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**Improving test coverage of LAPACK.** (English) Zbl 1122.68745  
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Summary: We discuss the way in which the LAPACK version 3.0 suite of software is tested and look at how the application of software testing metrics affects our view of that testing. We analyse the ways in which some errors may be masked by the existing approach and consider how we might use the existing suite to generate an alternative test suite that is easily extensible as well as providing a high degree of confidence that the package has been well tested.

**MSC:**

**68W30** Symbolic computation and algebraic computation

**Software:**

**CALGO; FLAME; LAPACK; LAPACK90; LAPACK95; NAGWare; PDECOL; PERL; Python**

**Full Text:** [DOI](#)

**References:**

- [1] Anderson, E., Bai, Z., Bischof, C., Blackford, S., Demmel, J., Dongarra, J.J., Du Croz, J., Greenbaum, A., Hammarling, S., McKenney, A., Sorensen, D.: *LAPACKusers' guide*. SIAM, Philadelphia, 3rd edn. (1999)
- [2] Barker, V.A., Blackford, L.S., Dongarra, J., Du Croz, J., Hammarling, S., Marinova, M., Waśniewski, J., Yalamov, P.: *LAPACK95: Users' Guide*. SIAM, Philadelphia (2001) · [Zbl 0992.65013](#)
- [3] Barnes, D., Hopkins, T.: Applying software testing metrics to Lapack. In: Dongarra, J., Madsen, K., Wasniewski, J. (eds.) *Applied Parallel Computing. State of the Art in Scientific Computing: 7th International Conference, PARA 2004*, Lyngby, Denmark, 20–23, June 2004. *Lecture Notes in Computer Science*, vol 3732, pp. 228–236. Springer, Heidelberg (2006)
- [4] Barnes, D.J., Hopkins, T.R.: The evolution and testing of a medium sized numerical package. In: Langtangen, H.P., Bruaset, A.M., Quak, E. (eds.) *Advances in Software Tools for Scientific Computing*, *Lecture Notes in Computational Science and Engineering*, pp. 225–238. Springer, Berlin (2000) · [Zbl 0947.68592](#)
- [5] Beizer B. (1984). *Software System Testing and Quality Assurance*. Van Nostrand Reinhold, New York
- [6] Blackford, S., Dongarra, J.: *Lapack working note 41 Installation guide for LAPACK*. Technical report, University of Tennessee, Department of Computer Science, University of Tennessee, Knoxville, pp. 37996–371301 (1999)
- [7] Gunnels J.A., Gustavson F.G., Henry G.M. and van de Geijn R.A. (2001). *Flame: formal linear algebra methods environment*. *ACM Trans. Math. Softw.* 27(4): 422–455 · [Zbl 1070.65522](#) · [doi:10.1145/504210.504213](#)
- [8] Hayhurst, K.J., Veerhusen, D.S., Chilenski, J.J., Rierson, L.K.: *A practical tutorial on modified condition/decision coverage*. Technical Report TM-2001-210876, NASA, Langley Research Center, Hampton, Virginia 23681–2199 (2001)
- [9] Hopkins T. (2002). A comment on the presentation and testing of CALGO codes and a remark on Algorithm 639: To integrate some infinite oscillating tails. *ACM Trans. Math. Softw.* 28(3): 285–300 · [Zbl 1070.68516](#) · [doi:10.1145/569147.569148](#)
- [10] ISO, Geneva, Switzerland: *ISO/IEC 9899:1990 Information technology–Programming Language C* (1990)
- [11] ISO/IEC: *Information Technology–Programming Languages–Fortran–Part 1: Base Language (ISO/IEC 1539-1:2004)*. ISO/IEC Copyright Office, Geneva (2004)
- [12] Kaner C., Falk J. and Nguyen H.Q. (1999). *Testing Computer Software*. Wiley, Chichester
- [13] King K.N. and Offutt A.J. (1991). A Fortran language system for mutation-based software testing. *Softw. Pract. Exp.* 21(7): 685–718 · [doi:10.1002/spe.4380210704](#)
- [14] Lahey Computer Systems, Inc., Incline Village, NV, USA: *Lahey/Fujitsu Fortran 95 User's Guide*, Revision C edition (2000)
- [15] LDRA Ltd, Liverpool, UK: *LDRA Testbed: Technical Description v7.0* (2000)
- [16] Lutz, M.: *Programming Python*, 2nd edn. O'Reilly & Associates, Sebastopol (2001) · [Zbl 0967.68026](#)
- [17] Numerical Algorithms Group Ltd., Oxford, UK: *NAGWare Fortran Tools (Release 4.0)* (1999)
- [18] Numerical Algorithms Group Ltd., Oxford, UK: *NAGWare Fortran Tools (Release 4.1)* (2001)
- [19] Numerical Algorithms Group Ltd., Oxford, UK: *NAGWare f95 Compiler (Release 5.0)* (2003)
- [20] Offut A.J., Lee A., Rothermel G., Untch R.H. and Zapf C. (1996). An experimental determination of sufficient mutant operators. *ACM Trans. Softw. Eng. Meth.* 5(2): 99–118 · [doi:10.1145/227607.227610](#)

- [21] Sun Microsystems, Inc., Santa Clara, CA: Fortran User's Guide (Forte Developer 7), Revision A edition (2002)
- [22] Wall, L., Christiansen, T., Orwant, J.: Programming Perl. 3rd edn. O'Reilly & Associates, Inc, Sebastopol (2000) · [Zbl 0949.68015](#)

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