

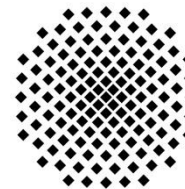


The dumux-lecture module and ViPLab: Using DuMu^x for education

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DuMu^x user meeting 2015

June 11, 2015



University of Stuttgart
Germany

dumux-lecture

- Dumux examples used in our lectures
- Spun off as a module in DuMuX 2.1

Get with Subversion

`svn://svn.iws.uni-stuttgart.de/DUMUX/dumux-lecture/trunk`

Use in lectures

- Modeling of hydrosystems
 - First example
 - Motivation
 - *Groundwater simulator*
- Multi-phase modeling
 - Understand physical modelling
 - *Buckley-Leverett, CO₂ plume, Column Xylene, convective mixing, fuel cell, heat pipe, heavy oil, Henry problem, McWhorter, NAPL infiltration, remediation scenarios*
- Environmental fluid mechanics
 - Comparison of different 2p models
 - *1p2c_2p_2p2c, 1p2cvs2p, 2p*

ViPLab

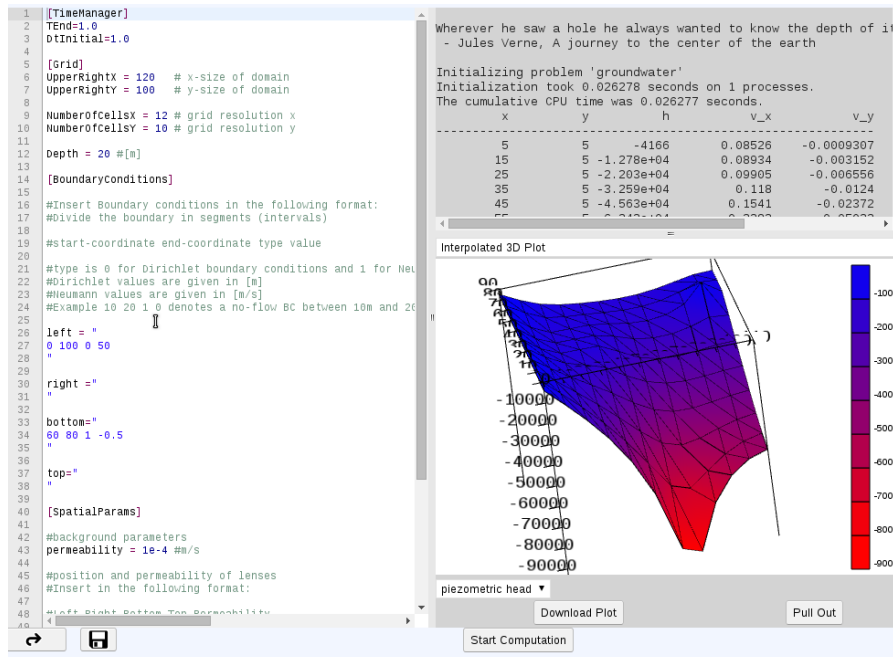
- *Virtual programming lab*
- Joint project with chairs from Math and aerospace engineers, and TIK (IT department)
- editor in browser
- executed on server
- Supports C, C++, Java, Matlab, Octave and DuMu^x
- Used in lectures

- Recently moved from Java to JavaScript
- Works inside Ilias
- Can be used to hand in assignments
- <http://www.uni-stuttgart.de/viplab>



DuMu^x with ViPLab

- Modify input file
- Visualization in 2d and 3d
- Groundwater example
- First experience with scientific software, 3d output
- DuMu^x usable from home



```

1 [TimeManager]
2 TEnd=1.0
3 dtInitial=1.0
4
5 [Grid]
6 UpperRightx = 120 # x-size of domain
7 UpperRighty = 100 # y-size of domain
8
9 NumberOfcellsx = 12 # grid resolution x
10 NumberOfcelly = 10 # grid resolution y
11
12 Depth = 20 #[m]
13
14 [BoundaryConditions]
15 #Insert Boundary conditions in the following format:
16 #Divide the boundary in segments (intervals)
17
18 #start-coordinate end-coordinate type value
19
20
21 #type is 0 for Dirichlet boundary conditions and 1 for Neumann
22 #Dirichlet values are given in [m]
23 #Neumann values are given in [m/s]
24 #Example 10 20 1 0 denotes a no-flow BC between 10m and 20m
25
26 left = "
27 0 100 0 50
28 "
29
30 right = "
31 "
32
33 bottom="
34 60 80 1 -0.5
35 "
36
37 top="
38 "
39
40 [SpatialParams]
41 #background parameters
42 permeability = 1e-4 #m/s
43
44 #position and permeability of lenses
45 #Insert in the following format:
46
47
48

```

Wherever he saw a hole he always wanted to know the depth of it
- Jules Verne, A journey to the center of the earth

Initializing problem 'groundwater'
Initialization took 0.026278 seconds on 1 processes.
The cumulative CPU time was 0.026277 seconds.

x	y	h	v_x	v_y
5	5	-4166	0.08526	-0.0009307
15	5	-1.278e+04	0.08934	-0.003152
25	5	-2.203e+04	0.09905	-0.006556
35	5	-3.259e+04	0.118	-0.0124
45	5	-4.563e+04	0.1541	-0.02372

Interpolated 3D Plot

piezometric head

Download Plot Pull Out

Start Computation

Outlook

- Populate dumux-lecture
- Add new exercises as needed

- Generalize ViPLab output
- Use ViPLab for Bachelor's theses