Vector representation of spatial models

Vector representation of spatial models, **types of modeling**

2 Topic Modeling Approaches :

1. Modeling using layers (coverage) – point, line, surface data:

- A layer contains elements with the same geometry and the same classes
  - Combination of 2 or more layers - allows to create new geoobjects
  - Attribute data is stored separately
  - *Older approach*

Vector representation of spatial models
types of modeling

- **Advantage of the layer principle** :
  - Create thematic hierarchies
  - Acquisition, modification and access can be handled separately for each of the layers
  - Quick search by attribute
- **Disadvantage of the principle of layers** :
  - A more complex approach to the object in terms of more attributes of more classes

Vector representation of spatial models

types of modeling

2. Modeling using objects – *a more modern approach*

- each class – its own geometry, topology
- objects grouped into classes
- hierarchical relationships between objects can be created
- attributes are inherited by derivation for a subclass from an existing class

Vector representation of spatial models

types modeling

Advantages of the object model :

- Hierarchical access to individual objects is possible
- It is easy to define classes
- Independence of individual objects
- Quick search for individual objects

Vector representation of spatial models, **types of data models**

Types of vector data models:

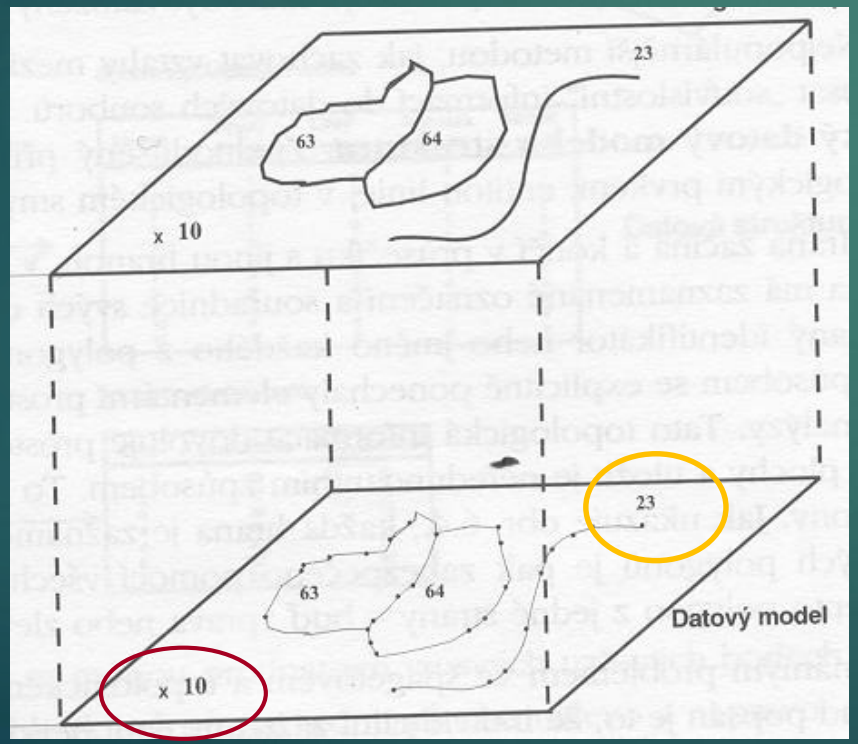
1. **Spaghetti** – spaghetti chain model
2. **Topological** – a model preserving topological purity (intersection of 2 lines – a point that is part of both lines, the common boundary is given twice)
3. **Hierarchical**

Vector representation of spatial models

types of data models - **spaghetti model**

1. Spaghetti model

Model without topology



Datová struktura

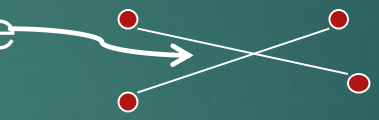
Objekt	Číslo	Poloha
Bod	10	X, Y Jednotlivý bod
Čára	23	$X_1 Y_1, X_2 Y_2 .... X_n Y_n$ Řetězec
Polygon	63	$X_1 Y_1, X_2 Y_2 .... X_1 Y_1$ Uzavřená smyčka
	64	$X_1 Y_1, X_2 Y_2 .... X_1 Y_1$

cannot recognize adjacencies, crossings, …

Vector representation of spatial models

types of data models - **spaghetti model**

there is no
intersection because
no node is inserted



Spaghetti model - not used with exceptions

- Topological relationships are not addressed here
- It is usually the result of vectorization without modifying the topology

Vector representation of spatial models
types of data models - **topological model**

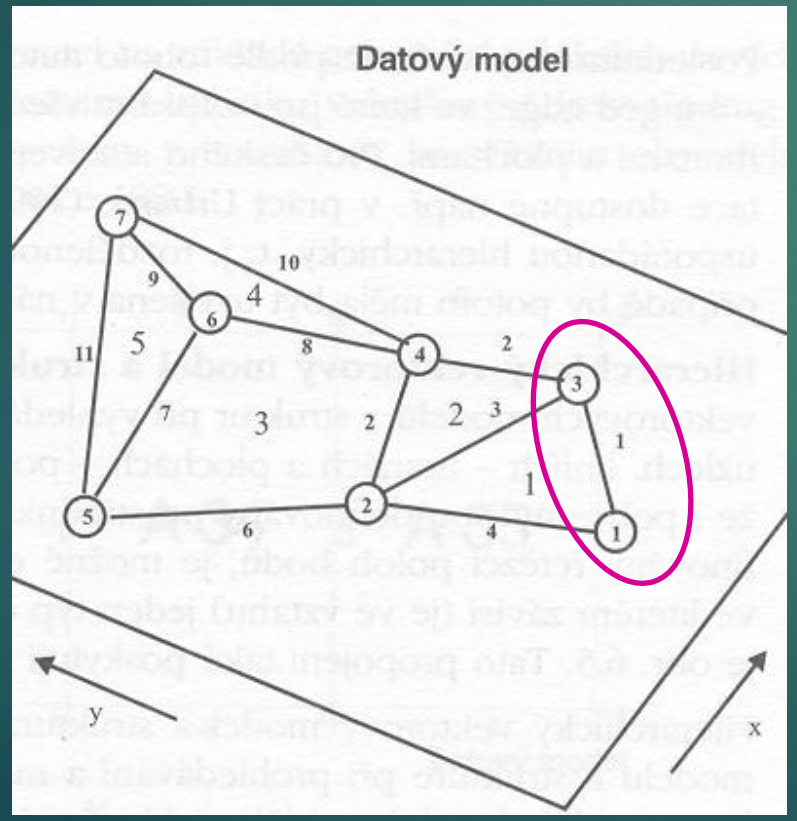
2. Topological model

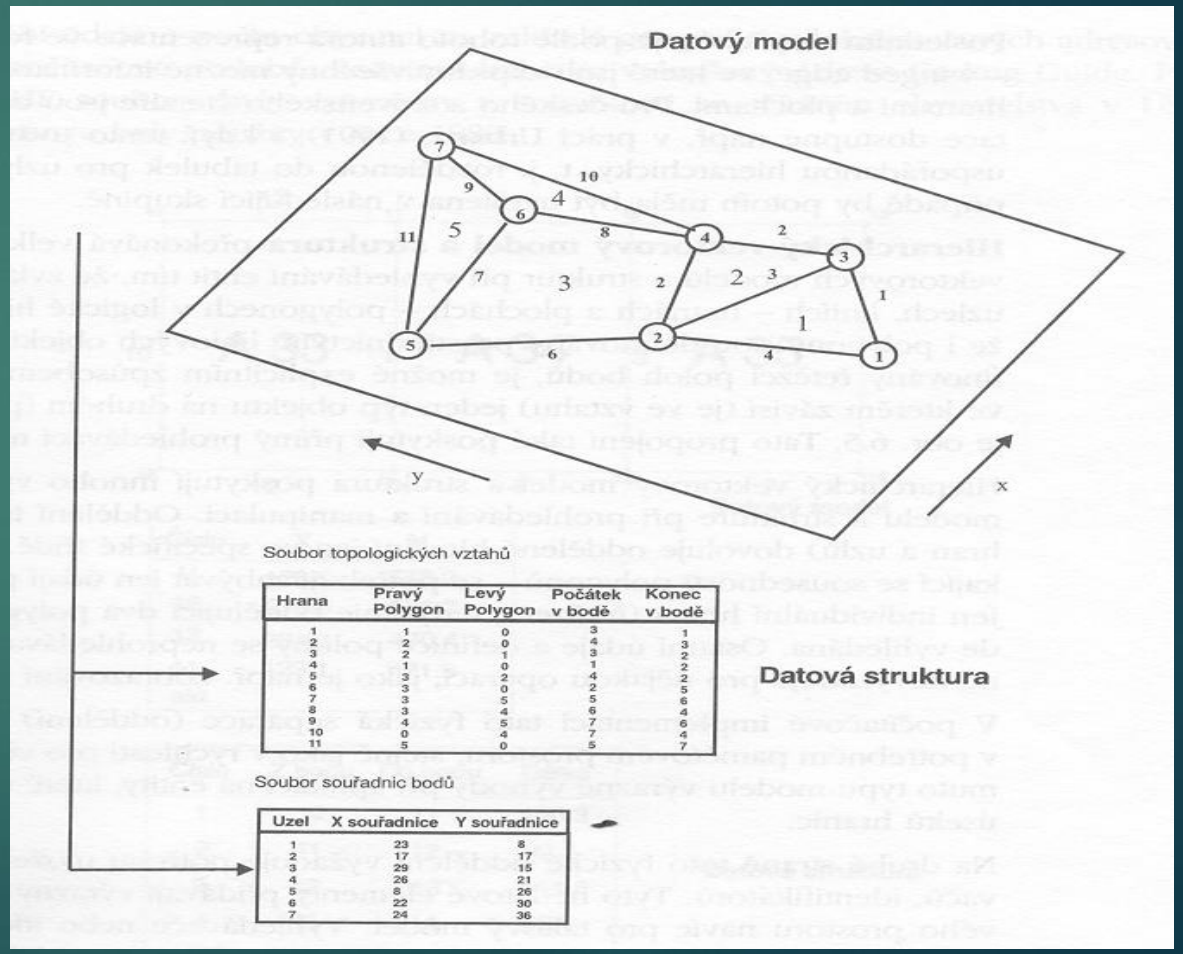
Transition between Spaghetti and Hierarchical models

Only points and lines are stored, while information about its orientation can be attached to the line, according to which the **neighboring polygon to the left and right can be determined**

Vector representation of spatial models
types of data models - **topological model**

2. **A topological model of**
   explanation - on the next page



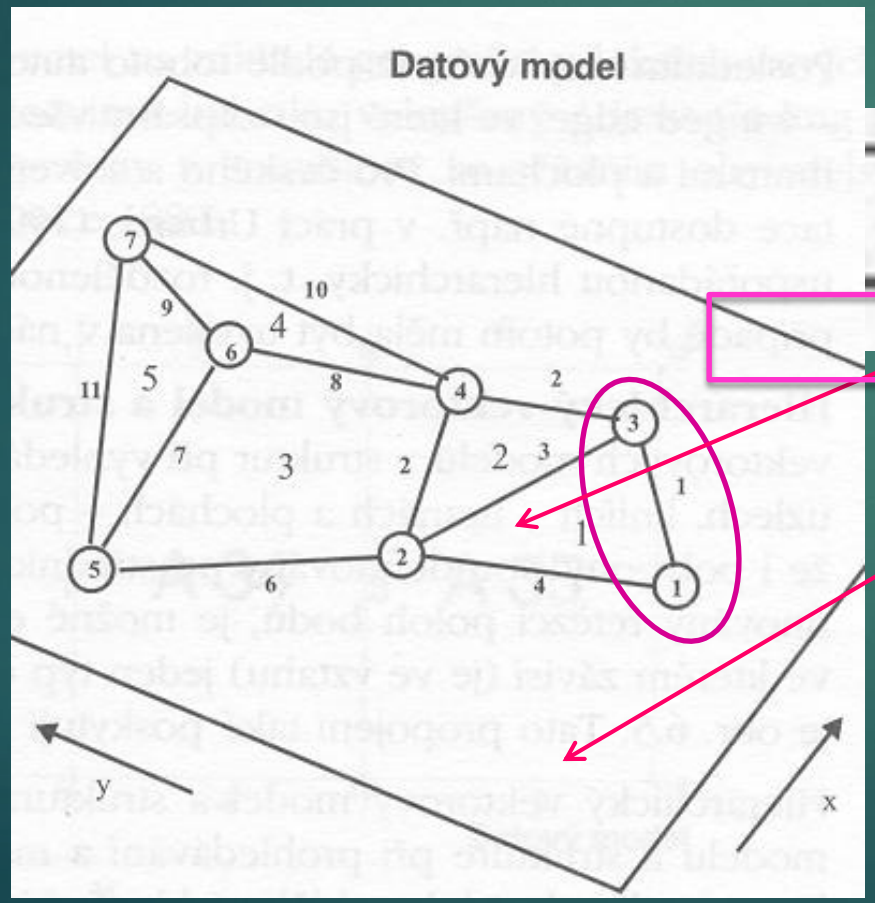


Vector representation of spatial models
types of data models - **topological model**

2. **Topological model**

stores separately data on:

- points - nodes,
- lines - edges

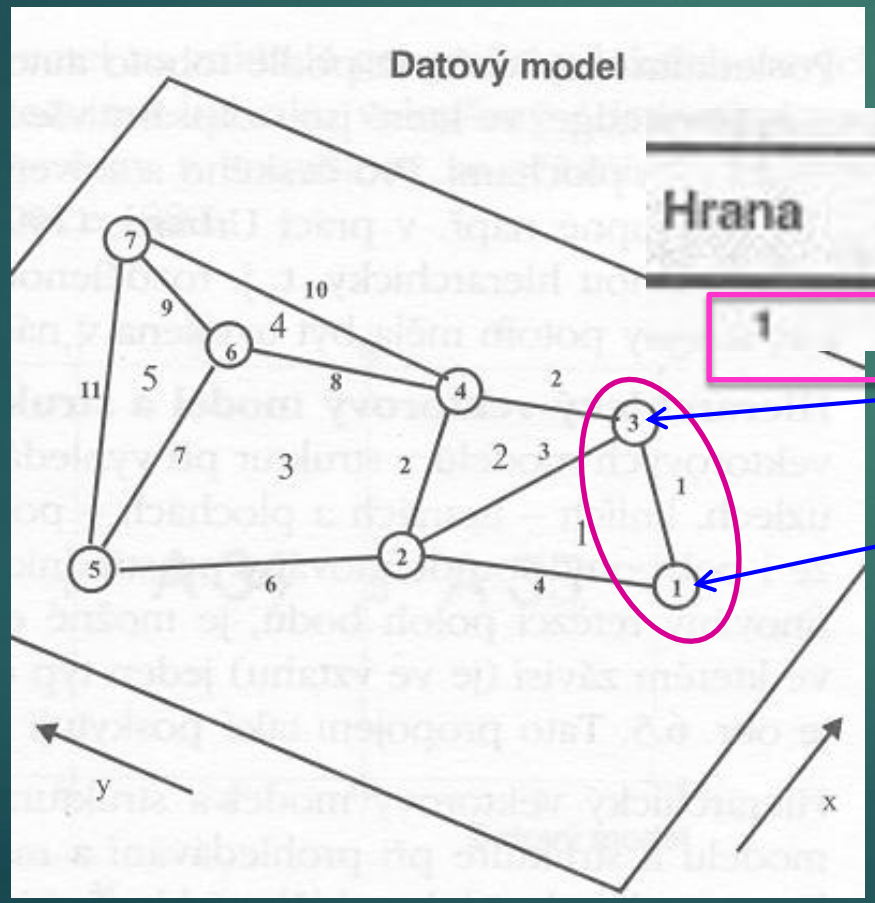


Pravý Polygon	Levý Polygon	Počátek v bodě	Konec v bodě
1	0	3	1

Uzel	X souřadnice	Y souřadnice
1	23	8
2	17	17
3	29	15

Vector representation of spatial models
types of data models - **topological model**

2. **Topological model**



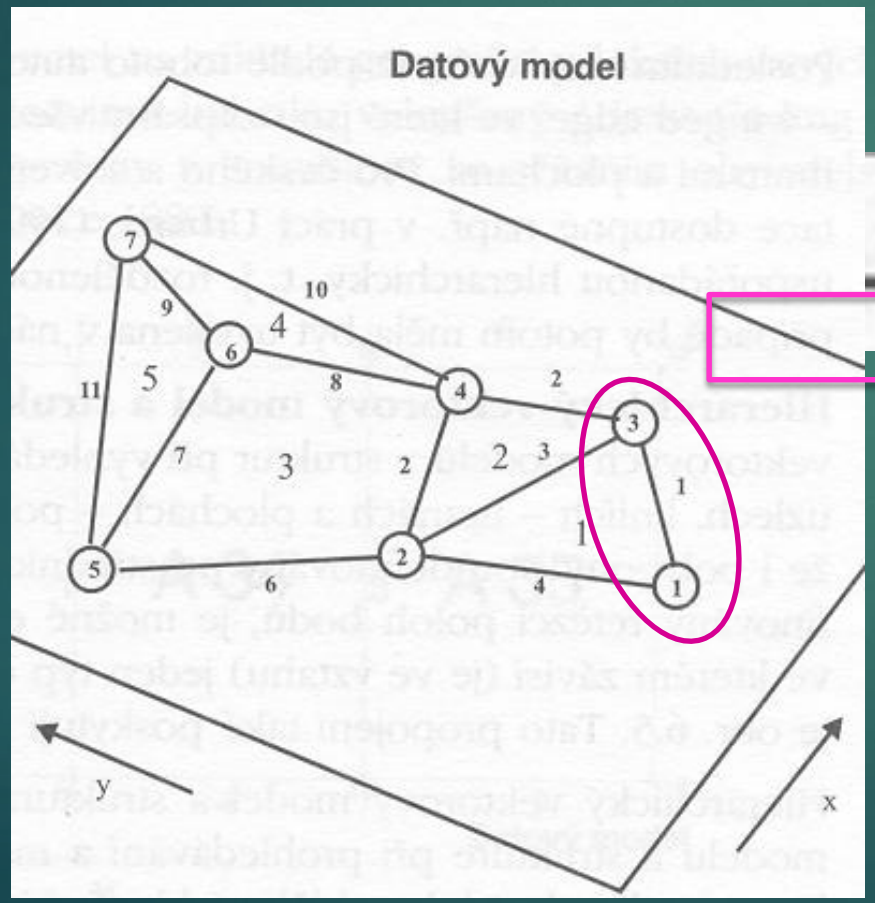
Hrana	Pravý Polygon	Levý Polygon	Počátek v bodě	Konec v bodě
1	1	0	3	1

Uzel	X souřadnice	Y souřadnice
1	23	8
2	17	17
3	29	15

Vector representation of spatial models

types of data models - **topological model**

2. **Topological model**



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Uzel	X souřadnice	Y souřadnice
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Vector representation of spatial models

spaghetti x topological model

Spaghetti model

Datová struktura

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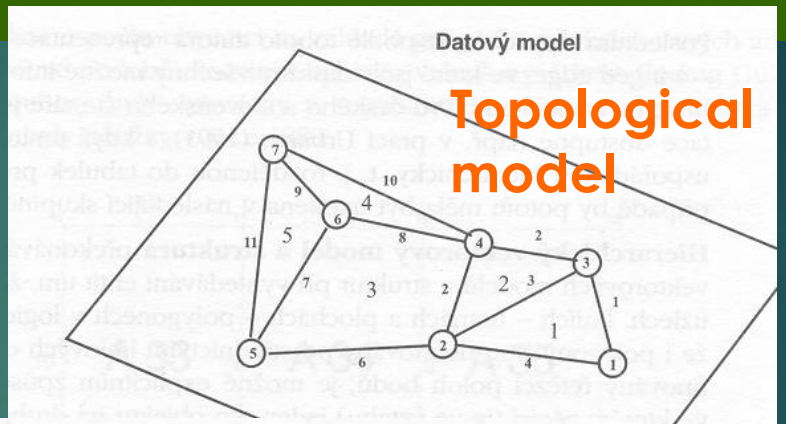
Points entered with their own coordinates , it is not interconnectedness through points

Topological model



Soubor topologických vztahů

Hrana	Pravý Polygon	Levý Polygon	Počátek v bodě	Konec v bodě
1	1	0	3	1
2	2	0	4	3
3	2	1	3	2
4	1	0	1	2
5	3	2	4	2
6	3	0	2	5
7	3	5	5	6
8	3	4	6	4
9	4	5	7	6
10	0	4	7	4
11	5	0	5	7

Soubor souřadnic bodů

Uzel	X souřadnice	Y souřadnice
1	23	8
2	17	17
3	29	15
4	26	21
5	8	26
6	22	30
7	24	36

Can't easily extract polygons

Vector representation of spatial models
types of data models - **hierarchical model**

3. **Hierarchical vector model**

stores separately data on:

- points - nodes,
- lines - edges and
- areas – polygons in a logical hierarchical structure

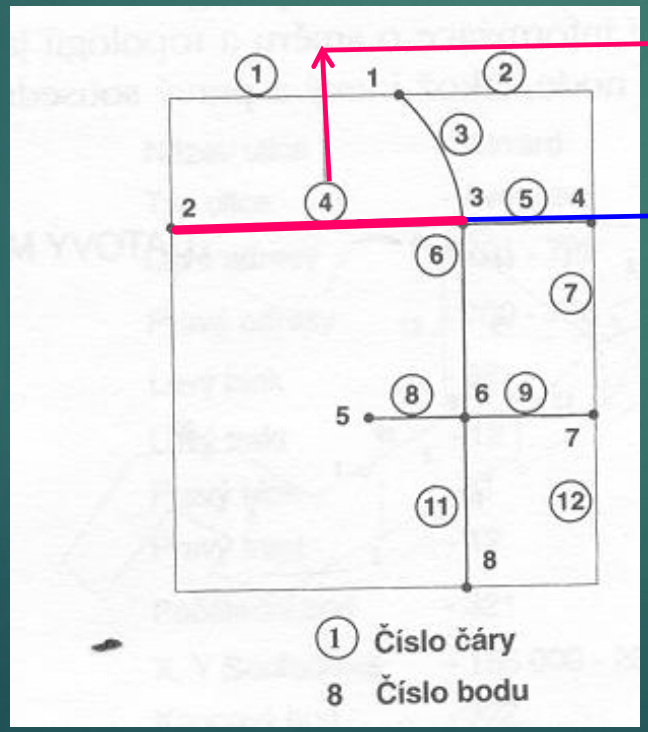
- Allows separate searches - only in **points** or **lines** or **areas**

- into the model included links between individual second objects (polygons , lines and points). These links then they allow much easier search individual objects than in the case of topological model .

Vector representation of spatial models
types of data models - **hierarchical model**

Hierarchical model - line objects:

line + intersection topology



Seznam průsečíků čar

Čára	Z bodu	Do bodu
1	2	1
2	1	4
3	1	3
4	2	3
5	4	3
6	3	6
7	4	7
8	5	6
9	6	7
10	2	8
11	6	8
12	8	7

Seznam souřadnic čar

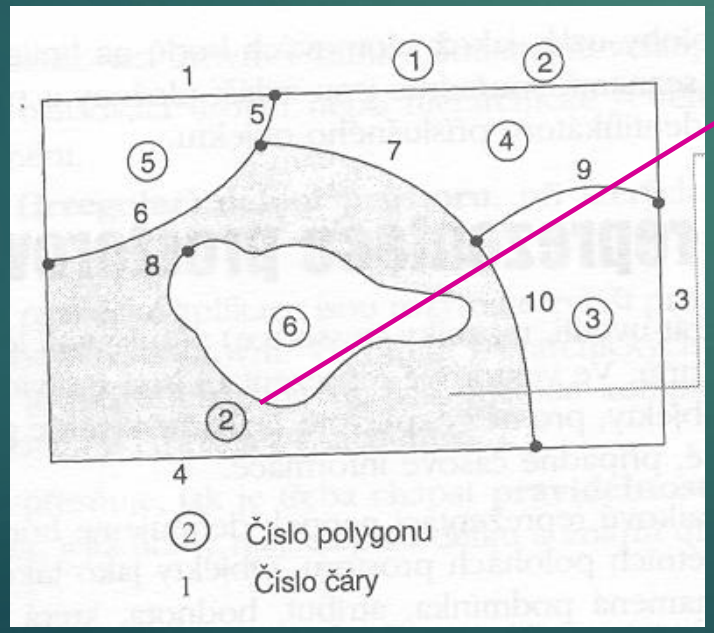
Čára	X, Y
1	5,5 5,7 8,7
2	8,7 11,7 11,5
3	8,7 ... 9,5
4	5,5 9,5
5	11,5 9,5
6	. . .
7	
8	
9	
10	
11	
12	

Vector representation of spatial models

types of data models – **hierarchical model**

Hierarchical model – for surface objects

topology area, line



Seznam čar polygonů

Polygon	Čára
2	4, 6, 7, 10, 0, 8
3	3, 10, 9
4	7, 5, 2, 9
5	1, 5, 6
6	8

Seznam souřadnic čar

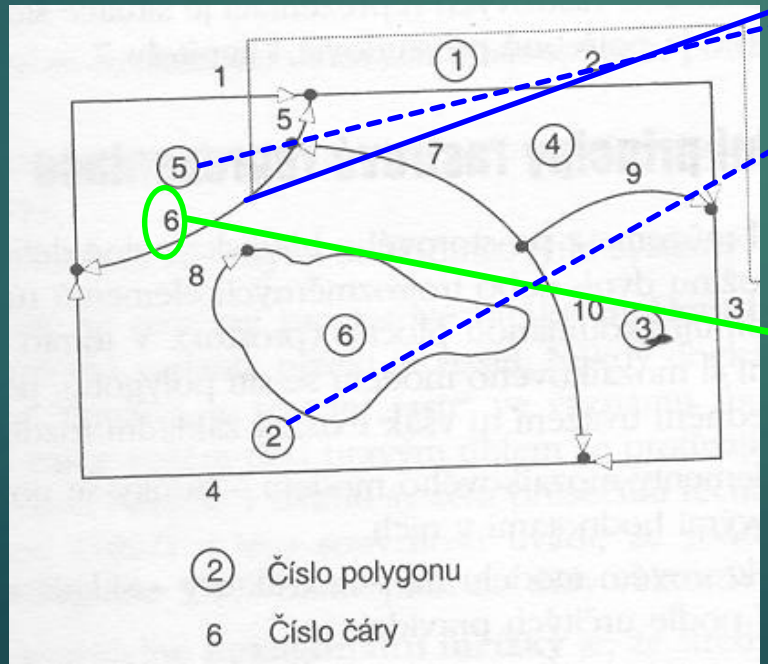
Čára	X, Y
1	5,3 5,5 8,5
2	8,5 20,5 ...
3	20,4 20,1 ...
4	18,1 5,1 5,3
5	7,4 8,5
6	7,4 6,3 ...
7	
8	
9	
10	

Vector representation of spatial models

types of data models - **hierarchical model**

Hierarchical model - for defining adjacency

right/left topology



Seznam ploch vpravo a vlevo

Čára	Levý polygon	Pravý polygon
1	1	5
2	1	4
3	1	3
4	1	2
5	5	4
6	2	5
7	2	4
8	2	6
9	4	3
10	3	2

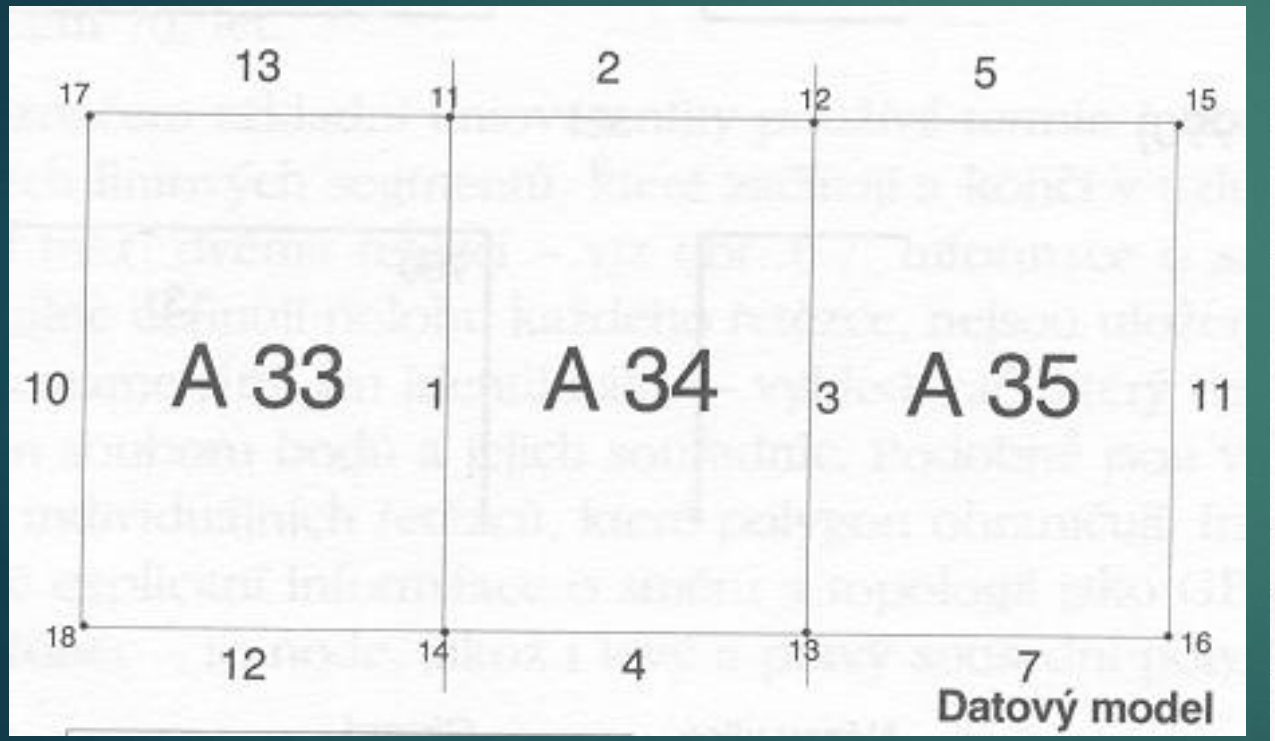
Seznam souřadnic čar

Čára	X, Y
1	5,3 5,5 8,5
2	8,5 20,5 ...
3	20,4 20,1 ...
4	18,1 5,1 5,3
5	7,4 8,5
6	7,4 6,3 ...
7	
8	
9	
10	

Vector representation of spatial models

types of data models - **Hierarchical model**

Hierarchical model for surfaces



Číslo	X	Y
11	126.5	578.2
12	218.6	581.2
13	224.2	470.4
14	129.1	471.9
atd.		

1) nodes

Číslo	Z bodu	Do bodu	Délka
1	14	11	106.3
2	11	12	92.2
3	12	13	111.6
4	13	14	95.1
atd.			

2) edges

Datová struktura

Název	Majitel	Čáry	Obvod	Plocha
A34	J. Smith	1,2,3,4	405.2	10203
A35	R. White	3,5,7,11	478.1	11562
A33	J. Streit	1,12,13,10	410.2	9625

3) surfaces