Lab 02 - Sparsity Patterns (step-2)

Numerical Solution of PDEs Using the Finite Element Method

MHPC P2.13_seed

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1. See documentation at https://www.dealii.org/8.4.0/doxygen/deal.II/step_2.html
2. Copy and run step-2. Look at the sparsity patterns in firefox.
3. How does the pattern change if you increase the polynomial degree from 1 to 2 or to 3?
4. How does the pattern change if you use a globally refined (say 3 times) unit square?
5. Are these patterns symmetric? Why/why not?
6. How many entries per row in the sparsity pattern do you expect for a Q1 element (assuming four cells are around each vertex)? Check that this is true for the mesh in b) (look for `row_length(i)` and output them for each row). Can you construct a 2d mesh (without hanging nodes) that has a row with more entries?
7. Print all entries for row 42 for the original renumbered sparsity pattern.
8. Bonus: Compute and output statistics like the the number of unknowns, bandwidth of the sparsity pattern, average number of entries per row, and fill ratio.