

Homework I

Iterative methods for sparse matrices

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October 22, 2015

1 Abstract

When solving $\|\mathbf{Ax} - \mathbf{b}\|$ for very large \mathbf{A} the memory requirements do not allow it to run the algorithm in on iteration until convergence. Therefore a modified version of **GMRES** called restarted **GMRES(m)** is often used. After a fixed amount of iteration m the algorithms is restarted using \mathbf{x}_m as initial condition for the next run. This changed version avoids memory problems at the cost of convergence. One would expect that the larger m is chosen the better the convergence properties of the restarted would be. However this is not always the case. In this report this curious behaviour will be investigated following the paper "The Tortoise and the Hare Restart GMRES"¹ by Marc Embree.

2 Results

3 Conclusion

¹SIAM Rev., 45(2), 259266. (8 pages) The Tortoise and the Hare Restart GMRES, Marc Embree, <http://epubs.siam.org/doi/abs/10.1137/S003614450139961>

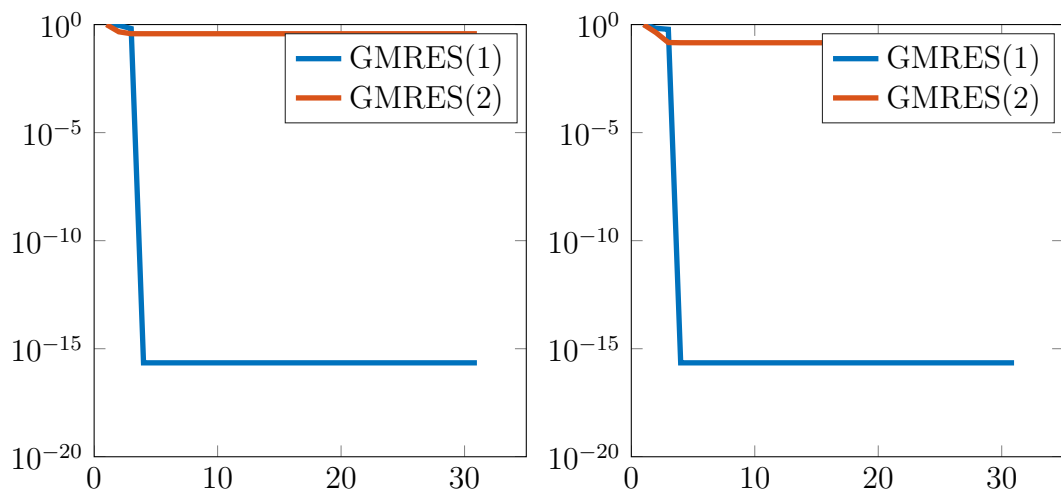


Figure 1: Convergence plot of GMRES(1) and GMRES(2). As seen in figure 1 and three of Embree's paper.

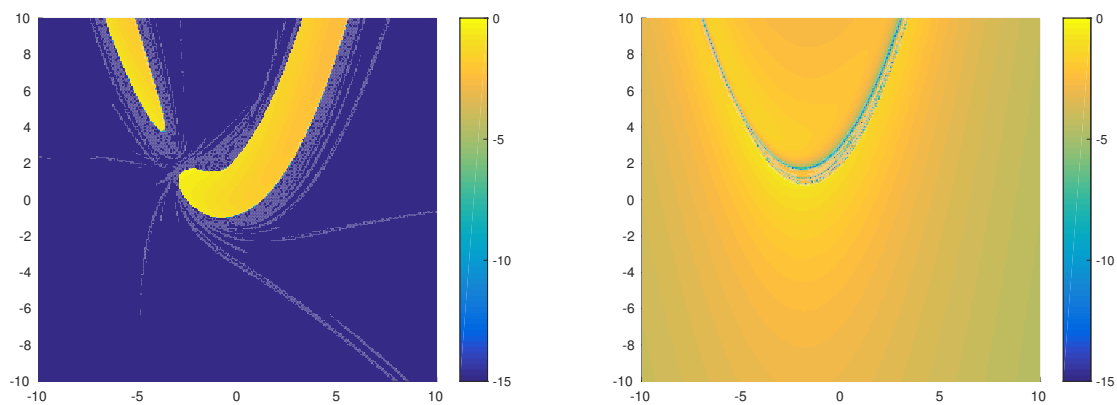


Figure 2: Plot as seen in the Embree paper GMRES(1)(left) and GMRES(2)(right) in figure two.

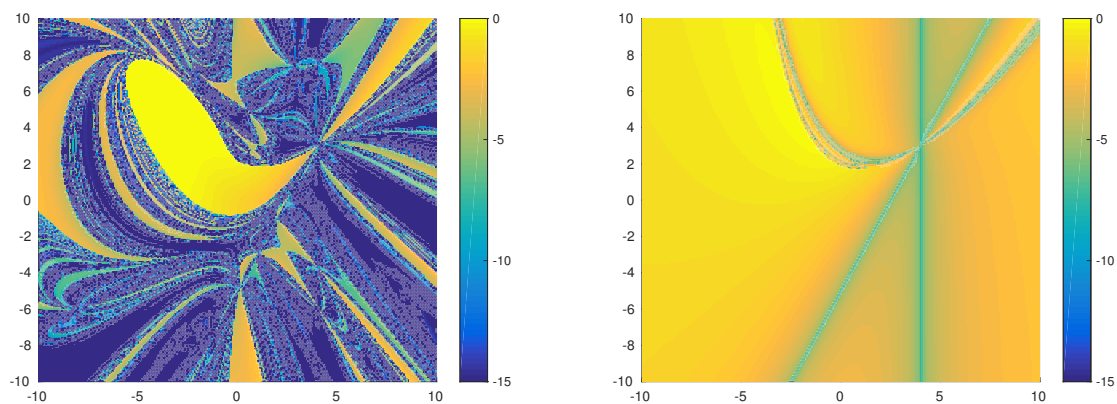


Figure 3: Plot as seen in the Embree paper for GMRES(1)(left) and GMRES(2)(right) in figure 4.