
Bibliography

- [1] M. Abramowitz, I.A. Stegun, *Handbook of Mathematical Functions with Formulas, Graphs and Mathematical Tables*. Applied Math. Series 55 (National Bureau of Standards, Washington, D.C., 1964)
- [2] R.C. Agarwal, J.C. Cooley, F.G. Gustavson, J.B. Shearer, G. Slishman, B. Tuckerman, New scalar and vector elementary functions for the IBM system/370. *IBM J. Res. Dev.* **30**(2), 126–144 (1986)
- [3] H.M. Ahmed, Efficient elementary function generation with multipliers, in *Proceedings of the 9th IEEE Symposium on Computer Arithmetic* (1989), pp. 52–59
- [4] H.M. Ahmed, J.M. Delosme, M. Morf, Highly concurrent computing structures for matrix arithmetic and signal processing. *Computer* **15**(1), 65–82 (1982)
- [5] H. Alt, Comparison of arithmetic functions with respect to Boolean circuits, in *Proceedings of the 16th ACM STOC* (1984), pp. 466–470
- [6] American National Standards Institute and Institute of Electrical and Electronic Engineers. *IEEE Standard for Binary Floating-Point Arithmetic*. ANSI/IEEE Standard 754–1985 (1985)
- [7] C. Ancourt, F. Irigoien, Scanning polyhedra with do loops, in *Proceedings of the 3rd ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming (PPoPP'91)*, Apr 1991 (ACM Press, New York, NY, 1991), pp. 39–50
- [8] I.J. Anderson, A distillation algorithm for floating-point summation. *SIAM J. Sci. Comput.* **20**(5), 1797–1806 (1999)
- [9] M. Andrews, T. Mraz, Unified elementary function generator. *Microprocess. Microsyst.* **2**(5), 270–274 (1978)
- [10] E. Antelo, J.D. Bruguera, J. Villalba, E. Zapata, Redundant CORDIC rotator based on parallel prediction, in *Proceedings of the 12th IEEE Symposium on Computer Arithmetic*, July 1995, pp. 172–179
- [11] E. Antelo, T. Lang, J.D. Bruguera, Very-high radix CORDIC rotation based on selection by rounding. *J. VLSI Signal Process. Syst.* **25**(2), 141–154 (2000)
- [12] A. Avizienis, Signed-digit number representations for fast parallel arithmetic. *IRE Trans. Electron. Comput.* **10**, 389–400 (1961). Reprinted in [440]
- [13] A. Azmi, F. Lombardi, On a tapered floating point system, in *Proceedings of 9th IEEE Symposium on Computer Arithmetic*, Sept 1989, pp. 2–9
- [14] L. Babai, On Lovász' lattice reduction and the nearest lattice point problem. *Combinatorica* **6**(1), 1–13 (1986)
- [15] D.H. Bailey, Algorithm 719, multiprecision translation and execution of FORTRAN programs. *ACM Trans. Math. Softw.* **19**(3), 288–319 (1993)
- [16] D.H. Bailey, Some background on Kanada's recent pi calculation. Technical report, Lawrence Berkeley National Laboratory (2003), <http://crd.lbl.gov/~dhbailey/dhbpapers/dhb-kanada.pdf>
- [17] D.H. Bailey, High-precision floating-point arithmetic in scientific computation. *Comput. Sci. Eng.* **7**(3), 54–61 (2005)
- [18] D.H. Bailey, A thread-safe arbitrary precision computation package (full documentation) (2015), <http://www.davidhbailey.com/dhbpapers/index.html#Technical-papers>
- [19] D.H. Bailey, J.M. Borwein, Experimental mathematics: examples, methods and implications. *Not. AMS* **52**(5), 502–514 (2005)
- [20] D.H. Bailey, J.M. Borwein, High-precision arithmetic in mathematical physics. *Mathematics* **3**, 337–367 (2015)
- [21] D.H. Bailey, J.M. Borwein, P.B. Borwein, S. Plouffe, The quest for pi. *Math. Intelligencer* **19**(1), 50–57 (1997)
- [22] D.H. Bailey, Y. Hida, X.S. Li, B. Thompson, ARPREC: an arbitrary precision computation package. Technical report, Lawrence Berkeley National Laboratory (2002), <http://crd.lbl.gov/~dhbailey/dhbpapers/arprec.pdf>

- [23] B.L. Baily, J.P. Thiran, Computing complex polynomial chebyshev approximants on the unit circle by the real remez algorithm. *SIAM J. Numer. Anal.* **36**(6), 1858–1877 (1999)
- [24] J.C. Bajard, J. Duprat, S. Kla, J.M. Muller, Some operators for on-line radix 2 computations. *J. Parallel Distrib. Comput.* **22**(2), 336–345 (1994)
- [25] J.C. Bajard, S. Kla, J.M. Muller, BKM: a new hardware algorithm for complex elementary functions. *IEEE Trans. Comput.* **43**(8), 955–963 (1994)
- [26] G.A. Baker, *Essentials of Padé Approximants* (Academic Press, New York, 1975)
- [27] G.A. Baker, *Padé Approximants*. Number 59 in *Encyclopedia of Mathematics and its Applications* (Cambridge University Press, New York, 1996)
- [28] H.G. Baker, Less complex elementary functions. *ACM SIGPLAN Not.* **27**(11), 15–16 (1992)
- [29] P.W. Baker, Suggestion for a fast binary sine/cosine generator. *IEEE Trans. Comput.* **C-25**(11) (1976)
- [30] G.V. Bard, *Sage for Undergraduates* (American Mathematical Society, 2015)
- [31] R. Barrio, A. Dena, W. Tucker, A database of rigorous and high-precision periodic orbits of the Lorenz model. *Comput. Phys. Commun.* **194**, 76–83 (2015)
- [32] P. Beame, S. Cook, H. Hoover, Log depth circuits for division and related problems. *SIAM J. Comput.* **15**, 994–1003 (1986)
- [33] M. Bekooij, J. Huisken, K. Nowak, Numerical accuracy of fast fourier transforms with CORDIC arithmetic. *J. VLSI Signal Process. Syst.* **25**(2), 187–193 (2000)
- [34] A. Benoit, F. Chyzak, A. Darrasse, S. Gerhold, M. Mezzarobba, B. Salvy, The dynamic dictionary of mathematical functions (DDMF), in *Mathematical Software—ICMS 2010*. LNCS, vol. 6327, ed. by K. Fukuda, J. van der Hoeven, M. Joswig, N. Takayama (Springer, 2010), pp. 3541
- [35] J.-P. Berrut, H. Mittelmann, Adaptive point shifts in rational approximation with optimized denominator. *J. Comput. Appl. Math.* **164–165**, 81–92 (2004)
- [36] C. Bertin, N. Brisebarre, B.D. de Dinechin, C.-P. Jeannerod, C. Monat, J.-M. Muller, S.-K. Raina, A. Tisserand, A floating-point library for integer processors, in *Proceedings of SPIE 49th Annual Meeting International Symposium on Optical Science and Technology, Denver*. SPIE, Aug 2004
- [37] C.M. Black, R.P. Burton, T.H. Miller, The need for an industry standard of accuracy for elementary-function programs. *ACM Trans. Math. Softw.* **10**(4), 361–366 (1984)
- [38] M. Bodrato, Towards optimal Toom-Cook multiplication for univariate and multivariate polynomials in characteristic 2 and 0, in *WAIFI'07 Proceedings*. LNCS, vol. 4547, ed. by C. Carlet, B. Sunar (Springer, 2007), pp. 116–133
- [39] S. Boldo, Pitfalls of a full floating-point proof: example on the formal proof of the Veltkamp/Dekker algorithms, in *Proceedings of the 3rd International Joint Conference on Automated Reasoning*. Lecture Notes in Computer Science, vol. 4130, ed. by U. Furbach, N. Shankar (2006), pp. 52–66
- [40] S. Boldo, M. Dumas, R.-C. Li, Formally verified argument reduction with a fused multiply-add. *IEEE Trans. Comput.* **58**(8), 1139–1145 (2009)
- [41] S. Boldo, M. Dumas, C. Moreau-Finot, L. Théry, Computer validated proofs of a toolset for adaptable arithmetic. Technical report, École Normale Supérieure de Lyon (2001), <http://arxiv.org/pdf/cs.MS/0107025>
- [42] S. Boldo, M. Dumas, L. Théry, Formal proofs and computations in finite precision arithmetic, in *Proceedings of the 11th Symposium on the Integration of Symbolic Computation and Mechanized Reasoning*, ed. by T. Hardin, R. Rioboo (2003)
- [43] S. Boldo, J.-C. Filliâtre, Formal verification of floating-point programs, in *Proceedings of the 18th IEEE Symposium on Computer Arithmetic* (2007), pp. 187–194
- [44] S. Boldo, G. Melquiond, Emulation of FMA and correctly rounded sums: proved algorithms using rounding to odd. *IEEE Trans. Comput.* **57**(4), 462–471 (2008)
- [45] S. Boldo, J.-M. Muller, Some functions computable with a fused-mac, in *Proceedings of the 17th IEEE Symposium on Computer Arithmetic*, June 2005, pp. 52–58
- [46] S. Boldo, J.-M. Muller, Exact and approximated error of the FMA. *IEEE Trans. Comput.* **60**, 157–164 (2011)
- [47] A.D. Booth, A signed binary multiplication technique. *Q. J. Mech. Appl. Math.* **4**(2), 236–240 (1951). Reprinted in [439]
- [48] F. Bornemann, D. Laurie, S. Wagon, J. Waldvogel, *The SIAM 100-Digit Challenge* (SIAM, 2004)
- [49] J. Borwein, D.H. Bailey, *Mathematics by Experiment: Plausible Reasoning in the 21st Century* (A. K. Peters, Natick, MA, 2004)
- [50] J.M. Borwein, P.B. Borwein, The arithmetic-geometric mean and fast computation of elementary functions. *SIAM Rev.* **26**(3), 351–366 (1984)
- [51] J.M. Borwein, P.B. Borwein, On the complexity of familiar functions and numbers. *SIAM Rev.* **30**(4), 589–601 (1988)
- [52] P. Borwein, T. Erdélyi, *Polynomials and Polynomial Inequalities*. Graduate Texts in Mathematics, vol. 161 (Springer, New York, 1995)
- [53] E.L. Braun, *Digital Computer Design* (Academic Press, New York, 1963)

- [54] K. Braune, Standard functions for real and complex point and interval arguments with dynamic accuracy. *Comput. Suppl.* **6**, 159–184 (1988)
- [55] R.P. Brent, On the precision attainable with various floating point number systems. *IEEE Trans. Comput.* **C-22**(6), 601–607 (1973)
- [56] R.P. Brent, Multiple precision zero-finding methods and the complexity of elementary function evaluation, in *Analytic Computational Complexity*, ed. by J.F. Traub (Academic Press, New York, 1975)
- [57] R.P. Brent, Fast multiple precision evaluation of elementary functions. *J. ACM* **23**, 242–251 (1976)
- [58] R.P. Brent, Algorithm 524, MP, a FORTRAN multiple-precision arithmetic package. *ACM Trans. Math. Softw.* **4**(1), 71–81 (1978)
- [59] R.P. Brent, A FORTRAN multiple-precision arithmetic package. *ACM Trans. Math. Softw.* **4**(1), 57–70 (1978)
- [60] R.P. Brent, Unrestricted algorithms for elementary and special functions, in *Information Processing 80*, ed. by S.H. Lavington (North-Holland, Amsterdam, 1980), pp. 613–619
- [61] R.P. Brent, P. Zimmermann, *Modern Computer Arithmetic*. Cambridge Monographs on Applied and Computational Mathematics, vol. 18 (Cambridge University Press, 2010)
- [62] W.S. Briggs, D.W. Matula, A 17 x 69 bit multiply and add unit with redundant binary feedback and single cycle latency, in *Proceedings of the 11th IEEE Symposium on Computer Arithmetic*, June 1993, pp. 163–171. Reprinted in [442]
- [63] N. Brisebarre, S. Chevillard, Efficient polynomial L^∞ approximations, in *Proceedings of the 18th IEEE Symposium on Computer Arithmetic* (2007), pp. 169–176
- [64] N. Brisebarre, D. Defour, P. Kornerup, J.-M. Muller, N. Revol, A new range reduction algorithm. *IEEE Trans. Comput.* **54**(3), 331–339 (2005)
- [65] N. Brisebarre, M.D. Ercegovac, J.-M. Muller, (m, p, k) -friendly points: a table-based method for trigonometric function evaluation, in *2012 IEEE 23rd International Conference on Application-Specific Systems, Architectures and Processors*, Los Alamitos, CA, USA, July 2012, pp. 46–52. IEEE Computer Society
- [66] N. Brisebarre, J.-M. Muller, Correct rounding of algebraic functions. *Theor. Inf. Appl.* **41**, 71–83 (2007)
- [67] N. Brisebarre, J.-M. Muller, Correctly rounded multiplication by arbitrary precision constants. *IEEE Trans. Comput.* **57**(2), 165–174 (2008)
- [68] N. Brisebarre, J.-M. Muller, S.-K. Raina, Accelerating correctly rounded floating-point division when the divisor is known in advance. *IEEE Trans. Comput.* **53**(8), 1069–1072 (2004)
- [69] N. Brisebarre, J.-M. Muller, A. Tisserand, Computing machine-efficient polynomial approximations. Draft, LIP Laboratory (2004), <http://perso.ens-lyon.fr/jean-michel.muller/bmt-toms.ps>
- [70] N. Brunie, F. de Dinechin, O. Kupriianova, C. Lauter, Code generators for mathematical functions, in *Proceedings of the 22nd IEEE Symposium on Computer Arithmetic*, June 2015, pp. 66–73
- [71] A. Bultheel, P. Gonzales-Vera, E. Hendriksen, O. Njåstad, *Orthogonal Rational Functions*. Cambridge Monographs on Applied and Computational Mathematics, vol. 5 (Cambridge University Press, New York, 1999)
- [72] J.W. Carr III, A.J. Perlis, J.E. Robertson, N.R. Scott, A visit to computation centers in the Soviet Union. *Commun. ACM* **2**(6), 8–20 (1959)
- [73] A. Cauchy, Sur les moyens d'éviter les erreurs dans les calculs numériques. *Comptes Rendus de l'Académie des Sciences, Paris*, 11:789–798 (1840). Republished in: Augustin Cauchy, *oeuvres complètes*, 1ère série, Tome V, pp. 431–442, <http://gallica.bnf.fr/scripts/ConsultationTout.exe?O=N090185>
- [74] J.R. Cavallaro, N.D. Hemkumar, Efficient complex matrix transformations with CORDIC, in *Proceedings of the 11th IEEE Symposium on Computer Arithmetic*, June 1993, pp. 122–129
- [75] J.R. Cavallaro, F.T. Luk, CORDIC arithmetic for an SVD processor, in *Proceedings of the 8th IEEE Symposium on Computer Arithmetic* (1988), pp. 113–120
- [76] J.R. Cavallaro, F.T. Luk, Floating-point CORDIC for matrix computations, in *Proceedings of the 1988 IEEE International Conference on Computer Design* (1988), pp. 40–42
- [77] L.W. Chang, S.W. Lee, Systolic arrays for the discrete Hartley transform. *IEEE Trans. Signal Process.* **39**(11), 2411–2418 (1991)
- [78] B.W. Char, K.O. Geddes, G.H. Gonnet, B.L. Leong, M.B. Monagan, S.M. Watt, *Maple V Library Reference Manual* (Springer, Berlin, 1991)
- [79] T.C. Chen, Automatic computation of logarithms, exponentials, ratios and square roots. *IBM J. Res. Dev.* **16**, 380–388 (1972)
- [80] E.W. Cheney, *Introduction to Approximation Theory*, International Series in Pure and Applied Mathematics (McGraw Hill, New York, 1966)
- [81] E.W. Cheney, *Introduction to Approximation Theory*, 2nd edn. (AMS Chelsea Publishing, Providence, RI, 1982)
- [82] S.H. Cheng, N.J. Higham, C.S. Kenney, A.J. Laub, Approximating the logarithm of a matrix to specified accuracy. *SIAM J. Matrix Anal. Appl.* **22**(4), 1112–1125 (2001)
- [83] S. Chevillard, J. Harrison, M. Joldes, C. Lauter, Efficient and accurate computation of upper bounds of approximation errors. *Theoret. Comput. Sci.* **412**(16), 1523–1543 (2011)

- [84] S. Chevillard, J. Harrison, M.M. Joldes, C. Lauter, Efficient and accurate computation of upper bounds of approximation errors. *J. Theoret. Comput. Sci.* **412**(16), 1523–1543 (2011)
- [85] S. Chevillard, M. Joldes, C. Lauter, Sollya: an environment for the development of numerical codes, in *Mathematical Software—ICMS 2010*, vol. 6327, Lecture Notes in Computer Science, ed. by K. Fukuda, J. van der Hoeven, M. Joswig, N. Takayama (Springer, Heidelberg, 2010), pp. 28–31
- [86] S. Chevillard, C.Q. Lauter, A certified infinite norm for the implementation of elementary functions, in *Seventh International Conference on Quality Software (QSIC 2007)*. IEEE (2007), pp. 153–160
- [87] S. Chevillard, M. Mezzarobba, Multiple precision evaluation of the Airy Ai function with reduced cancellation, in *Proceedings of the 21st IEEE Symposium on Computer Arithmetic* (2013), pp. 175–182
- [88] C.Y. Chow, J.E. Robertson, Logical design of a redundant binary adder, in *Proceedings of the 4th IEEE Symposium on Computer Arithmetic* (1978)
- [89] D.V. Chudnovsky, G.V. Chudnovsky, The computation of classical constants. *Proc. Nat. Acad. Sci.* **86**(21), 8178–8182 (1989)
- [90] C.W. Clenshaw, Rational approximations for special functions, in *Software for Numerical Mathematics*, ed. by D.J. Evans (Academic Press, New York, 1974)
- [91] C.W. Clenshaw, F.W.J. Olver, Beyond floating point. *J. ACM* **31**, 319–328 (1985)
- [92] D. Cochran, Algorithms and accuracy in the HP 35. *Hewlett Packard J.* **23**, 10–11 (1972)
- [93] W. Cody, W. Waite, *Software Manual for the Elementary Functions* (Prentice-Hall, Englewood Cliffs, 1980)
- [94] W.J. Cody, A survey of practical rational and polynomial approximation of functions. *SIAM Rev.* **12**(3), 400–423 (1970)
- [95] W.J. Cody, Static and dynamic numerical characteristics of floating-point arithmetic. *IEEE Trans. Comput.* **C-22**(6), 598–601 (1973)
- [96] W.J. Cody, Funpack, a package of special function subroutines. Technical Memorandum 385, Argonne National Laboratory, Argonne, IL (1981)
- [97] W.J. Cody, Implementation and testing of function software, in *Problems and Methodologies in Mathematical Software Production*, vol. 142, Lecture Notes in Computer Science, ed. by P.C. Messina, A. Murli (Springer, Berlin, 1982)
- [98] W.J. Cody, MACHAR: a subroutine to dynamically determine machine parameters. *ACM Trans. Math. Softw.* **14**(4), 301–311 (1988)
- [99] W.J. Cody, Performance evaluation of programs for the error and complementary error functions. *ACM Trans. Math. Softw.* **16**(1), 29–37 (1990)
- [100] W.J. Cody, Algorithm 715: SPECFUN—a portable FORTRAN package for special function routines and test drivers. *ACM Trans. Math. Softw.* **19**(1), 22–32 (1993)
- [101] W.J. Cody, CELEFUNT: a portable test package for complex elementary functions. *ACM Trans. Math. Softw.* **19**(1), 1–21 (1993)
- [102] W.J. Cody, J.T. Coonen, Algorithm 722: functions to support the IEEE standard for binary floating-point arithmetic. *ACM Trans. Math. Softw.* **19**(4), 443–451 (1993)
- [103] W.J. Cody, J.T. Coonen, D.M. Gay, K. Hanson, D. Hough, W. Kahan, R. Karpinski, J. Palmer, F.N. Ris, D. Stevenson, A proposed radix-and-word-length-independent standard for floating-point arithmetic. *IEEE MICRO* **4**(4), 86–100 (1984)
- [104] W.J. Cody, L. Stoltz, The use of Taylor series to test accuracy of function programs. *ACM Trans. Math. Softw.* **17**(1), 55–63 (1991)
- [105] J.-F. Collard, P. Feautrier, T. Risset, Construction of do loops from systems of affine constraints. *Parallel Process. Lett.* **5**, 421–436 (1995)
- [106] V. Considine, CORDIC trigonometric function generator for DSP, in *Proceedings of 1989 International Conference on Acoustics, Speech and Signal Processing* (1989), pp. 2381–2384
- [107] S.A. Cook, *On the minimum computation time of functions*. PhD thesis, Department of Mathematics, Harvard University (1966)
- [108] J.W. Cooley, J.W. Tukey, An algorithm for the machine calculation of complex Fourier series. *Math. Comput.* **19**(90), 297–301 (1965)
- [109] J.T. Coonen, An implementation guide to a proposed standard for floating-point arithmetic. *Computer* (1980)
- [110] D. Coppersmith, Finding a small root of a univariate modular equation, in *Proceedings of EUROCRYPT*, vol. 1070, Lecture Notes in Computer Science, ed. by U.M. Maurer (Springer, Berlin, 1996), pp. 155–165
- [111] D. Coppersmith, Finding small solutions to small degree polynomials, in *Proceedings of Cryptography and Lattices (CaLC)*, vol. 2146, Lecture Notes in Computer Science, ed. by J.H. Silverman (Springer, Berlin, 2001), pp. 20–31
- [112] R.M. Corless, D.J. Jeffrey, S.M. Watt, J.H. Davenport, “According to Abramowitz and Stegun” or arccoth needn’t be uncouth. *SIGSAM Bull.* **34**(2), 58–65 (2000)

- [113] M. Cornea, R.A. Golliver, P. Markstein, Correctness proofs outline for Newton–Raphson-based floating-point divide and square root algorithms, in *Proceedings of the 14th IEEE Symposium on Computer Arithmetic*, Apr 1999, pp. 96–105
- [114] M. Cornea, J. Harrison, C. Anderson, P.T.P. Tang, E. Schneider, E. Gvozdev, A software implementation of the IEEE 754R decimal floating-point arithmetic using the binary encoding format. *IEEE Trans. Comput.* **58**(2), 148–162 (2009)
- [115] M. Cornea, J. Harrison, P.T.P. Tang, *Scientific Computing on Itanium® -based Systems* (Intel Press, Hillsboro, OR, 2002)
- [116] M. Cosnard, A. Guyot, B. Hochet, J.M. Muller, H. Ouauouicha, P. Paul, E. Zysman, The FELIN arithmetic coprocessor chip, in *Proceedings of the 8th IEEE Symposium on Computer Arithmetic*, May 1987
- [117] M.F. Cowlshaw, Decimal floating-point: algorithm for computers, in *Proceedings of the 16th IEEE Symposium on Computer Arithmetic*, June 2003, pp. 104–111
- [118] A.A. Cuyt, V. Petersen, B. Verdonk, H. Waadeland, W.B. Jones, *Handbook of Continued Fractions for Special Functions*, 1st edn. (Springer Publishing Company, Incorporated, 2008)
- [119] T. Cyrix Corporation, Richardson. *FastMath Accuracy*, Report (1989)
- [120] T. Cyrix Corporation, Richardson. *Cyrix 6x86 Processor Data Book* (1996)
- [121] L. Dadda, Some schemes for parallel multipliers. *Alta Frequenza* **34**, 349–356 (1965). Reprinted in [439]
- [122] D.H. Daggett, Decimal-binary conversion in CORDIC. *IRE Trans. Electron. Comput.* **EC-8**(3), 335–339 (1959)
- [123] A. Dahan-Dalmedico, J. Pfeiffer, *Histoire des Mathématiques* (Editions du Seuil, Paris, 1986). In French
- [124] C. Daramy, D. Defour, F. de Dinechin, J.-M. Muller, CR-LIBM, a correctly rounded elementary function library, in *SPIE 48th Annual Meeting International Symposium on Optical Science and Technology*, Aug 2003
- [125] C. Daramy-Loirat, D. Defour, F. de Dinechin, M. Gallet, N. Gast, C.Q. Lauter, J.-M. Muller, CR-LIBM, a library of correctly-rounded elementary functions in double-precision. Technical report, LIP Laboratory, Aenaire team, <https://lipforge.ens-lyon.fr/frs/download.php/99/crlibm-0.18beta1.pdf>, Dec 2006
- [126] M. Daumas, C. Mazenc, X. Merrheim, J.-M. Muller, Fast and accurate range reduction for computation of the elementary functions, in *Proceedings of the 14th IMACS World Congress on Computational and Applied Mathematics*. IMACS, Piscataway, NJ (1994), pp. 1196–1198
- [127] M. Daumas, C. Mazenc, X. Merrheim, J.-M. Muller, Modular range reduction: a new algorithm for fast and accurate computation of the elementary functions. *J. Univ. Comput. Sci.* **1**(3), 162–175 (1995)
- [128] M. Daumas, G. Melquiond, Certification of bounds on expressions involving rounded operators. *ACM Trans. Math. Softw.* **37**(1), 2:1–2:20 (2010)
- [129] M. Daumas, G. Melquiond, C. Muñoz, Guaranteed proofs using interval arithmetic, in *Proceedings of the 17th IEEE Symposium on Computer Arithmetic* (2005), pp. 188–195
- [130] H. Dawid, H. Meyr, The differential CORDIC algorithm: constant scale factor redundant implementation without correcting iterations. *IEEE Trans. Comput.* **45**(3), 307–318 (1996)
- [131] F. de Dinechin, A.V. Ershov, N. Gast, Towards the post-ultimate libm, in *Proceedings of the 17th IEEE Symposium on Computer Arithmetic* (2005), pp. 288–295
- [132] F. de Dinechin, N. Gast, Towards the post-ultimate libm. Research Report 2004-47, LIP, École normale supérieure de Lyon (2004), <http://www.ens-lyon.fr/LIP/Pub/Rapports/RR/RR2004/RR2004-47.pdf>
- [133] F. de Dinechin, C. Lauter, G. Melquiond, Assisted verification of elementary functions using Gappa, in *Proceedings of the 2006 ACM Symposium on Applied Computing*, Dijon, France (2006), pp. 1318–1322
- [134] F. de Dinechin, C. Lauter, G. Melquiond, Certifying the floating-point implementation of an elementary function using Gappa. *Trans. Comput.* **60**(2), 242–253 (2011)
- [135] F. de Dinechin, C. Lauter, J.-M. Muller, S. Torres, On Ziv’s rounding test. *ACM Trans. Math. Softw.* **39**(4) (2013)
- [136] F. de Dinechin, C.Q. Lauter, J.-M. Muller, Fast and correctly rounded logarithms in double-precision. *Theor. Inf. Appl.* **41**, 85–102 (2007)
- [137] F. de Dinechin, B. Pasca, Designing custom arithmetic data paths with FloPoCo. *IEEE Des. Test Comput.* **28**(4), 18–27 (2011)
- [138] F. de Dinechin, A. Tisserand, Some improvements on multipartite table methods, in *Proceedings of the 15th IEEE Symposium on Computer Arithmetic* (2001), pp. 128–135. Reprinted in [442]
- [139] F. de Dinechin, A. Tisserand, Multipartite table methods. *IEEE Trans. Comput.* **54**(3), 319–330 (2005)
- [140] C.J. de La Vallée Poussin, *L’approximation des Fonctions d’une Variable Réelle (in French)* (Gauthier-Villars, Paris, 1919)
- [141] H. de Lassus Saint-Genies, D. Defour, G. Revy, Range reduction based on pythagorean triples for trigonometric function evaluation, in *IEEE 26th International Conference on Application-specific Systems, Architectures and Processors (ASAP)*, July 2015, pp. 74–81
- [142] G. Deaconu, C. Louembet, A. Theron, Designing continuously constrained spacecraft relative trajectories for proximity operations. *J. Guidance Control Dyn.* **38**(7), 1208–1217 (2015)
- [143] D. Defour, Cache-optimised methods for the evaluation of elementary functions. Technical Report RR2002-38, LIP Laboratory, ENS Lyon, <ftp://ftp.ens-lyon.fr/pub/LIP/Rapports/RR/RR2002/RR2002-38.ps.gz>, Oct 2002

- [144] D. Defour, *Fonctions élémentaires : algorithmes et implémentations efficaces pour l'arrondi correct en double précision (in French)*. PhD thesis, École Normale Supérieure de Lyon, Sept 2003
- [145] D. Defour, F. de Dinechin, Software carry-save for fast multiple-precision algorithms, in *35th International Congress of Mathematical Software*, Aug 2002, pp. 29–40
- [146] D. Defour, G. Hanrot, V. Lefèvre, J.-M. Muller, N. Revol, P. Zimmermann, Proposal for a standardization of mathematical function implementation in floating-point arithmetic. *Numer. Algorithms* **37**(1–4), 367–375 (2004)
- [147] D. Defour, P. Kornerup, J.-M. Muller, N. Revol, A new range reduction algorithm, in *Thirty-Fifth Asilomar Conference on Signals, Systems, and Computers*, vol. 2 (2001), pp. 1656–1660
- [148] T.J. Dekker, A floating-point technique for extending the available precision. *Numer. Math.* **18**(3), 224–242 (1971)
- [149] J.M. Delosme, A processor for two-dimensional symmetric eigenvalue and singular value arrays, in *Twenty-First Asilomar Conference on Circuits, Systems, and Computers*, Nov 1987, pp. 217–221
- [150] J.M. Delosme, Bit-level systolic algorithms for real symmetric and hermitian eigenvalue problems. *J. VLSI Signal Process.* **4**, 69–88 (1992)
- [151] B. DeLugish, *A class of algorithms for automatic evaluation of functions and computations in a digital computer*. PhD thesis, Department of Computer Science, University of Illinois, Urbana-Champaign, IL (1970)
- [152] E. Deprettere, P. Dewilde, R. Udo, Pipelined CORDIC architectures for fast VLSI filtering and array processing, in *Proceedings of ICASSP'84* (1984), pp. 41.A.6.1–41.A.6.4
- [153] E.F. Deprettere, A.J. de Lange, Design and implementation of a floating-point quasi-systolic general purpose CORDIC rotator for high-rate parallel data and signal processing, in *Proceedings of the 10th IEEE Symposium on Computer Arithmetic*, June 1991, pp. 272–281
- [154] A.M. Despain, Fourier transform computers using CORDIC iterations. *IEEE Trans. Comput.* **C-33**(5) (1974)
- [155] P. Deuffhard, A short history of Newton's method. *Doc. Math. ISMP*, 25–30 (2012)
- [156] J.V. Deun, A. Bultheel, An interpolation algorithm for orthogonal rational functions. *J. Comput. Appl. Math.* **164–165**, 749–762 (2004)
- [157] L. Didier, F. Rico, High radix BKM algorithm. *Numer. Algorithms* **37**(1–4), 113–125 (2004)
- [158] W.S. Dorn, Generalizations of Horner's rule for polynomial evaluation. *IBM J. Res. Dev.* **6**(2), 239–245 (1962)
- [159] C.B. Dunham, Rational approximation with a vanishing weight function and with a fixed value at zero. *Math. Comput.* **30**(133), 45–47 (1976)
- [160] C.B. Dunham, Choice of basis for Chebyshev approximation. *ACM Trans. Math. Softw.* **8**(1), 21–25 (1982)
- [161] C.B. Dunham, Provably monotone approximations I. *SIGNAL Newsl.* **22**, 6–11 (1987)
- [162] C.B. Dunham, Provably monotone approximations, II. *SIGNAL Newsl.* **22**, 30–31 (1987)
- [163] C.B. Dunham, Feasibility of “perfect” function evaluation. *SIGNAL Newsl.* **25**(4), 25–26 (1990)
- [164] C.B. Dunham, Fitting approximations to the Kuki-Cody-Waite form. *Int. J. Comput. Math.* **31**, 263–265 (1990)
- [165] C.B. Dunham, Provably monotone approximations, IV. Technical Report 422, Department of Computer Science, The University of Western Ontario, London, Canada (1994)
- [166] C.B. Dunham, Approximation with Taylor matching at the origin. *Int. J. Comput. Math.* **80**(8), 1019–1024 (2003)
- [167] J. Duprat, J.-M. Muller, Hardwired polynomial evaluation. *J. Parallel Distrib. Comput.*, Special Issue on Parallelism in Computer Arithmetic (5) (1988)
- [168] J. Duprat, J.-M. Muller, The CORDIC algorithm: new results for fast VLSI implementation. *IEEE Trans. Comput.* **42**(2), 168–178 (1993)
- [169] S.W. Ellacott, On the Faber transform and efficient numerical rational approximation. *SIAM J. Numer. Anal.* **20**(5), 989–1000 (1983)
- [170] M. Ercegovac, T. Lang, J.-M. Muller, A. Tisserand, Reciprocation, square root, inverse square root and some elementary functions using small multipliers. *IEEE Trans. Comput.* **49**(7), 628–637 (2000). Reprinted in [442]
- [171] M.D. Ercegovac, Radix 16 evaluation of certain elementary functions. *IEEE Trans. Comput.* **C-22**(6), 561–566, June 1973. Reprinted in [439]
- [172] M.D. Ercegovac, *A general method for evaluation of functions and computation in a digital computer*. PhD thesis, Department of Computer Science, University of Illinois, Urbana-Champaign, IL (1975)
- [173] M.D. Ercegovac, A general hardware-oriented method for evaluation of functions and computations in a digital computer. *IEEE Trans. Comput.* **C-26**(7), 667–680 (1977)
- [174] M.D. Ercegovac, On-line arithmetic: an overview, in *SPIE, Real Time Signal Processing VII*. SPIE-The International Society for Optical Engineering, Bellingham, WA (1984), pp. 86–93
- [175] M.D. Ercegovac, T. Lang, Fast cosine/sine implementation using on-line CORDIC, in *Twenty-First Asilomar Conference on Signals, Systems, and Computers* (1987)
- [176] M.D. Ercegovac, T. Lang, On-the-fly conversion of redundant into conventional representations. *IEEE Trans. Comput.* **C-36**(7), 895–897 (1987). Reprinted in [440]
- [177] M.D. Ercegovac, T. Lang, On-line scheme for computing rotation factors. *J. Parallel Distrib. Comput. Special Issue on Parallelism in Computer Arithmetic* (5), 209–227 (1988). Reprinted in [440]
- [178] M.D. Ercegovac, T. Lang, Redundant and on-line CORDIC: application to matrix triangularization and SVD. *IEEE Trans. Comput.* **39**(6), 725–740 (1990)

- [179] M.D. Ercegovac, T. Lang, *Division and Square Root: Digit-Recurrence Algorithms and Implementations* (Kluwer Academic Publishers, Boston, 1994)
- [180] M.D. Ercegovac, T. Lang, *Digital Arithmetic* (Morgan Kaufmann Publishers, San Francisco, 2004)
- [181] M.D. Ercegovac, T. Lang, P. Montuschi, Very-high radix division with prescaling and selection by rounding. *IEEE Trans. Comput.* **43**(8), 909–918 (1994)
- [182] M.D. Ercegovac, K.S. Trivedi, On-line algorithms for division and multiplication. *IEEE Trans. Comput.* **C-26**(7), 681–687 (1977). Reprinted in [440]
- [183] M.A. Erle, M.J. Schulte, B.J. Hickmann, Decimal floating-point multiplication via carry-save addition, in *Proceedings of the 18th IEEE Symposium on Computer Arithmetic*, June 2007, pp. 46–55
- [184] G. Estrin, Organization of computer systems—the fixed plus variable structure computer, in *Proceedings Western Joint Computing Conference*, vol. 17, pp. 33–40 (1960)
- [185] A. Feldstein, R. Goodman, Convergence estimates for the distribution of trailing digits. *J. ACM* **23**, 287–297 (1976)
- [186] W. Ferguson, Exact computation of a sum or difference with applications to argument reduction, in *Proceedings of the 12th IEEE Symposium on Computer Arithmetic*, July 1995, pp. 216–221
- [187] W. Ferguson, Private communication. Unpublished (1997)
- [188] W. Ferguson, T. Brightman, Accurate and monotone approximations of some transcendental functions, in *Proceedings of the 10th IEEE Symposium on Computer Arithmetic*, June 1991, pp. 237–244. Reprinted in [442]
- [189] C.T. Fike, Methods for evaluating polynomial approximations in function evaluation routines. *Commun. ACM* **10**(3), 175–178 (1967)
- [190] B.P. Flannery, W.H. Press, S.A. Teukolsky, W.T. Vetterling, *Numerical Recipes in C*, 2nd edn. (Cambridge University Press, New York, 1992)
- [191] M.J. Flynn, S.F. Oberman, *Advanced Computer Arithmetic Design* (Wiley-Interscience, 2001)
- [192] A. Fog, The microarchitecture of Intel, AMD and VIA CPUs: an optimization guide for assembly programmers and compiler makers. Technical report, Technical University of Denmark (2014), <http://www.agner.org/optimize/>
- [193] P. Fortin, M. Gouicem, S. Graillat, Towards solving the table maker’s dilemma on GPU, in *2012 20th Euromicro International Conference on Parallel, Distributed and Network-Based Processing (PDP)*, Feb 2012, pp. 407–415
- [194] L. Fousse, G. Hanrot, V. Lefèvre, P. Pélicissier, P. Zimmermann, MPFR: a multiple-precision binary floating-point library with correct rounding. *ACM Trans. Math. Softw.* **33**(2) (2007), <http://www.mpfr.org/>
- [195] D. Fowler, E. Robson, Square root approximations in old Babylonian mathematics: YBC 7289 in context. *Historia Mathematica* **25**, 366–378 (1998)
- [196] W. Fraser, A survey of methods of computing minimax and near-minimax polynomial approximations for functions of a single independent variable. *J. ACM* **12**(3), 295–314 (1965)
- [197] M. Fürer, Faster integer multiplication, in *Proceedings of the 39th Annual ACM Symposium on Theory of Computing, San Diego, CA*, ed. by D.S. Johnson, U. Feige, June 2007. ACM, pp. 57–66
- [198] S. Gal, Computing elementary functions: a new approach for achieving high accuracy and good performance, *Accurate Scientific Computations*, vol. 235, Lecture Notes in Computer Science (Springer, Berlin, 1986), pp. 1–16
- [199] S. Gal, B. Bachelis, An accurate elementary mathematical library for the IEEE floating point standard. *ACM Trans. Math. Softw.* **17**(1), 26–45 (1991)
- [200] M. Garrido, J. Grajal, Efficient memoryless CORDIC for FFT computation, in *IEEE International Conference on Acoustics, Speech and Signal Processing, 2007*, vol. 2, April 2007, pp. II–113–II–116
- [201] M. Garrido, P. Kallstrom, M. Kumm, O. Gustafsson, CORDIC II: a new improved CORDIC algorithm. *IEEE Trans. Circuits Syst. II: express briefs* **63**(2), 186–190 (2016)
- [202] W. Gautschi, *Numerical Analysis: An Introduction* (Birkhäuser, Boston, 1997)
- [203] W. Gautschi, G.H. Golub, G. Opfer (eds.), *Applications and Computation of Orthogonal Polynomials* (International Series of Numerical Mathematics. Birkhäuser, Basel, 1999)
- [204] W.M. Gentleman, S.B. Marovitch, More on algorithms that reveal properties of floating-point arithmetic units. *Commun. ACM* **17**(5), 276–277 (1974)
- [205] A. Gil, J. Segura, N. Temme, *Numerical Methods for Special Functions*. Society for Industrial and Applied Mathematics (2007)
- [206] D. Goldberg, What every computer scientist should know about floating-point arithmetic. *ACM Comput. Surv.* **23**(1), 5–47, Mar 1991. An edited reprint is available at http://www.physics.ohio-state.edu/~dws/group/links/floating_point_math.pdf from Sun’s Numerical Computation Guide; it contains an addendum *Differences Among IEEE 754 Implementations*, <http://www.validlab.com/goldberg/addendum.html>
- [207] X. Gourdon, P. Sebah, Binary splitting methods (2001), <http://numbers.computation.free.fr/Constants/Algorithms/splitting.ps>
- [208] P.J. Grabner, C. Heuberger, On the number of optimal base 2 representations of integers. *Des. Codes Crypt.* **40**, 25–39 (2006)
- [209] S. Graillat, V. Lefèvre, J.-M. Muller, On the maximum relative error when computing integer powers by iterated multiplications in floating-point arithmetic. *Numerical Algorithms* (2015), pp. 1–15

- [210] T. Granlund, The GNU multiple precision arithmetic library, release 4.1.4. Sept 2004, <http://gmplib.org/gmp-man-4.1.4.pdf>
- [211] J. Gustafson, *The End of Error: Unum Computing*. Chapman & Hall/CRC Computational Science (Taylor & Francis, 2015)
- [212] B. Haible, T. Papanikolaou, Fast multiprecision evaluation of series of rational numbers, in *Algorithmic Number Theory*, vol. 1423, Lecture Notes in Computer Science, ed. by J. Buhler (Springer, Berlin, 1998), pp. 338–350
- [213] H. Hamada, A new approximation form for mathematical functions, in *Proceedings of SCAN-95, IMACS/GAMM Symposium on Scientific Computing, Computer Arithmetic and Validated Numerics*, Sept 1995
- [214] E.R. Hansen, M.L. Patrick, R.L.C. Wang, Polynomial evaluation with scaling. *ACM Trans. Math. Softw.* **16**(1), 86–93 (1990)
- [215] Y. Harata, Y. Nakamura, H. Nagase, M. Takigawa, N. Takagi, A high-speed multiplier using a redundant binary adder tree. *IEEE J. Solid-State Circuits* **SC-22**(1), 28–34 (1987). Reprinted in [440]
- [216] J. Harrison, Floating-point verification in HOL light: the exponential function. Technical Report 428, University of Cambridge Computer Laboratory (1997)
- [217] J. Harrison, A machine-checked theory of floating-point arithmetic, in *Theorem Proving in Higher Order Logics: 12th International Conference, TPHOLS'99*, Lecture Notes in Computer Science, vol. 1690, ed. by Y. Bertot, G. Dowek, A. Hirschowitz, C. Paulin, L. Théry (Springer, Berlin, 1999), pp. 113–130
- [218] J. Harrison, Formal verification of floating-point trigonometric functions, in *Proceedings of the 3rd International Conference on Formal Methods in Computer-Aided Design, FMCAD 2000*, number 1954 in Lecture Notes in Computer Science, ed. by W.A. Hunt, S.D. Johnson (Springer, Berlin, 2000), pp. 217–233
- [219] J. Harrison, Formal verification of IA-64 division algorithms, in *Proceedings of the 13th International Conference on Theorem Proving in Higher Order Logics, TPHOLS 2000*. Lecture Notes in Computer Science, vol. 1869, ed. by M. Aagaard, J. Harrison (Springer, 2000), pp. 234–251
- [220] J. Harrison, Floating-point verification using theorem proving, in *Formal Methods for Hardware Verification, 6th International School on Formal Methods for the Design of Computer, Communication, and Software Systems, SFM 2006*. Lecture Notes in Computer Science, vol. 3965, ed. by M. Bernardo, A. Cimatti (Springer, Bertinoro, Italy, 2006), pp. 211–242
- [221] J. Harrison, Verifying nonlinear real formulas via sums of squares, in *Proceedings of the 20th International Conference on Theorem Proving in Higher Order Logics, TPHOLS 2007*. Lecture Notes in Computer Science, vol. 4732, ed. by K. Schneider, J. Brandt (Springer, Kaiserslautern, Germany, 2007), pp. 102–118
- [222] J. Harrison, Decimal transcendentals via binary, in *Proceedings of the 19th IEEE Symposium on Computer Arithmetic*, June 2009, pp. 187–194
- [223] J. Harrison, Fast and accurate Bessel function computation, in *Proceedings of the 19th IEEE Symposium on Computer Arithmetic* (2009), pp. 104–113
- [224] J. Harrison, T. Kubaska, S. Story, P.T.P. Tang, The computation of transcendental functions on the IA-64 architecture. *Intel Technol. J. Q4* (1999), <http://developer.intel.com/technology/itj/archive/1999.htm>
- [225] J.F. Hart, E.W. Cheney, C.L. Lawson, H.J. Maehly, C.K. Mesztenyi, J.R. Rice, H.G. Thacher, C. Witzgall, *Computer Approximations* (Wiley, New York, 1968)
- [226] D. Harvey, J.v.d. Hoeven, G. Lecerf, Even faster integer multiplication. Technical report, ArXiv (2014), <http://arxiv.org/abs/1407.3360>
- [227] J.R. Hauser, Handling floating-point exceptions in numeric programs. Technical Report UCB//CSD-95-870, Computer Science Division, University of California, Berkeley, CA, Mar 1995
- [228] G.H. Haviland, A.A. Tuszinsky, A CORDIC arithmetic processor chip. *IEEE Trans. Comput.* **C-29**(2) (1980)
- [229] G.H. Hekstra, E.F.A. Deprettere, Floating-point CORDIC, in *Proceedings of the 11th IEEE Symposium on Computer Arithmetic*, June 1993, pp. 130–137
- [230] N.D. Hemkumar, J.R. Cavallaro, Redundant and on-line CORDIC for unitary transformations. *IEEE Trans. Comput.* **43**(8), 941–954 (1994)
- [231] Y. Hida, X.S. Li, D.H. Bailey, Algorithms for quad-double precision floating-point arithmetic, in *Proceedings of the 15th IEEE Symposium on Computer Arithmetic*, June 2001, pp. 155–162
- [232] N.J. Higham, *Accuracy and Stability of Numerical Algorithms*, 2nd edn. (SIAM, Philadelphia, 2002)
- [233] N.J. Higham, *Functions of Matrices: Theory and Computation*. Society for Industrial and Applied Mathematics (Philadelphia, PA, USA, 2008)
- [234] N.J. Higham, M.I. Smith, Computing the matrix cosine. *Numer. Algorithms* **34**, 13–26 (2003)
- [235] E. Hokenek, R.K. Montoye, P.W. Cook, Second-generation RISC floating point with multiply-add fused. *IEEE J. Solid-State Circuits* **25**(5), 1207–1213 (1990)
- [236] W.G. Horner, A new method of solving numerical equations of all orders by continuous approximation. *Philos. Trans. R. Soc. Lond.* **109**, 308–335 (1819), <http://www.jstor.org/stable/107508>
- [237] S. Hsiao, C. Lau, J.-M. Delosme, Redundant constant-factor implementation of multi-dimensional CORDIC and its application to complex SVD. *J. VLSI Signal Process. Syst.* **25**(2), 155–166 (2000)
- [238] S.F. Hsiao, J.M. Delosme, Householder CORDIC algorithms. *IEEE Trans. Comput.* **44**(8), 990–1000 (1995)

- [239] X. Hu, S.C. Bass, R.G. Harber, An efficient implementation of singular value decomposition rotation transformations with CORDIC processors. *J. Parallel Distrib. Comput.* **17**, 360–362 (1993)
- [240] Y.H. Hu, The quantization effects of the CORDIC algorithm. *IEEE Trans. Signal Process.* **40**(4), 834–844 (1992)
- [241] Y.H. Hu, S. Naganathan, An angle recoding method for CORDIC algorithm implementation. *IEEE Trans. Comput.* **42**(1), 99–102 (1993)
- [242] T.E. Hull, T.F. Fairgrieve, P.T.P. Tang, Implementing complex elementary functions using exception handling. *ACM Trans. Math. Softw.* **20**(2), 215–244 (1994)
- [243] T.E. Hull, T.F. Fairgrieve, P.T.P. Tang, Implementing the complex arcsine and arccosine functions using exception handling. *ACM Trans. Math. Softw.* **23**(3), 299–335 (1997)
- [244] K. Hwang, *Computer Arithmetic Principles, Architecture and design* (Wiley, New York, 1979)
- [245] IEEE Computer Society. *IEEE Standard for Floating-Point Arithmetic*. IEEE Standard 754-2008, Aug 2008, <http://ieeexplore.ieee.org/servlet/opac?punumber=4610933>
- [246] L. Imbert, J. Muller, F. Rico, Radix-10 BKM algorithm for computing transcendentals on a pocket computer. *J. VLSI Signal Process.* **25**(2), 179–186 (2000)
- [247] International Organization for Standardization, Information technology— Language independent arithmetic— Part 2: Elementary numerical functions. ISO/IEC standard 10967-2 (2001)
- [248] C. Iordache, D.W. Matula, On infinitely precise rounding for division, square root, reciprocal and square root reciprocal, in *Proceedings of the 14th IEEE Symposium on Computer Arithmetic*, Apr 1999, pp. 233–240
- [249] A. Iserles, A. Zanna, Efficient computation of the matrix exponential by generalized polar decompositions. *SIAM J. Numer. Anal.* **42**(5), 2218–2256 (2005)
- [250] F. Jaime, M. Sanchez, J. Hormigo, J. Villalba, E. Zapata, High-speed algorithms and architectures for range reduction computation. *IEEE Trans. Very Large Scale Integ. (VLSI) Syst.* **19**(3), 512–516 (2011)
- [251] F. Jaime, J. Villalba, J. Hormigo, E. Zapata, Pipelined range reduction for floating point numbers, in *Proceedings of the IEEE International Conference on Application-specific Systems, Architectures and Processors*, Sept 2006, pp. 145–152
- [252] F.J. Jaime, M.A. Sánchez, J. Hormigo, J. Villalba, E.L. Zapata, Enhanced scaling-free CORDIC. *IEEE Trans. Circuits Syst. Part I* **57**(7), 1654–1662 (2010)
- [253] C.-P. Jeannerod, N. Louvet, J.-M. Muller, Further analysis of Kahan’s algorithm for the accurate computation of 2×2 determinants. *Math. Comput.* **82**(284), 2245–2264 (2013)
- [254] C.-P. Jeannerod, N. Louvet, J.-M. Muller, A. Panhaleux, Midpoints and exact points of some algebraic functions in floating-point arithmetic. *IEEE Trans. Comput.* **60**(2) (2011)
- [255] C.-P. Jeannerod, C. Moulleron, J.-M. Muller, G. Revy, C. Bertin, J. Jourdan-Lu, H. Knochel, C. Monat, Techniques and tools for implementing IEEE 754 floating-point arithmetic on VLIW integer processors, in *Proceedings of the 4th International Workshop on Parallel and Symbolic Computation*, PASCO ’10, New York, NY, USA (ACM, 2010), pp. 1–9
- [256] R.M. Jessani, C.H. Olson, The floating-point unit of the PowerPC 603e microprocessor. *IBM J. Res. Dev.* **40**(5), 559–566 (1996)
- [257] F. Johansson, Evaluating parametric holonomic sequences using rectangular splitting, in *Proceedings of the 39th International Symposium on Symbolic and Algebraic Computation*, ISSAC ’14, New York, NY, USA (ACM, 2014), pp. 256–263
- [258] F. Johansson, Efficient implementation of elementary functions in the medium-precision range, in *Proceedings of the 22nd Symposium on Computer Arithmetic*, June 2015, pp. 83–89
- [259] M. Joldes, *Rigorous polynomial approximations and applications*. Ph.D. thesis, École Normale Supérieure de Lyon, Lyon, France (2011)
- [260] M. Joldes, V. Popescu, W. Tucker, Searching for sinks for the Henon map using a multiple-precision GPU arithmetic library. *SIGARCH Comput. Archit. News* **42**(4), 63–68 (2014)
- [261] W. Kahan, Pracniques: further remarks on reducing truncation errors. *Commun. ACM* **8**(1), 40 (1965)
- [262] W. Kahan, Minimizing q^*m-n . Text accessible electronically at <http://http.cs.berkeley.edu/~wkahan/>. At the beginning of the file “nearpi.c” (1983)
- [263] W. Kahan, Branch cuts for complex elementary functions, in *The State of the Art in Numerical Analysis*, ed. by A. Iserles, M.J.D. Powell (Clarendon Press, Oxford, 1987), pp. 165–211
- [264] W. Kahan, Paradoxes in concepts of accuracy, in *Lecture notes from Joint Seminar on Issues and Directions in Scientific Computations*, U.C. Berkeley (1989)
- [265] W. Kahan, Lecture notes on the status of IEEE-754. PDF file accessible at <http://www.cs.berkeley.edu/~wkahan/ieee754status/IEEE754.PDF> (1996)
- [266] W. Kahan, IEEE 754: an interview with William Kahan. *Computer* **31**(3), 114–115 (1998)
- [267] W. Kahan, A logarithm too clever by half (2004), <http://http.cs.berkeley.edu/~wkahan/LOG10HAF.TXT>
- [268] A. Karatsuba, Y. Ofman, Multiplication of many-digital numbers by automatic computers. *Doklady Akad. Nauk SSSR* **145**, 293–294 (1962). Translation in *Physics-Doklady* **7**(595–596) (1963)

- [269] A.H. Karp, P. Markstein, High-precision division and square root. *ACM Trans. Math. Softw.* **23**(4), 561–589 (1997)
- [270] R. Karpinsky, PARANOIA: a floating-point benchmark. *BYTE* **10**(2) (1985)
- [271] A.Y. Khinchin, *Continued Fractions* (Dover, New York, 1997)
- [272] N.G. Kingsbury, P.J.W. Rayner, Digital filtering using logarithmic arithmetic. *Electron. Lett.* **7**, 56–58 (1971). Reprinted in [439]
- [273] P. Kirchberger, *Ueber Tchebycheffsche Annaeherungsmethoden*. Ph.D. thesis, Gottingen (1902)
- [274] A. Klein, A generalized Kahan-Babuška-summation-algorithm. *Computing* **76**, 279–293 (2006)
- [275] D. Knuth, *The Art of Computer Programming*, vol. 2, 3rd edn. (Addison-Wesley, Reading, MA, 1998)
- [276] D. König, J.F. Böhme, Optimizing the CORDIC algorithm for processors with pipeline architectures, in *Signal Processing V: Theories and Applications*, ed. by L. Torres, E. Masgrau, M.A. Lagunas (Elsevier Science, Amsterdam, 1990)
- [277] I. Koren, *Computer Arithmetic Algorithms* (Prentice-Hall, Englewood Cliffs, 1993)
- [278] I. Koren, O. Zinaty, Evaluating elementary functions in a numerical coprocessor based on rational approximations. *IEEE Trans. Comput.* **39**(8), 1030–1037 (1990)
- [279] P. Kornerup, C. Lauter, V. Lefèvre, N. Louvet, J.-M. Muller, Computing correctly rounded integer powers in floating-point arithmetic. *ACM Trans. Math. Softw.* **37**(1), 4:1–4:23 (2010)
- [280] P. Kornerup, V. Lefevre, N. Louvet, J.-M. Muller, On the computation of correctly rounded sums. *IEEE Trans. Comput.* **61**(3), 289–298 (2012)
- [281] P. Kornerup, D.W. Matula, Finite precision lexicographic continued fraction number systems, in *Proceedings of the 7th IEEE Symposium on Computer Arithmetic* (1985). Reprinted in [440]
- [282] P. Kornerup, D.W. Matula, *Finite Precision Number Systems and Arithmetic* (Cambridge University Press, 2010). Cambridge Books Online
- [283] K. Kota, J.R. Cavallaro, Numerical accuracy and hardware tradeoffs for CORDIC arithmetic for special-purpose processors. *IEEE Trans. Comput.* **42**(7), 769–779 (1993)
- [284] W. Krämer, Inverse standard functions for real and complex point and interval arguments with dynamic accuracy. *Comput. Suppl.* **6**, 185–212 (1988)
- [285] J. Kropa, Calculator algorithms. *Math. Mag.* **51**(2), 106–109 (1978)
- [286] H. Kuki, W.J. Cody, A statistical study of the accuracy of floating-point number systems. *Commun. ACM* **16**(14), 223–230 (1973)
- [287] U.W. Kulisch, Mathematical foundation of computer arithmetic. *IEEE Trans. Comput.* **C-26**(7), 610–621 (1977)
- [288] U.W. Kulisch, W.L. Miranker, *Computer Arithmetic in Theory and Practice* (Academic Press, New York, 1981)
- [289] O. Kupriianova, C. Lauter, A domain splitting algorithm for the mathematical functions code generator, in *48th Asilomar Conference on Signals, Systems and Computers*, Nov 2014, pp. 1271–1275
- [290] O. Kupriianova, C. Lauter, Replacing branches by polynomials in vectorizable elementary functions, in *Book of abstracts for 16th GAMM-IMACS International Symposium on Scientific Computing, Computer Arithmetic and Validated Numerics* (2014)
- [291] T. Lang, E. Antelo, CORDIC-based computation of arccos and arcsin, in *ASAP'97, The IEEE International Conference on Application-Specific Systems, Architectures and Processors*. IEEE Computer Society Press, Los Alamitos, CA, July 1997
- [292] T. Lang, E. Antelo, Cordic-based computation of arccos and $\sqrt{1-t^2}$. *J. VLSI Signal Process. Syst.* **25**(1), 19–38 (2000)
- [293] T. Lang, E. Antelo, High-throughput CORDIC-based geometry operations for 3D computer graphics. *IEEE Trans. Comput.* **54**(3), 347–361 (2005)
- [294] T. Lang, J.A. Lee, SVD by constant-factor-redundant CORDIC, in *Proceedings of the 10th IEEE Symposium on Computer Arithmetic*, June 1991, pp. 264–271
- [295] T. Lang, J.-M. Muller, Bound on run of zeros and ones for algebraic functions, in *Proceedings of the 15th IEEE Symposium on Computer Arithmetic*, June 2001, pp. 13–20
- [296] M. Langhammer, B. Pasca, Efficient floating-point polynomial evaluation on FPGAs, in *Field Programmable Logic and Applications (FPL'2013)* (2013)
- [297] M. Langhammer and B. Pasca. Elementary function implementation with optimized sub range polynomial evaluation. In *Field Programmable Custom Computing Machines 2013 (FCCM'13)*, pages 202–205, 2013
- [298] P.J. Laurent, *Approximation et Optimisation*. Enseignement des Sciences (in French). Hermann, Paris, France (1972)
- [299] C. Lauter, M. Mezzarobba, Semi-automatic floating-point implementation of special functions, in *Proceedings of the 22nd IEEE Symposium on Computer Arithmetic*, June 2015, pp. 58–65
- [300] C.Q. Lauter, Basic building blocks for a triple-double intermediate format. Technical Report 2005-38, LIP, École Normale Supérieure de Lyon, Sept 2005
- [301] C.Q. Lauter, *Arrondi Correct de Fonctions Mathématiques*. Ph.D. thesis, École Normale Supérieure de Lyon, Lyon, France, Oct 2008. In French, <http://www.ens-lyon.fr/LIP/web/>

- [302] C.Q. Lauter, V. Lefèvre, An efficient rounding boundary test for $\text{pow}(x, y)$ in double precision. *IEEE Trans. Comput.* **58**(2), 197–207 (2009)
- [303] D.-U. Lee, W. Luk, J. Villasenor, P. Cheung, Hierarchical segmentation schemes for function evaluation, in *Proceedings of the IEEE International Conference on Field-Programmable Technology*, Dec 2003, pp. 92–99
- [304] D.-U. Lee, J.D. Villasenor, Optimized custom precision function evaluation for embedded processors. *IEEE Trans. Comput.* **58**(1), 46–59 (2009)
- [305] V. Lefèvre, *Developments in Reliable Computing*, chapter An Algorithm that Computes a Lower Bound on the Distance Between a Segment and \mathbb{Z}^2 (Kluwer Academic Publishers, Dordrecht, 1999), pp. 203–212
- [306] V. Lefèvre, *Moyens Arithmétiques Pour un Calcul Fiable*. Ph.D. thesis, École Normale Supérieure de Lyon, Lyon, France (2000)
- [307] V. Lefèvre, New results on the distance between a segment and \mathbb{Z}^2 . Application to the exact rounding, in *Proceedings of the 17th IEEE Symposium on Computer Arithmetic*, June 2005, pp. 68–75
- [308] V. Lefèvre, J.-M. Muller, Worst cases for correct rounding of the elementary functions in double precision, in *Proceedings of the 15th IEEE Symposium on Computer Arithmetic*, June 2001
- [309] V. Lefèvre, J.-M. Muller, On-the-fly range reduction. *J. VLSI Signal Process.* **33**(1/2), 31–35 (2003)
- [310] V. Lefèvre, J.-M. Muller, A. Tisserand, Towards correctly rounded transcendentals, in *Proceedings of the 13th IEEE Symposium on Computer Arithmetic* (1997)
- [311] V. Lefèvre, J.-M. Muller, A. Tisserand, Toward correctly rounded transcendentals. *IEEE Trans. Comput.* **47**(11), 1235–1243 (1998). Reprinted in [442]
- [312] V. Lefèvre, D. Stehlé, P. Zimmermann, Worst cases for the exponential function in the IEEE 754r decimal64 format, in *Reliable Implementation of Real Number Algorithms: Theory and Practice*. Lecture Notes in Computer Sciences, vol. 5045 (Springer, Berlin, 2008), pp. 114–126
- [313] A.K. Lenstra, H.W. Lenstra Jr., L. Lovász, Factoring polynomials with rational coefficients. *Math. Ann.* **261**, 515–534 (1982)
- [314] R.-C. Li, Near optimality of Chebyshev interpolation for elementary function computation. *IEEE Trans. Comput.* **53**(6), 678–687 (2004)
- [315] R.-C. Li, S. Boldo, M. Daumas, Theorems on efficient argument reduction, in *Proceedings of the 16th IEEE Symposium on Computer Arithmetic*, June 2003, pp. 129–136
- [316] R.-C. Li, P. Markstein, J. Okada, J. Thomas, The libm library and floating-point arithmetic in hp-ux for itanium 2. Technical report, Hewlett-Packard Company (2002), <http://h21007.www2.hp.com/dspp/files/unprotected/libm.pdf>
- [317] X. Li, J. Demmel, D.H. Bailey, G. Henry, Y. Hida, J. Iskandar, W. Kahan, A. Kapur, M. Martin, T. Tung, D.J. Yoo, Design, implementation and testing of extended and mixed precision BLAS. *ACM Trans. Math. Softw.* **28**(2), 152–205 (2002)
- [318] G. Lightbody, R. Woods, R. Walke, Design of a parameterizable silicon intellectual property core for QR-based RLS filtering. *IEEE Trans. Very Large Scale Integr. (VLSI) Syst.* **11**(4), 659–678 (2003)
- [319] H. Lin, H.J. Sips, On-line CORDIC algorithms, in *Proceedings of the 9th IEEE Symposium on Computer Arithmetic*, Sept 1989, pp. 26–33
- [320] H. Lin, H.J. Sips, On-line CORDIC algorithms. *IEEE Trans. Comput.* **39**(8) (1990)
- [321] R.J. Linhardt, H.S. Miller, Digit-by-digit transcendental function computation. *RCA Rev.* **30**, 209–247 (1969). Reprinted in [439]
- [322] G.L. Litvinov, Approximate construction of rational approximations and the effect of error autocorrection. Applications. Technical Report 8, Institute of Mathematics, University of Oslo, May 1993
- [323] Z. Liu, K. Dickson, J. McCanny, Application-specific instruction set processor for SoC implementation of modern signal processing algorithms. *IEEE Trans. Circuits Syst. I: Regul. Pap.* **52**(4), 755–765 (2005)
- [324] W. Luther, Highly accurate tables for elementary functions. *BIT* **35**, 352–360 (1995)
- [325] T. Lynch, E.E. Swartzlander, A formalization for computer arithmetic, in *Computer Arithmetic and Enclosure Methods*, ed. by L. Atanassova, J. Hertzberger (Elsevier Science, Amsterdam, 1992), pp. 137–145
- [326] A.J. MacLeod, Algorithm 757; miscfun, a software package to compute uncommon special functions. *ACM Trans. Math. Softw.* **22**(3), 288–301 (1996)
- [327] N. Macon, A. Spitzbart, Inverses of vandermonde matrices. *Am. Math. Mon.* **65**(2), 95–100 (1958)
- [328] K. Maharatna, S. Banerjee, E. Grass, M. Krstic, A. Troya, Modified virtually scaling-free adaptive CORDIC rotator algorithm and architecture. *IEEE Trans. Circuits Syst. Video Technol.* **15**(11), 1463–1474 (2005)
- [329] K. Makino, M. Berz, Taylor models and other validated functional inclusion methods. *Int. J. Pure Appl. Math.* **6**(3), 239–312 (2003)
- [330] M.A. Malcolm, Algorithms to reveal properties of floating-point arithmetic. *Commun. ACM* **15**(11), 949–951 (1972)
- [331] P. Markstein, *IA-64 and Elementary Functions: Speed and Precision*, Hewlett-Packard professional books (Prentice-Hall, Englewood Cliffs, 2000)

- [332] P. Markstein, Accelerating sine and cosine evaluation with compiler assistance, in *Proceedings of the 16th IEEE Symposium on Computer Arithmetic*, June 2003, pp. 137–140
- [333] P.W. Markstein, Computation of elementary functions on the IBM RISC System/6000 processor. *IBM J. Res. Dev.* **34**(1), 111–119 (1990). Reprinted in [442]
- [334] D.W. Matula, P. Kornerup, Finite precision rational arithmetic: Slash number systems. *IEEE Trans. Comput.* **34**(1), 3–18 (1985). Reprinted in [440]
- [335] D.W. Matula, M.T. Panu, A prescale-lookup-postscale additive procedure for obtaining a single precision ulp accurate reciprocal, in *Proceedings of the 20th IEEE Symposium on Computer Arithmetic* (2011), pp. 177–183
- [336] C. Mazenc, X. Merrheim, J.M. Muller, Computing functions \cos^{-1} and \sin^{-1} using CORDIC. *IEEE Trans. Comput.* **42**(1), 118–122 (1993)
- [337] J.E. Meggitt, Pseudo division and pseudo multiplication processes. *IBM J. Res. Dev.* **6**, 210–226 (1962)
- [338] P. Meher, J. Valls, T.-B. Juang, K. Sridharan, K. Maharatna, 50 years of CORDIC: algorithms, architectures, and applications. *IEEE Trans. Circuits Syst. I: Regul. Pap.* **56**(9), 1893–1907 (2009)
- [339] G. Melquiond, *De l'arithmétique d'intervalles à la certification de programmes (in French)*. Ph.D. thesis, École Normale Supérieure de Lyon, Nov 2006, <http://www.ens-lyon.fr/LIP/Pub/PhD2006.php>
- [340] G. Melquiond, Proving bounds on real-valued functions with computations, in *Proceedings of the 4th International Joint Conference on Automated Reasoning*. Lecture Notes in Artificial Intelligence, vol. 5195, ed. by A. Armando, P. Baumgartner, G. Dowek (Sydney, Australia, 2008), pp. 2–17
- [341] G. Melquiond, S. Pion, Formally certified floating-point filters for homogeneous geometric predicates. *Theor. Inf. Appl.* **41**(1), 57–69 (2007)
- [342] X. Merrheim, *Bases discrètes et calcul des fonctions élémentaires par matériel (in French)*. Ph.D. thesis, École Normale Supérieure de Lyon and Université Lyon I, France, Feb 1994
- [343] M. Mezzarobba, NumGfun: a package for numerical and analytic computation with D-finite functions, in *ISSAC '10*, ed. by S.M. Watt. ACM (2010), pp. 139146
- [344] M. Mezzarobba, *Autour de l'évaluation numérique des fonctions D-finies (in French)*. Ph.d. dissertation, École Polytechnique, Palaiseau, France, Nov 2011
- [345] P. Midy, Y. Yakovlev, Computing some elementary functions of a complex variable. *Math. Comput. Simul.* **33**, 33–49 (1991)
- [346] O. Møller, Quasi double-precision in floating-point addition. *BIT* **5**, 37–50 (1965)
- [347] P. Montgomery, Five, six, and seven-term Karatsuba-like formulae. *IEEE Trans. Comput.* **54**(3), 362–369 (2005)
- [348] R.K. Montoye, E. Hokonek, S.L. Runyan, Design of the IBM RISC System/6000 floating-point execution unit. *IBM J. Res. Dev.* **34**(1), 59–70 (1990). Reprinted in [442]
- [349] R.E. Moore, *Interval Analysis* (Prentice-Hall, Englewood Cliffs, 1963)
- [350] R. Morris, Tapered floating point: a new floating-point representation. *IEEE Trans. Comput.* **20**(12), 1578–1579 (1971)
- [351] C. Moulleron, G. Revy, Automatic generation of fast and certified code for polynomial evaluation, in *Proceedings of the 20th IEEE Symposium on Computer Arithmetic* (2011), pp. 233–242
- [352] J.-M. Muller, Discrete basis and computation of elementary functions. *IEEE Trans. Comput.* **C-34**(9) (1985)
- [353] J.-M. Muller, *Méthodologies de calcul des fonctions élémentaires (in French)*. Ph.D. thesis, Institut National Polytechnique de Grenoble, France, Sept 1985
- [354] J.-M. Muller, Une méthodologie du calcul hardware des fonctions élémentaires (in French). *M2AN* **20**(4), 667–695 (1986)
- [355] J.-M. Muller, A few results on table-based methods. *Reliable Comput.* **5**(3), 279–288 (1999)
- [356] J.-M. Muller, N. Brisebarre, F. de Dinechin, C.-P. Jeannerod, V. Lefèvre, G. Melquiond, N. Revol, D. Stehlé, S. Torres, *Handbook of Floating-Point Arithmetic*. Birkhäuser Boston (2010). ACM G.1.0; G.1.2; G.4; B.2.0; B.2.4; F.2.1., ISBN 978-0-8176-4704-9
- [357] A. Munk-Nielsen, J.M. Muller, On-line algorithms for computing exponentials and logarithms, in *Proceedings of EuroPar'96, Lecture Notes in Computer Science 1124* (Springer, Berlin, 1996)
- [358] S. Nakamura, Algorithms for iterative array multiplication. *IEEE Trans. Comput.* **C-35**(8) (1986)
- [359] R. Nave, Implementation of transcendental functions on a numerics processor. *Microprocessing Microprogramming* **11**, 221–225 (1983)
- [360] Y.V. Nesterenko, M. Waldschmidt, On the approximation of the values of exponential function and logarithm by algebraic numbers (in Russian). *Mat. Zapiski* **2**, 23–42 (1996). Available in English at <http://www.math.jussieu.fr/~miw/articles/ps/Nesterenko.ps>
- [361] I. Newton, *Methodus fluxionum et serierum infinitarum*, 1664–1671
- [362] K.C. Ng, Argument reduction for huge arguments: good to the last bit. Technical report, SunPro (1992)
- [363] K.C. Ng, K.H. Bierman, Getting the right answer for the trigonometric functions. SunProgrammer, Spring 1992
- [364] S. Oberman, M.J. Flynn, Implementing division and other floating-point operations: a system perspective, in *Scientific Computing and Validated Numerics (Proceedings of SCAN'95)*, ed. by Alefeld, Frommer, and Lang (Akademie Verlag, Berlin, 1996), pp. 18–24

- [365] S.F. Oberman, *Design issues in high performance floating point arithmetic units*. Ph.D. thesis, Department of Electrical Engineering, Stanford University, Palo Alto, CA, Nov 1996
- [366] S.F. Oberman, Floating point division and square root algorithms and implementation in the AMD-K7 microprocessor, in *Proceedings of the 14th IEEE Symposium on Computer Arithmetic*, Apr 1999, pp. 106–115. Reprinted in [442]
- [367] T. Ogita, S.M. Rump, S. Oishi, Accurate sum and dot product. *SIAM J. Sci. Comput.* **26**(6), 1955–1988 (2005)
- [368] Y. Okabe, N. Takagi, S. Yajima, Log-depth circuits for elementary functions using residue number system. *Electron. Commun. Jpn, Part 3*, **74**, 8 (1991)
- [369] F.W.J. Olver, P.R. Turner, Implementation of level-index arithmetic using partial table look-up, in *Proceedings of the 8th IEEE Symposium on Computer Arithmetic*, May 1987
- [370] A.R. Omondi, *Computer Arithmetic Systems, Algorithms, Architecture and Implementations*. Prentice-Hall International Series in Computer Science (Englewood Cliffs, NJ, 1994)
- [371] R.R. Osoroi, E. Antelo, J.D. Bruguera, J. Villalba, E. Zapata, Digit on-line large radix CORDIC rotator, in *Proceedings of the IEEE International Conference on Application Specific Array Processors (Strasbourg, France)*, ed. by P. Cappello, C. Mongenet, G.R. Perrin, P. Quinton, Y. Robert (IEEE Computer Society Press, Los Alamitos, CA, 1995), pp. 246–257
- [372] A. Ostrowski, *On Two problems in Abstract Algebra Connected with Horner's Rule* (Academic Press, New York, 1954), pp. 40–48
- [373] M.L. Overton, *Numerical Computing with IEEE Floating-Point Arithmetic* (SIAM, Philadelphia, 2001)
- [374] V.Y. Pan, Methods of computing values of polynomials. *Russ. Math Surv.* **21**(1), 105–135 (1966)
- [375] B. Parhami, Carry-free addition of recoded binary signed-digit numbers. *IEEE Trans. Comput.* **C-37**, 1470–1476 (1988)
- [376] B. Parhami, Generalized signed-digit number systems: a unifying framework for redundant number representations. *IEEE Trans. Comput.* **39**(1), 89–98 (1990)
- [377] B. Parhami, On the implementation of arithmetic support functions for generalized signed-digit number systems. *IEEE Trans. Comput.* **42**(3), 379–384 (1993)
- [378] B. Parhami, *Computer Arithmetic: Algorithms and Hardware Designs* (Oxford University Press, New York, 2000)
- [379] M.S. Paterson, L.J. Stockmeyer, On the number of nonscalar multiplications necessary to evaluate polynomials. *SIAM J. Comput.* **2**(1), 60–66 (1973)
- [380] G. Paul, M.W. Wilson, Should the elementary function library be incorporated into computer instruction sets? *ACM Trans. Math. Softw.* **2**(2) (1976)
- [381] M. Payne, R. Hanek, Radian reduction for trigonometric functions. *SIGNAL Newslett.* **18**, 19–24 (1983)
- [382] D. Phatak, T. Goff, I. Koren, Constant-time addition and simultaneous format conversion based on redundant binary representations. *IEEE Trans. Comput.* **50**(11), 1267–1278 (2001)
- [383] D.S. Phatak, Comments on Duprat and Muller's branching CORDIC. *IEEE Trans. Comput.* **47**(9), 1037–1040 (1998)
- [384] D.S. Phatak, Double step branching CORDIC: a new algorithm for fast sine and cosine generation. *IEEE Trans. Comput.* **47**(5), 587–602 (1998)
- [385] G.M. Phillips, *Interpolation and Approximation by Polynomials*, CMS books in mathematics (Springer, New York, 2003)
- [386] M. Pichat, Correction d'une somme en arithmétique à virgule flottante. *Numer. Math.* **19**, 400–406 (1972). In French
- [387] S. Pion, *De la Géométrie Algorithmique au Calcul Géométrique*. Ph.D. thesis, Université de Nice Sophia-Antipolis, France, Nov 1999. In French
- [388] M.J.D. Powell, *Approximation Theory and Methods* (Cambridge University Press, 1981)
- [389] D.M. Priest, Algorithms for arbitrary precision floating point arithmetic, in *Proceedings of the 10th IEEE Symposium on Computer Arithmetic*, June 1991, pp. 132–144
- [390] X. Qian, H. Zhang, J. Yang, H. Huang, J. Zhang, D. Fan, Circuit implementation of floating point range reduction for trigonometric functions, in *IEEE International Symposium on Circuits and Systems*, May 2007, pp. 3010–3013
- [391] C.V. Ramamoorthy, J.R. Goodman, K.H. Kim, Some properties of iterative square-rooting methods using high-speed multiplication. *IEEE Trans. Comput.* **C-21**, 837–847 (1972). Reprinted in [439]
- [392] E.M. Reingold, Establishing lower bounds on algorithms—a survey, in *Spring Joint Computer Conference* (1972), pp. 471–481
- [393] G.W. Reitwiesner, Binary arithmetic. *Adv. Comput.* **1**, 231–308 (1960)
- [394] E. Remez, Sur un procédé convergent d'approximations successives pour déterminer les polynômes d'approximation (in french). *C.R. Académie des Sciences, Paris* **198**, 2063–2065 (1934)
- [395] N. Revol, F. Rouillier, Motivations for an arbitrary precision interval arithmetic and the MPFI library. *Reliable Comput.* **11**, 1–16 (2005)
- [396] J.R. Rice, *The Approximation of Functions* (Addison-Wesley, Reading, 1964)

- [397] T.J. Rivlin, *An Introduction to the Approximation of Functions* (Blaisdell Publishing Company, Walham, MA, 1969). Republished by Dover (1981)
- [398] T.J. Rivlin, *Chebyshev Polynomials. From Approximation Theory to Algebra*. Pure and Applied Mathematics, 2nd edn. (Wiley, New York, 1990)
- [399] J.E. Robertson, A new class of digital division methods. *IRE Trans. Electron. Comput.* **EC-7**, 218–222 (1958). Reprinted in [439]
- [400] J.E. Robertson, The correspondence between methods of digital division and multiplier recoding procedures. *IEEE Trans. Comput.* **C-19**(8) (1970)
- [401] D. Roegel, A reconstruction of the tables of Briggs' *Arithmetica logarithmica* (1624). Technical Report inria-00543939, Inria, France (2010), <https://hal.inria.fr/inria-00543939>
- [402] S. Rump, F. Bungler, C.-P. Jeannerod, Improved error bounds for floating-point products and horner's scheme. *BIT Numer. Math.* 1–15 (2015)
- [403] S. Rump, F. Bungler, C.-P. Jeannerod, Improved error bounds for floating-point products and horner's scheme. *BIT Numer. Math.* 1–15 (2015)
- [404] S.M. Rump, T. Ogita, S. Oishi, Accurate floating-point summation part II: sign, K-fold faithful and rounding to nearest. *SIAM J. Sci. Comput.* (2005–2008). Submitted for publication
- [405] S.M. Rump, T. Ogita, S. Oishi, Accurate floating-point summation part I: faithful rounding. *SIAM J. Sci. Comput.* **31**(1), 189–224 (2008)
- [406] D.M. Russinoff, A mechanically checked proof of IEEE compliance of a register-transfer-level specification of the AMD-K7 floating-point multiplication, division, and square root instructions. *LMS J. Comput. Math.* **1**, 148–200 (1998)
- [407] B.V. Sakar, E.V. Krishnamurthy, Economic pseudodivision processes for obtaining square root, logarithm and arctan. *IEEE Trans. Comput.* **C-20**(12) (1971)
- [408] E. Salamin, Computation of π using arithmetic-geometric mean. *Math. Comput.* **30**, 565–570 (1976)
- [409] D.D. Sarma, D.W. Matula, Faithful bipartite ROM reciprocal tables, in *Proceedings of the 12th IEEE Symposium on Computer Arithmetic*, June 1995, pp. 17–28
- [410] W.S. Sayed, H.A.H. Fahmy, What are the correct results for the special values of the operands of the power operation? *ACM Trans. Math. Softw.* (to appear)
- [411] C.W. Schelin, Calculator function approximation. *Am. Math. Mon.* **90**(5) (1983)
- [412] H. Schmid, A. Bogacki, Use decimal CORDIC for generation of many transcendental functions. *EDN*, pp. 64–73, Feb 1973
- [413] A. Schönhage, V. Strassen, Schnelle Multiplikation Grosser Zahlen. *Computing* **7**, 281–292 (1971). In German
- [414] M.J. Schulte, J. Stine, Symmetric bipartite tables for accurate function approximation, in *Proceedings of the 13th IEEE Symposium on Computer Arithmetic* (1997)
- [415] M.J. Schulte, J.E. Stine, Accurate function evaluation by symmetric table lookup and addition, in *Proceedings of the IEEE International Conference on Application-Specific Systems, Architectures and Processors (Zurich, Switzerland)* (1997), pp. 144–153
- [416] M.J. Schulte, J.E. Stine, Approximating elementary functions with symmetric bipartite tables. *IEEE Trans. Comput.* **48**(8), 842–847 (1999)
- [417] M.J. Schulte, E.E. Swartzlander, Exact rounding of certain elementary functions, in *Proceedings of the 11th IEEE Symposium on Computer Arithmetic*, June 1993, pp. 138–145
- [418] M.J. Schulte, E.E. Swartzlander, Hardware designs for exactly rounded elementary functions. *IEEE Trans. Comput.* **43**(8), 964–973 (1994). Reprinted in [442]
- [419] P. Sebah, X. Gourdon, Newton's method and high-order iterations (2001), <http://numbers.computation.free.fr/Constants/Algorithms/newton.html>
- [420] R.B. Seidensticker, Continued fractions for high-speed and high-accuracy computer arithmetic, in *Proceedings of the 6th IEEE Symposium on Computer Arithmetic* (1983), pp. 184–193
- [421] A. Seznec, F. Lloansi, Étude des architectures des microprocesseurs MIPS R10000, Ultrasparc et Pentium Pro (in French). Technical Report 1024, IRISA Rennes, France, May 1996
- [422] A. Seznec, T. Vauléon, Étude comparative des architectures des microprocesseurs Intel Pentium et PowerPC 601 (in French). Technical Report 835, IRISA Rennes, France, June 1994
- [423] J.R. Shewchuk, Adaptive precision floating-point arithmetic and fast robust geometric predicates. *Discrete Comput. Geom.* **18**, 305–363 (1997)
- [424] R. Shukla, K.C. Ray, A low latency hybrid CORDIC algorithm. *IEEE Trans. Comput.* **63**(12), 3066–3078 (2014)
- [425] J.D. Silverstein, S.E. Sommars, Y.C. Tao, The UNIX system math library, a status report, in *USENIX — Winter'90* (1990)
- [426] A. Singh, D. Phatak, T. Goff, M. Riggs, J. Plusquellic, C. Patel, Comparison of branching CORDIC implementations, in *IEEE International Conference on Application-Specific Systems, Architectures and Processors*, June 2003, pp. 215–225

- [427] D. Smith, Efficient multiple-precision evaluation of the elementary functions. *Math. Comput.* **52**(185), 131–134 (1989)
- [428] R.A. Smith, A continued-fraction analysis of trigonometric argument reduction. *IEEE Trans. Comput.* **44**(11), 1348–1351 (1995)
- [429] W.H. Specker, A class of algorithms for $\ln(x)$, $\exp(x)$, $\sin(x)$, $\cos(x)$, $\tan^{-1}(x)$ and $\cot^{-1}(x)$. *IEEE Trans. Electron. Comput.* **EC-14** (1965). Reprinted in [439]
- [430] H.M. Stark, *An Introduction to Number Theory* (MIT Press, Cambridge, 1981)
- [431] D. Stehlé, *Algorithmique de la Réduction de Réseaux et Application à la Recherche de Pires Cas pour l'Arrondi de Fonctions Mathématiques (in French)*. Ph.D. thesis, Université Henri Poincaré—Nancy 1, France, Dec 2005
- [432] D. Stehlé, V. Lefèvre, P. Zimmermann, Worst cases and lattice reduction, in *Proceedings of the 16th IEEE Symposium on Computer Arithmetic*, June 2003, pp. 142–147
- [433] D. Stehlé, V. Lefèvre, P. Zimmermann, Searching worst cases of a one-variable function. *IEEE Trans. Comput.* **54**(3), 340–346 (2005)
- [434] D. Stehlé, P. Zimmermann, Gal's accurate tables method revisited, in *Proceedings of the 17th IEEE Symposium on Computer Arithmetic*, June 2005, pp. 257–264
- [435] J.E. Stine, M.J. Schulte, The symmetric table addition method for accurate function approximation. *J. VLSI Signal Process.* **21**, 167–177 (1999)
- [436] S. Story, P.T.P. Tang, New algorithms for improved transcendental functions on IA-64, in *Proceedings of the 14th IEEE Symposium on Computer Arithmetic*, Apr 1999, pp. 4–11
- [437] D.A. Sunderland, R.A. Strauch, S.W. Wharfield, H.T. Peterson, C.R. Cole, CMOS/SOS frequency synthesizer LSI circuit for spread spectrum communications. *IEEE J. Solid State Circuits* **SC-19**(4), 497–506 (1984)
- [438] T.Y. Sung, Y.H. Hu, Parallel VLSI implementation of Kalman filters. *IEEE Trans. Aerosp. Electron. Syst.* **AES 23**(2) (1987)
- [439] E.E. Swartzlander, *Computer Arithmetic*, vol. 1 (World Scientific Publishing Co., Singapore, 2015)
- [440] E.E. Swartzlander, *Computer Arithmetic*, vol. 2 (World Scientific Publishing Co., Singapore, 2015)
- [441] E.E. Swartzlander, A.G. Alexopoulos, The sign-logarithm number system. *IEEE Trans. Comput.* (1975). Reprinted in [439]
- [442] E.E. Swartzlander, C.E. Lemonds, *Computer Arithmetic*, vol. 3 (World Scientific Publishing Co., Singapore, 2015)
- [443] N. Takagi. *Studies on hardware algorithms for arithmetic operations with a redundant binary representation*. Ph.D. thesis, Dept. Info. Sci., Kyoto University, Japan (1987)
- [444] N. Takagi, T. Asada, S. Yajima, A hardware algorithm for computing sine and cosine using redundant binary representation. *Syst. Comput. Jpn.* **18**(8) (1987)
- [445] N. Takagi, T. Asada, S. Yajima, Redundant CORDIC methods with a constant scale factor. *IEEE Trans. Comput.* **40**(9), 989–995 (1991)
- [446] N. Takagi, H. Yasukura, S. Yajima, High speed multiplication algorithm with a redundant binary addition tree. *IEEE Trans. Comput.* **C-34**(9) (1985)
- [447] P.T.P. Tang, Table-driven implementation of the exponential function in IEEE floating-point arithmetic. *ACM Trans. Math. Softw.* **15**(2), 144–157 (1989)
- [448] P.T.P. Tang, Table-driven implementation of the logarithm function in IEEE floating-point arithmetic. *ACM Trans. Math. Softw.* **16**(4), 378–400 (1990)
- [449] P.T.P. Tang, Table lookup algorithms for elementary functions and their error analysis, in *Proceedings of the 10th IEEE Symposium on Computer Arithmetic*, June 1991, pp. 232–236
- [450] P.T.P. Tang, Table-driven implementation of the \exp_{m1} function in IEEE floating-point arithmetic. *ACM Trans. Math. Softw.* **18**(2), 211–222 (1992)
- [451] The Polylib Team. Polylib, a library of polyhedral functions, version 5.20.0 (2004), <http://icps.u-strasbg.fr/polylib/>
- [452] D.B. Thomas, A general-purpose method for faithfully rounded floating-point function approximation in FPGAs, in *Proceedings of the 22nd Symposium on Computer Arithmetic* (2015), pp. 42–49
- [453] J. Thompson, N. Karra, M. Schulte, A 64-bit decimal floating-point adder, in *IEEE Computer society Annual Symposium on VLSI* (2004), pp. 297–298
- [454] D. Timmermann, H. Hahn, B.J. Hosticka, Low latency time CORDIC algorithms. *IEEE Trans. Comput.* **41**(8), 1010–1015 (1992)
- [455] D. Timmermann, H. Hahn, B.J. Hosticka, B. Rix, A new addition scheme and fast scaling factor compensation methods for CORDIC algorithms. *INTEGRATION, VLSI J.* **11**, 85–100 (1991)
- [456] D. Timmermann, H. Hahn, B.J. Hosticka, G. Schmidt, A programmable CORDIC chip for digital signal processing applications. *IEEE J. Solid-State Circuits* **26**(9), 1317–1321 (1991)
- [457] A.L. Toom, The complexity of a scheme of functional elements realizing the multiplication of integers. *Sov. Math. Dokl.* **3**, 714–716 (1963)
- [458] L. Trefethen, *Approximation Theory and Approximation Practice* (Siam, 2013)
- [459] L. Trefethen, Computing numerically with functions instead of numbers. *Commun. ACM* **58**(10), 91–97 (2015)

- [460] C.-Y. Tseng, A multiple-exchange algorithm for complex chebyshev approximation by polynomials on the unit circle. *SIAM J. Numer. Anal.* **33**(5), 2017–2049 (1996)
- [461] L. Veidinger, On the numerical determination of the best approximations in the Chebyshev sense. *Numer. Math.* **2**, 99–105 (1960)
- [462] B. Verdonk, A. Cuyt, D. Verschaeren, A precision- and range-independent tool for testing floating-point arithmetic. I: basic operations, square root, and remainder. *ACM Trans. Math. Softw.* **27**(1), 92–118 (2001)
- [463] B. Verdonk, A. Cuyt, D. Verschaeren, A precision- and range-independent tool for testing floating-point arithmetic. II: conversions. *ACM Trans. Math. Softw.* **27**(1), 119–140 (2001)
- [464] J. Villalba, T. Lang, M. Gonzalez, Double-residue modular range reduction for floating-point hardware implementations. *IEEE Trans. Comput.* **55**(3), 254–267 (2006)
- [465] J.E. Volder, The CORDIC computing technique. *IRE Trans. Electron. Comput.* **EC-8**(3), 330–334 (1959). Reprinted in [439]
- [466] J.E. Volder, The birth of CORDIC. *J. VLSI Signal Process. Syst.* **25**(2), 101–105 (2000)
- [467] J.E. Vuillemin, Exact real computer arithmetic with continued fractions. *IEEE Trans. Comput.* **39**(8) (1990)
- [468] C.S. Wallace, A suggestion for a fast multiplier. *IEEE Trans. Electron. Comput.* 14–17 (1964). Reprinted in [439]
- [469] P.J.L. Wallis (ed.), *Improving Floating-Point Programming* (John Wiley, New York, 1990)
- [470] J.S. Walther, A unified algorithm for elementary functions, in *Joint Computer Conference Proceedings* (1971). Reprinted in [439]
- [471] J.S. Walther, The story of unified CORDIC. *J. VLSI Signal Process. Syst.* **25**(2), 107–112 (2000)
- [472] D. Wang, J.-M. Muller, N. Brisebarre, M. Ercegovac, (m, p, k) -friendly points: a table-based method to evaluate trigonometric function. *IEEE Trans. Circuits Syst. II: Express Briefs* **61**(9), 711–715 (2014)
- [473] L. Wang, J. Needham, Horner’s method in chinese mathematics: its origins in the root-extraction procedures of the han dynasty. *T’oung Pao* **43**(5), 345–401 (1955), <http://www.jstor.org/stable/4527405>
- [474] S. Wang, E.E. Swartzlander, Merged CORDIC algorithm, in *1995 IEEE International Symposium on Circuits and Systems*, Apr 1995, pp. 1988–1991
- [475] W.F. Wong, E. Goto, Fast hardware-based algorithms for elementary function computations using rectangular multipliers. *IEEE Trans. Comput.* **43**(3), 278–294 (1994)
- [476] C.-S. Wu, A.-Y. Wu, C.-H. Lin, A high-performance/low-latency vector rotational CORDIC architecture based on extended elementary angle set and trellis-based searching schemes. *IEEE Trans. Circuits Syst. II: Analog Digit. Signal Process.* **50**(9), 589–601 (2003)
- [477] J.M. Yohe, Roundings in floating-point arithmetic. *IEEE Trans. Comput.* **C-22**(6), 577–586 (1973)
- [478] H. Yoshimura, T. Nakanishi, H. Tamauchi, A 50MHz geometrical mapping processor, in *Proceedings of the 1988 IEEE International Solid-State Circuits Conference* (1988)
- [479] T.J. Ypma, Historical development of the Newton-Raphson method. *SIAM Rev.* **37**(4), 531–551 (1995)
- [480] P. Zimmermann, Arithmétique en précision arbitraire. Réseaux et Systèmes Répartis, *Calculateurs Parallèles* **13**(4–5), 357–386 (2001). In French
- [481] A. Ziv, Fast evaluation of elementary mathematical functions with correctly rounded last bit. *ACM Trans. Math. Softw.* **17**(3), 410–423 (1991)
- [482] F. Zou, P. Kornerup, High speed DCT/IDCT using a pipelined CORDIC algorithm, in *Proceedings of the 12th IEEE Symposium on Computer Arithmetic*, July 1995, pp. 180–187
- [483] D. Zuras, More on squaring and multiplying large integers. *IEEE Trans. Comput.* **43**(8), 899–908 (1994)

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