Lab 06 - Higher Order Mappings

Numerical Solution of PDEs Using the Finite Element Method

MHPC P2.13_seed

Martin Kronbichler kronbichler@lnm.mw.tum.de and **Luca Heltai** luca.heltai@sissa.it

---

1. The topic of this lab session is a modified version of step-4 made available for you https://www.dealii.org/8.5.0/doxygen/deal.II/step_4.html
2. For more information in higher order mappings see step-10
   https://www.dealii.org/8.5.0/doxygen/deal.II/step_10.html
3. Run the program and check the graphical and text output.
4. Adjust the right-hand side and solution to get the manufactured solution

   $$u(x,y) = r^2 \sin(3\theta) \cos(\frac{1}{2}\pi r)$$

   and apply zero boundary conditions. You can use wolframalpha.com to compute $-\triangle u$. Make sure the L2 errors are converging.
5. What mapping degree is required to get optimal convergence of the L2 error based on the polynomial degree of the finite element space?
6. Try getting H1 convergence to work correctly too.