EXERCISE: SPH METHOD

Description: The DualSPHysics open-source software is employed to simulate a simple case of a dam break. DualSPHysics package includes many typical cases and the exercise simulation is based on the CaseDamBreak files.

To save time, simulation has already been completed using a GPU workstation. Animation of the case is included in the folder with ouput files (Google Drive) which are going to be post-processed in this exercise.

Exercise contents:
- preparation of an input xml file
- generation of a 3D model geometry
- run of a simulation (comparison of CPU in GPU computational times)
- post-processing:
    - Paraview animation
    - setup of the txt files for selected locations
    - calculation of water surface elevation and forces using tools MeasureTool in ComputeForces

Tasks:
1) For the initial geometry, compare the required computational time of a CPU and a GPU run.
2) Modify the geometry of the model, generate it and export its figure from Paraview.
3) For the initial geometry, make a screenshot of an animation showing the water flushing against the object or the downstream wall.
4) For the initial geometry, show time-series graphs of water surface elevations in the selected points (e.g. located upstream, next to, and downstream of the object).
5) For the initial geometry, show time-series graphs of forces acting upon the object.

Procedure:
1) CaseDamBreak files: input files + programs

2) Input file …_Def.xml (e.g. Porusitev_Def)
/comment: Porusitev means something like a »Dam break« in Slovenian; you can rename the files, but dont use č, š, ž etc.)

3) Geometry generation
Use Command prompt to write:
gencase_win64 Porusitev_Def Porusitev

4) View of the generated geometry in Paraview
In ParaView open the file …MkCells.vtk → change the view, colors, background … → Save Screenshot → file .png

5) Run DualSPHysics
In H-28 we only have PCs with CPUs, there are no GPUs. Thus:
dualsphysics5.0CPU_win64 Porusitev Out-Porusitev-CPU

Comparison of computational times: GPU run is finished in one minute.

6) Copy Command Prompt and all the programs (at least PartVTK, MeasureTool in ComputeForces) into the folder containing output files (Out-…)

7) Animation
While in folder Out-… write the following commands:

partvtk_win64 -savevtk Porusitev_fluid.vtk -onlytype:-all,fluid
partvtk_win64 -savevtk Porusitev_bound.vtk -onlytype:-all,bound
partvtk_win64 -savevtk Porusitev_objekt.vtk -onlymk:15 /!!! Object has mk=5, but you need to write 15

8) In folder Out-… prepare the txt files for the calculation of water surfaces in three points (e.g. h1.txt, h2.txt, h3.txt).

9) Graph h(t) for different locations

measuretool_win64 -points h1.txt -onlytype:-all,fluid -elevation -savecsv Porusitev-h1

10) Graph F(t) for the object (which has mk=5)

computeforces_win64 -onlymk:15 -savecsv Porusitev-F