Guidelines to Add a Linear System (or Generalized Eigenvalue Problem) to the UESTC-Math Matrix Library

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1 What is your test problem ?

Please provide a short but comprehensive (at most five sentences long) description of your matrix problem(s), including the field or application where your problem arise from, the physical meaning of the solution, and possibly one or two related references in BibTex format.

2 Numerical properties of your matrices.

Please inform us about the properties of your test matrices, such as

- size (number of rows, columns and nonzeros; matrices of size larger than 1,000 are especially welcome);
- structure (square, dense, sparse, banded, block, structurally symmetric, unstructured, Toeplitz/Hankel(-like), etc)
- symmetry (real symmetric, real general, complex symmetric, Hermitian, complex general)
- conditioning (if available)
- physics-based right hand side vector (if available)

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- any other useful property to understand better the characteristic of the problem.

Below we provide an example of description:

Table 1: Set and characteristics of test matrices in Example 1 (listed in increasing matrix size).

Grid size	Matrix problem	Reference	Size	Field	$nnz(A)$
1/16	`orsirr_2`	Ref. [1]	886	Oil reservoir simulation	5,970
1/32	`pde2961`	Ref. [1]	2,961	2D/3D problem	14,585
1/64	`ex36`	Ref. [2]	3,079	Computational fluid dynamics	53,099
1/128	`vdvorst3`	Ref. [2]	4,096	2D/3D problem	20,224
1/256	`rajat13`	Ref. [3]	7,598	Circuit simulation problem	48,762
1/512	`M4D2`	Ref. [3]	10,000	Quantum mechanics	127,400

Finally, please specify the storage format used to supply your test matrices, e.g. `*.m`, `*.mat`, `*.txt`, `*.dat`, `*.bin`, ..., or if a matrix generator is available to create matrices using different input parameters and having different size and levels of difficulty for our numerical experiments.

PS: Now, our test matrices corresponding to linear systems $A\boldsymbol{x} = \boldsymbol{b}$ in MATLAB format are partly available online at `https://github.com/Hsien-Ming-Ku/Test_matrices`.

References

[1] C. Lin, Q. Wang, T. Lee, A less conservative robust stability test for linear uncertain time-delay systems, IEEE Trans. Automat. Control., 51 (2006), pp. 87-91.

[2] J. Hale, S. Lunel, Introduction to Functional Differential Equations, Springer-Verlag, New York, USA, 1993.

[3] M. Clemens, T. Weiland, Iterative methods for the solution of very large complex-symmetric linear systems of equations in electromagnetics, in *Eleventh Copper Mountain Conference on Iterative Methods*, Part 2, T.A. Manteuffel, S.F. McCormick (Eds.), 1996, 7 pages.