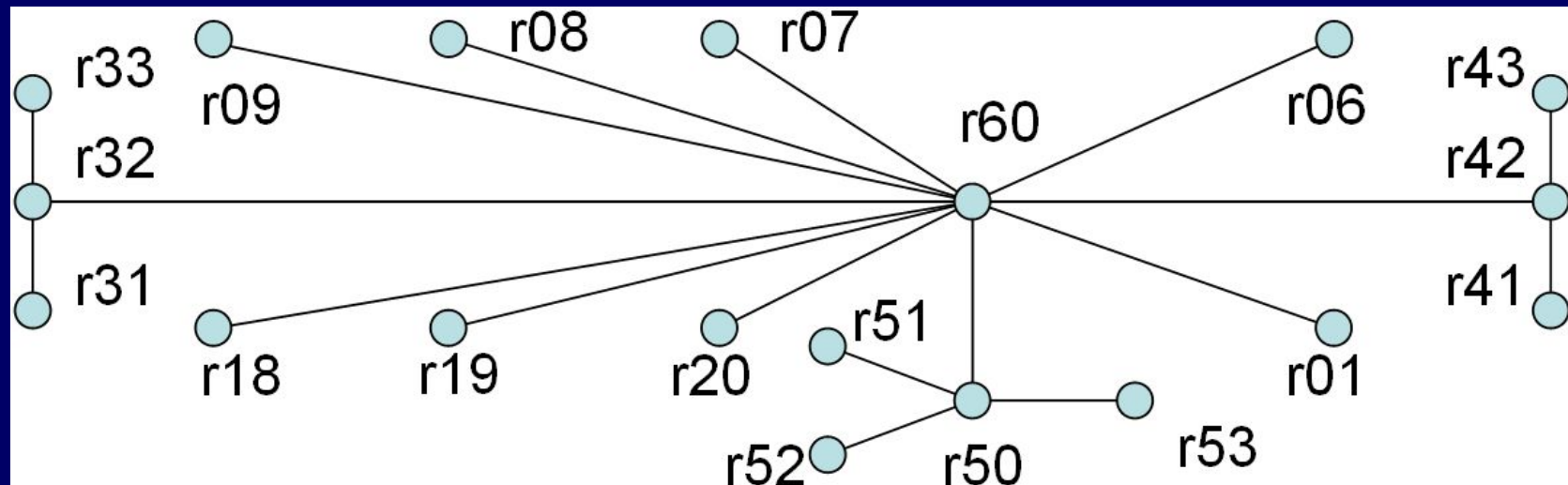
- SPC alone is not enough
- Mapping to a graph, i.e. network model

Mapping to a graph structure (1)

- Granting polygons to an edge
+
- 1 node per (end/connector) section (not suitable) or
- 1 node for end section & graph for connector section
 - Derive graph for connector section? 4 methods [...]

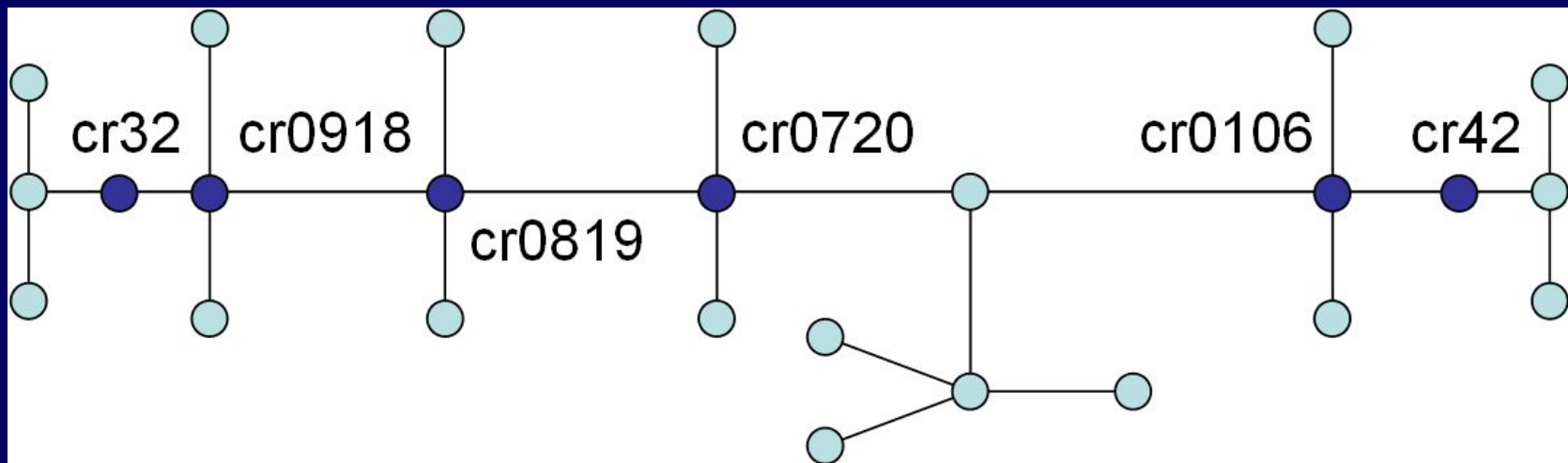
Mapping to a graph structure (2)

- 1 node per end/connector section:



Mapping to a graph structure (3)

- Connector section also as graph:



How to calculate this graph in a connector section?

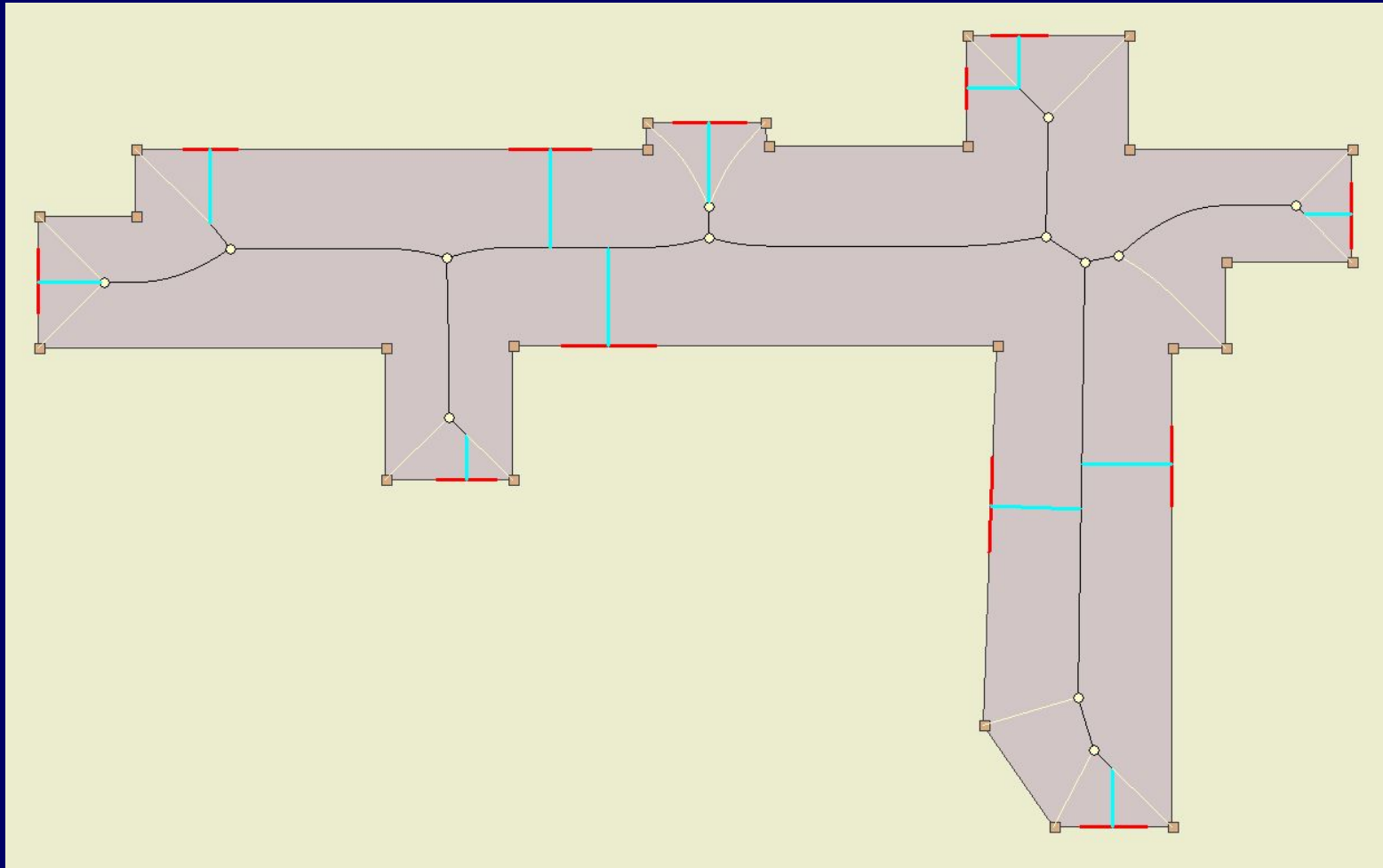
- 4 algorithms:
 - Adjusting line
 - Convex hull
 - Euclidean Minimum Spanning Tree
 - Medial axis

Medial Axis

- Medial axis = set of all centers of circles, which:
 - i. touch the polygon in at least two points
 - ii. are completely contained inside the polygon
- Project 'step into the corridor' points on medial axis

- Advantage is that it works on:
 - concave shaped connector sections
 - sections with columns inside

Medial Axis Example



From SPC / Network to integral system

- Manage SPC
- Manage Network

- Manage both in a Geo-DBMS

Geo-DBMS for storage

- Semantic model into DBMS (Oracle Spatial)
 - 10 tables, relationally modeled
- Graph: work in progress
 - Oracle Spatial 10g its network model
 - Network stored in separate tables
 - 4 tables: node, link, [path node], [path link]
 - Connection between semantic model & network model
 - Visualization

Findings

- Major benefit: automatic graph creation
- Computation of shortest path
- Geometry of polygons can be used for 3D visualization

Future work

I. Semantic model:

- Granting polygons
- Complex-of-Sections (i.e. floors, also elevator shafts)

II. Graph calculation:

- Feasibility of computing evacuation routes by graph theory algorithms

III. Geo-DBMS:

- Test network model
- Procedures for automatic graph creation