An appendix to my SCAN 2000 talk[1]

Prompted by several requests concerning my SCAN 2000 talk (whose slides are now available at `http://www.mscs.mu.edu/~georgec/Corliss/rohn_slides.html`), I have compiled a list of references of the results cited there. The enumeration used below is identical with that of the slides.

1. —
2. —
3. **(Basic tool)** Matrices A_{yz} were introduced in [1], p. 43.
4. **(Main point)** Also, $\underline{A} = A_{ee}$ and $\overline{A} = A_{-e,e}$.
5. —
6. **(Regularity) Theorem 1:** Baumann [2], reproved in [1], Thm. 5.1, (C1); **Theorem 2:** Poljak and Rohn [3], in journal form [4], Thm. 2.8.
7. **(Positive (semi)definiteness) Theorem 1:** [5], Thm. 2; **Theorem 2:** Nemirovskii [6] for positive semidefiniteness, [7] for positive definiteness.
8. **(Stability) Theorem 1:** [5], Thm. 6; (no such characterization in nonsymmetric case: Barmish and Hollot [8]); **Theorem 2:** [7].
9. —
10. **(Reminder)** Vectors b_y were introduced in [1], p. 43.
11. **(Linear interval equations) Theorem 1:** [1], Thm. 2.4 using the form of x_y given in Eq. (2.5); **Theorem 2:** Rohn and Kreinovich [9], Thm. 3.1.
12. **(Inverse interval matrix) Theorem 1:** [10], Thm. 1.1 and Eqs. (1.3), (1.4); **Theorem 2:** Coxson [11].
13. **(Nonnegative invertibility) Theorem 1:** Kuttler [12]; (some generalization in [1], Thm. 4.6); **Theorem 2:** follows from Bareiss [13].
14. —
15. —

[1]by J. Rohn (`rohn@cs.cas.cz`)

16. **(Solvability of linear equations) Theorem 1:** an unpublished result whose proof employs Farkas lemma and the existence theorem in [14] (a special case of nonnegative solutions was handled in [15]); **Theorem 2:** Lakeyev and Kreinovich [16].

17. **(Solvability of linear inequalities) Theorem 1:** Rohn and Kreslová [17], Thm. 1 and Proposition; **Theorem 2:** follows from Khachiyan [18].

18. **(Tolerance solutions) Theorem 1:** [19]; **Theorem 2:** as in 17.

19. **(Control solutions)** Introduced by Shary [20]; **Theorem 1:** unpublished, follows from the description given in my submission to the *reliable_computing* net on March 20, 1999; **Theorem 2:** Lakeyev and Noskov [21].

20. **(Linear programming I)** Values $\underline{f}$, $\overline{f}$ were introduced in [22], pp. 52-53.

21. **(Linear programming II) Theorem 1:** Mráz [23]; **Theorem 2:** [24], Thm. 6.1.

22. —

23. **(Conclusion)** Sufficient conditions and inexact enclosures were excluded from this talk: first, for time reasons; second, because they would require more complicated notations. This topic may become subject of another talk in future.

References

[1] J. Rohn. Systems of linear interval equations. *Linear Algebra and Its Applications*, 126:39–78, 1989.

[2] M. Baumann. A regularity criterion for interval matrices. In J. Garloff et al., editor, *Collection of Scientific Papers Honouring Prof. Dr. K. Nickel on Occasion of his 60th Birthday, Part I*, pages 45–50, Freiburg, 1984. Freiburg University.

[3] S. Poljak and J. Rohn. Radius of nonsingularity. Research Report, KAM Series 88–117, Charles University, Prague, December 1988.

[4] S. Poljak and J. Rohn. Checking robust nonsingularity is NP-hard. *Mathematics of Control, Signals, and Systems*, 6:1–9, 1993.

[5] J. Rohn. Positive definiteness and stability of interval matrices. *SIAM Journal on Matrix Analysis and Applications*, 15:175–184, 1994.

[6] A. Nemirovskii. Several NP-hard problems arising in robust stability analysis. *Mathematics of Control, Signals, and Systems*, 6:99–105, 1993.

[7] J. Rohn. Checking positive definiteness or stability of symmetric interval matrices is NP-hard. *Commentationes Mathematicae Universitatis Carolinae*, 35:795–797, 1994.

[8] B. R. Barmish and C. V. Hollot. Counter–example to a recent result on the stability of interval matrices by S. Białas. *International Journal of Control*, 39:1103–1104, 1984.

[9] J. Rohn and V. Kreinovich. Computing exact componentwise bounds on solutions of linear systems with interval data is NP-hard. *SIAM Journal on Matrix Analysis and Applications*, 16:415–420, 1995.

[10] J. Rohn. Inverse interval matrix. *SIAM Journal on Numerical Analysis*, 30:864–870, 1993.

[11] G. E. Coxson. Computing exact bounds on elements of an inverse interval matrix is NP-hard. *Reliable Computing*, 5:137–142, 1999.

[12] J. Kuttler. A fourth–order finite–difference approximation for the fixed membrane eigenproblem. *Mathematics of Computation*, 25:237–256, 1971.

[13] E. F. Bareiss. Sylvester's identity and multistep integer-preserving Gaussian elimination. *Mathematics of Computation*, 103:565–578, 1968.

[14] J. Rohn. An existence theorem for systems of linear equations. *Linear and Multilinear Algebra*, 29:141–144, 1991.

[15] J. Rohn. Strong solvability of interval linear programming problems. *Computing*, 26:79–82, 1981.

[16] A. V. Lakeyev and V. Kreinovich. NP-hard classes of linear algebraic systems with uncertainties. *Reliable Computing*, 3:51–81, 1997.

[17] J. Rohn and J. Kreslová. Linear interval inequalities. *Linear and Multilinear Algebra*, 38:79–82, 1994.

[18] L. G. Khachiyan. A polynomial algorithm in linear programming. *Doklady Akademii Nauk SSSR*, 244:1093–1096, 1979.

[19] J. Rohn. Inner solutions of linear interval systems. In K. Nickel, editor, *Interval Mathematics 1985*, Lecture Notes in Computer Science 212, pages 157–158, Berlin, 1986. Springer-Verlag.

[20] S. P. Shary. On controlled solution set of interval algebraic systems. *Interval Computations*, 6:66–75, 1992.

[21] A. V. Lakeyev and S. I. Noskov. A description of the set of solutions of a linear equation with intervally defined operator and right–hand side (in Russian). *Doklady of the Russian Academy of Sciences*, 330:430–433, 1993.

[22] J. Rohn. Interval linear systems. Freiburger Intervall-Berichte 84/7, Albert-Ludwigs-Universität, Freiburg, 1984.

[23] F. Mráz. Úloha lineárního programování s intervalovými koeficienty. West Bohemian University, 1993. Habilitationsschrift.

[24] J. Rohn. Complexity of some linear problems with interval data. *Reliable Computing*, 3:315–323, 1997.