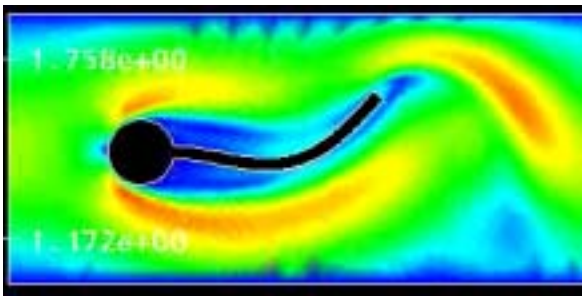
Topic x:
Partitioned Fluid-Structure Interaction and Linear Solvers

Imagine a flag in the wind. The wind applies forces onto the flag which causes it to deform. Because of the changed geometry, the wind will exert different forces onto the flag and in turn changes its deflection. This interaction may lead to a fluttering motion of the flag.

The calculation of these phenomena may be performed in a similar way. For every time step, we may calculate the fluid forces exerted onto the structure, calculate the structural displacement, change the geometry of the boundary for the fluid accordingly and iterate over this process until no further relevant change occurs. The system then is said to have converged. After convergence we may proceed to the next time step.

Mathematically this is equivalent to a Gauss-Seidel procedure solving the fluid- and structural equations simultaneously. As you may know, this method is neither unconditionally stable nor converges fast.



Flag in the wind

In the course of the entire come.tum program you will be taught several different methods to solve systems of equations. In this software lab you will learn more about these procedures and start investigating into very modern and only recently published methods. These belong to the family of the Krylov-Subspace methods and are very closely related to the ones you will need to understand and use in other courses.

In particular you will work closely with your supervisor in order to:

1.) understand the methods
2.) program an example Fluid – Structure – Interaction Program in C or C++
3.) integrate these new methods into your program and evaluate them.

This project will contribute to ongoing research at the chair of Computational Civil and Environmental Engineering funded by the Deutsche Forschungsgemeinschaft.