VISNOW

http://visnow.icm.edu.pl

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VisNow availability

Open source project

- Open access to Java source code
- GitLab: https://gitlab.com/ICM-VisLab/VisNow
- Cooperation possible

Platform independent

- Java >=1.7
- Windows, Linux, Mac OS X

Current version

- v1.3.1

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Advanced visualization with VisNow platform

Data structures

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Data for visualization

Geometry

- N-dimensional point coordinates (N=1,2,3)
  - Location in space
  - Naturally given or calculated on the basis of structure or values
  - Explicit or easily calculable

Structure

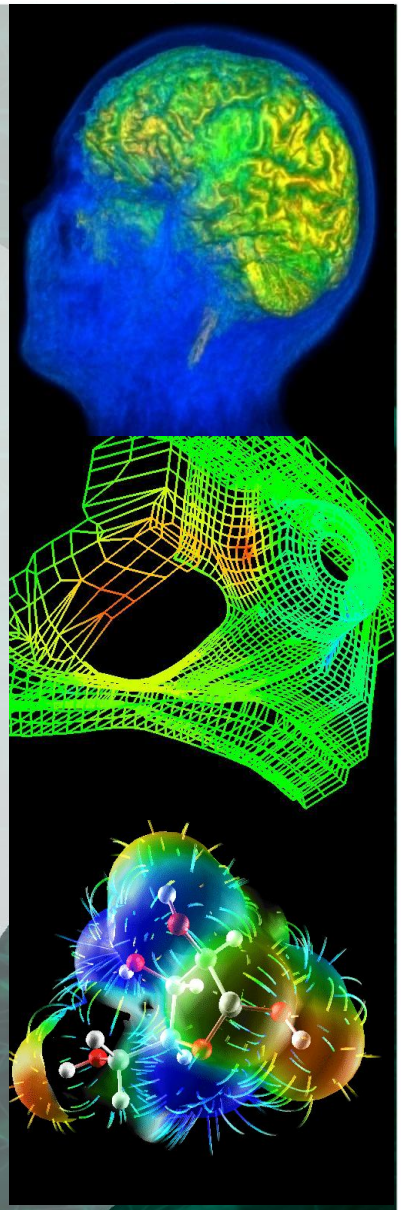
- Logical relations between points
- Usually imposes possible interpolations
- Problem dependant

Values

- Scalar, vector, tensor, symbolic, etc.

Generic data type

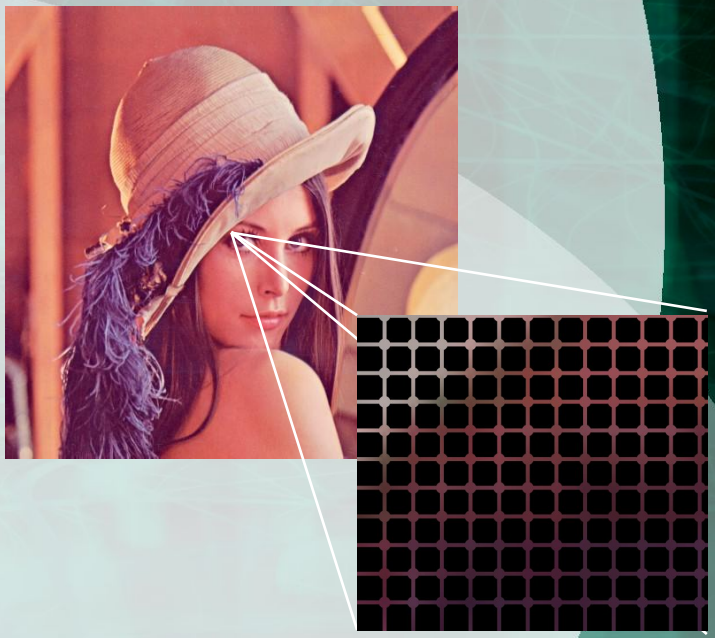
- **FIELD = geometry + structure + values**



VisNow fields

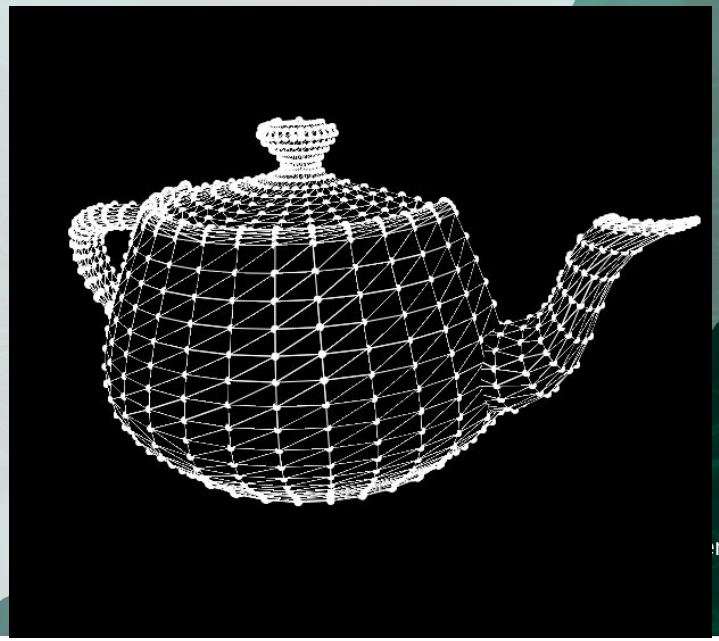
Regular Field

- Structured grid of neighbouring nodes
- 1/2/3-dimensional grid
- Values defined on nodes
- Simple example: image data



Irregular Field

- Unstructured nodes
- Cells defined over nodes
- Cell sets defined over cells form a grid
- 0/1/2/3-dimensional cells
- Values defined on nodes or cells
- Simple example: scanned 3D surface



Regular Fields

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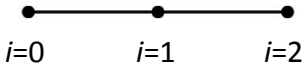
Regular Field structure

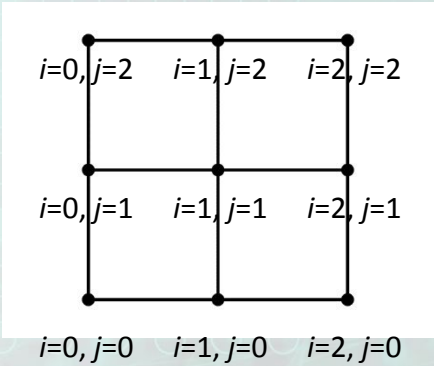
Structure

- Array based
- Indexed as *i,j,k*

1D



2D

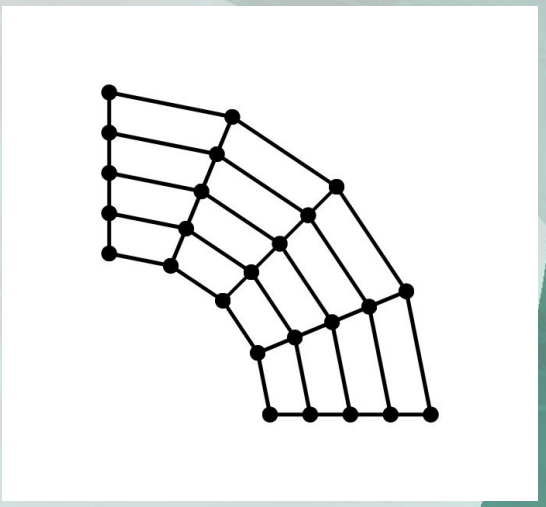


3D

Regular Field geometry

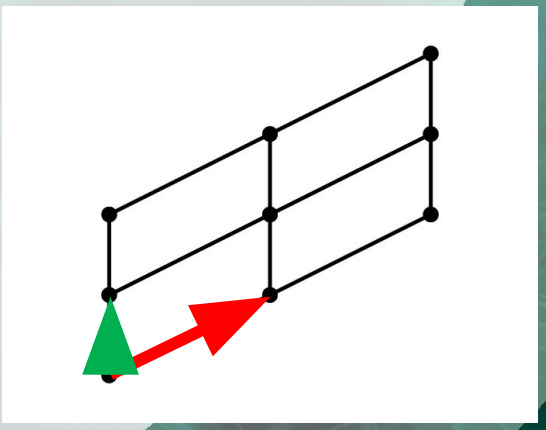
Explicit/curvlinear/arbitrary

- Geometry described explicitly by *x,y,z* coordinates for each node



Affine/linear

- Geometry described implicitly by base
- *N* base vectors for *N*-dimensional field
- Node coordinates calculated from position in structure (*i,j,k*), basis vectors and origin point



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Irregular Fields

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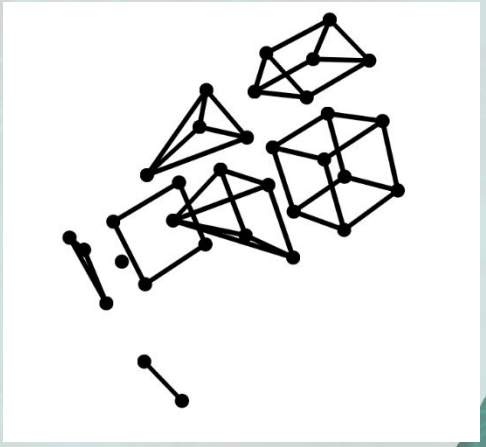
Irregular Field structure and geometry

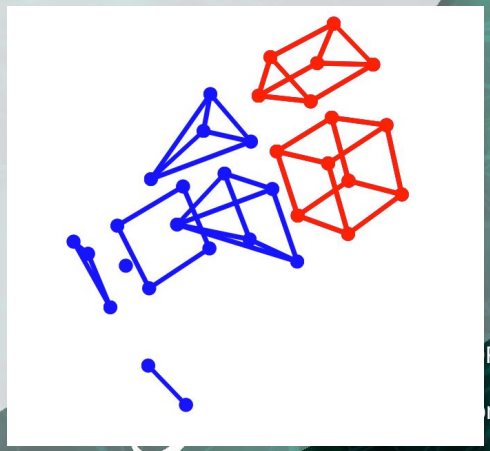
Explicit geometry

- Geometry described explicitly by *x,y,z* coordinates for each node



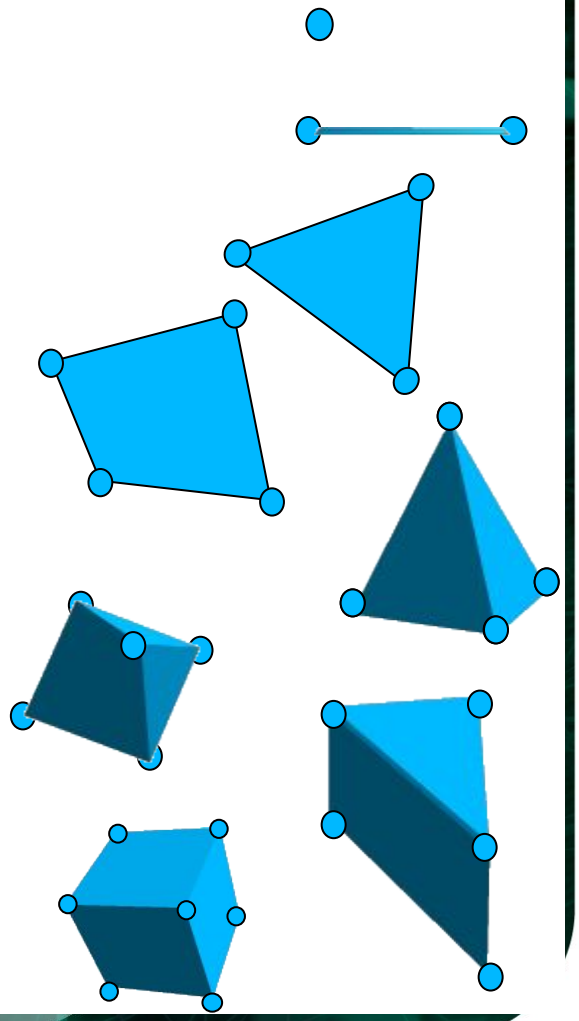
Structure

- Nodes indexed as *i*
- Cell
  - 0D/1D/2D/3D
  - Given by list of vertices/node indices
  - Limited to declared types
- Cellset
  - Group of cells of any types
  - Additionaly group of boundary cells
- Irregular Field
  - Can contain any number of cellsets
  - Cellsets can overlap

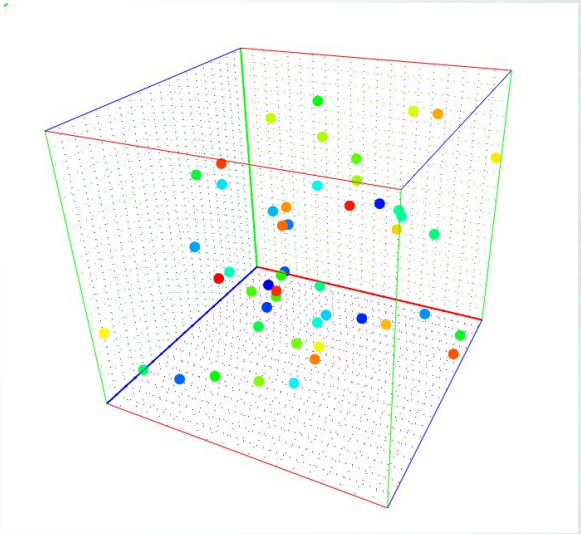


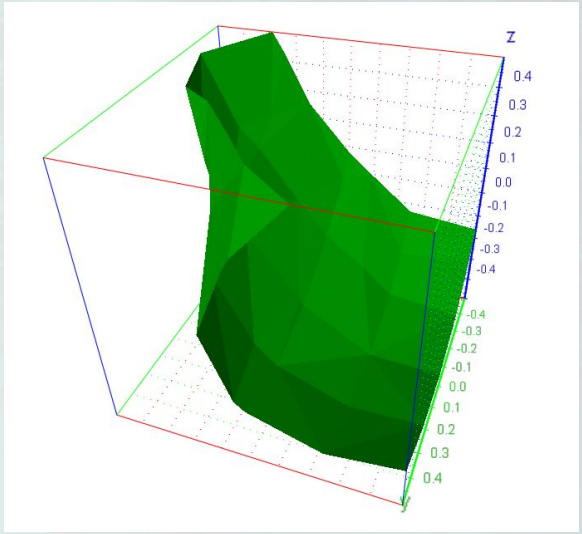
Irregular Field cells

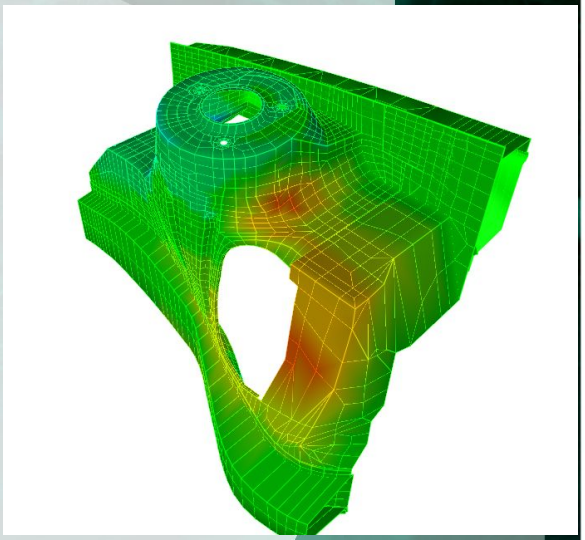
0D Cells	1D Cells	2D Cells	3D Cells	Vertices	Example
Point				1	
	Segment			2	
		Triangle		3	
		Quadrilateral		4	
			Terahedron	4	
			Pyramid	5	
			Prism	6	
			Hexahedron	8	

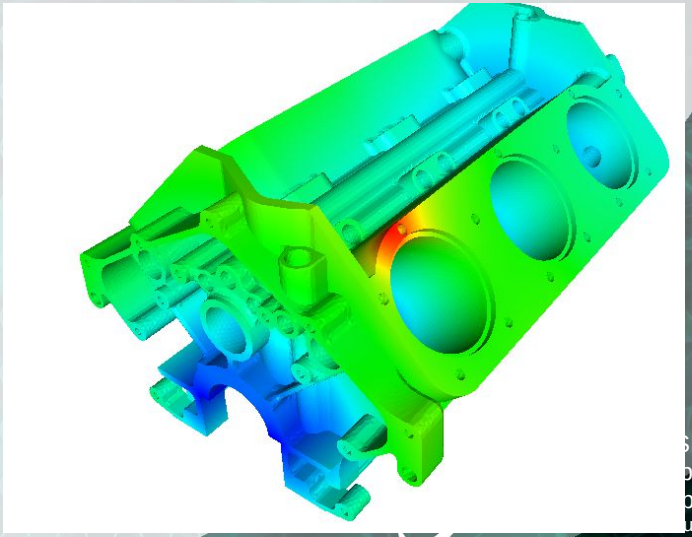


Irregular Field examples









Values

Regular Field values

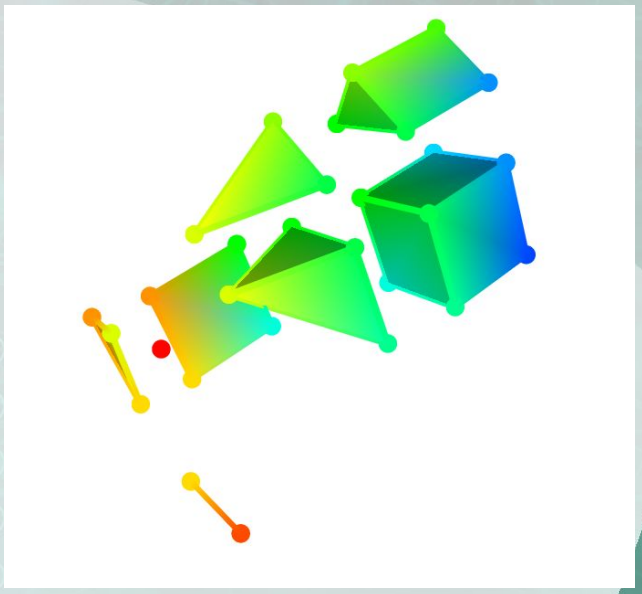
Node data

- Value assigned to node
- Interpolated on walls and edges
- Global for field

Irregular Field values

Node data

- Value assigned to node
- Interpolated on walls and edges
- Global for field



Cell data

- Value assigned to whole cell
- Local for cellset

Data components

- Each field or cellset can have several values assigned
- Consistent piece of information, declared over all nodes (node data) or all cells in cellset (cell data) is called data component
- E.g. numerical weather forecast simulation calculates several values in each grid node: pressure, temperature, wind direction and velocity, etc. Each such measurement is stored as a single data component.
- Values stored in components can be numbers, texts or other objects (e.g. atom) and can be scalar or vector

Component

- **Name** – used for component identification and description
- **Type** – defines data type of this component
- **Vector length** – 1 for scalar data, >1 for vector data
- **Range** – range of numerical values
- **Physical range** – range of linearly mapped physical values
- **Unit** – unit for physical range

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Data types

Byte

- Unsigned single byte
- Values 0 - 255

Short

- Signed short (two bytes)
- Values -32768 - 32768

Int

- Signed integer (four bytes)
- Values -2^31-1 – 2^31-1

Float

- Single precision floating numbers (four bytes)

Double

- Double precision floating numbers (eight bytes)

Logic

- Binary true/false

String

- Text data

Complex

- Complex numbers
- Single precision (float)

Object

- Any Java object
- Requires additional suport in modules

Other field parameters

Mask

- Binary information on node validity
- Invalid nodes are not displayed

Time

- Time dependent geometry
- Time dependent data
- Time dependent mask

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Visualisation lecture and practicals

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