A Bibliography of Publications on Floating-Point Arithmetic

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Introduction

This is a bibliography of material on floating-point arithmetic that I came up with while doing research on a floating-point package of my own. I don’t claim it to be anywhere near complete. The material listed is only what I myself possess.

My main interest was in software based, binary floating-point arithmetic on a microprocessor, so you won’t find much material about the hardware used in floating-point arithmetic (e.g. adders, carry propagation schemes, higher radix
representation for multiplication and division, etc.) in this list. There is also not too much on non-binary floating-point arithmetic.

For most fields covered in this bibliography, the important or historically relevant articles should be included. There is also some material on integer arithmetic in this list as some of the methods used with integer arithmetic contain interesting ideas that may be useful in the realization of a floating-point arithmetic package.

Also, depending on the type of microprocessor used, one may need to implement integer multiplication and division for use in the floating-point package, so articles about this topic are included as well.

As I am German, there is a bit of material in German in this bibliography. However, English translations are provided for all non-English titles.

Thanks to the people who have helped me with previous versions of this document by sending me papers or additional references:

- Steven Sommars (sesv@research.bell-labs.com),
- Jim Kiernan (jmk@teak.cray.com),
- Warren Ferguson (ferguson@seas.smu.edu),
- Nhuad Doduc (ndoduc@framentec.fr),
- K. C. Ng (kwok.ng@eng.sun.com),
- Nelson H. F. Beebe (beebe@math.utah.edu).

Bibliography entries in the Books section are ordered alphabetically by author; ordering is by ascending year in the remaining sections.

**Warning:** it has yet not been possible to bring this citation list up-to-date with the entries in the BibTeX

**Books, hardware oriented**

[1618, 248, 1205, 1140, 2972, 3174, 1813, 777, 1089, 930, 1372, 779, 1258, 6067, 6068, 1464]

**Books, software oriented or theory**

[1192, 427, 430, 431, 96, 1335, 2278, 840, 978, 318, 2816, 2319, 2832, 2161, 287, 483, 6080]

**Books, machine specific**

[2066, 3077, 2974, 2321, 1665, 1800, 2179, 1832, 2356]
1 Choice of base, floating point formats

1.1 Precision and Rounding

1.2 Determination of parameters of floating point arithmetic

1.3 IEEE standards for floating point arithmetic

1.4 Floating point arithmetic, general and implementation issues

1.5 Floating point packages

1.6 Floating point units
1.7 Test of floating point routines
\[457, 1369, 1623, 1767, 1766, 1916, 1917, 1861, 1999, 2354, 2477, 2485, 2549, 2548, 2661, 2640, 2626, 2915\]

2 Addition and Subtraction
\[341, 1422\]

2.1 Floating-point Summation
\[292, 311, 328, 327, 524, 588, 626, 768, 1561, 2166, 2237\]

2.2 Multiplication
\[629, 1167, 1179, 1390, 1451, 1425, 1478, 1504, 1496, 1521, 1575, 1494, 1656\]

2.3 Division
\[179, 206, 192, 289, 314, 399, 947, 992, 1228, 1317, 1472, 1546, 1525, 1509, 1668, 1787, 1911, 1890, 2272, 2650, 2596, 2830, 2879, 6240, 2813\]

3 Elementary functions, general
\[350, 362, 539, 599, 567, 1049, 1184, 1529, 1556, 1654, 1616, 1614, 1691, 1737, 6163, 1841, 1947, 2046, 1991, 2168, 6181, 2442, 2477, 2429, 3193, 2431, 2400, 2571, 2720, 2538, 2684, 2566, 3226, 3194\]

3.1 Elementary functions, CORDIC and related algorithms
\[162, 163, 217, 231, 339, 479, 506, 608, 600, 616, 680, 790, 996, 1012, 1212, 1366, 1397, 1794, 1605, 1708, 1859, 2051, 2266, 2198, 2423, 2449, 2590, 2682, 2872, 2867, 2989, 2931, 2975\]

3.2 Elementary functions, function approximation
\[208, 209, 441, 574, 710, 709, 913, 951, 1087, 1896, 2186, 2079, 2561, 2656, 2657\]

3.2.1 Polynomial evaluation
\[226, 246, 271, 387, 989, 1150, 2236\]
3.3 Square root, general
[1010, 1111, 1394, 1501, 1552, 2447, 2553]

3.3.1 Square root, bit-oriented, iterative, and table methods of computation
[97, 126, 325, 938, 1076, 1268, 1359, 1320, 1287, 1341, 1445, 1722, 1819, 1731, 1784, 1867, 1848, 1931, 1902, 1942, 1982, 2031, 2070, 2144, 2275, 2459, 2416, 2583, 2901]

3.3.2 Square root, Newton’s method
[131, 247, 269, 340, 313, 309, 349, 412, 388, 470, 475, 488, 549, 538, 532, 534, 651, 1244, 1234, 1312, 1487, 2221, 2881, 2811]

3.4 Sine and Cosine
[152, 996, 948, 953, 1100, 1313, 1452, 1566, 1563, 1663, 1750, 1849, 2013, 2123, 2486, 2824, 2821, 2749, 2843, 2937]

3.5 Logarithm
[127, 238, 298, 639, 928, 1039, 1218, 1438, 2000, 2001, 2487, 2608]

3.6 Exponential function
[114, 372, 1107, 1276, 1427, 1646, 1744, 2355, 2488, 2864]

3.7 Arctangent
[116, 132, 177]

3.8 Other transcendental functions
[456, 565, 133, 954, 331, 242, 326, 1993, 1082, 2730, 2917]

4 Binary-decimal conversion
[161, 145, 191, 436, 530, 633, 1090, 1210, 1211, 1319, 1554, 1606, 1898, 1871, 2392, 2481, 2407, 2726]
5  BCD ARITHMETIC

5 BCD arithmetic

[623, 673, 719, 720, 721, 722, 723, 724, 725, 1297, 1402, 1603, 1542, 1933, 2523, 2823]

6 Multiple precision arithmetic

[259, 297, 373, 389, 582, 568, 883, 932, 1027, 1026, 1184, 1265, 1345, 1450, 2677, 2662, 2896, 3114]

7 Conferences on computer arithmetic

[6105, 6115, 6119, 6127, 6130, 6142, 6160, 6161, 6201, 6229, 6237, 6231, 6261]

8 Additional contributions from Nelson H. F. Beebe


Title word cross-reference

#26 [5255].

\((2^n)^m\) [3640]. \((10^{31} - 1)/9\) [1872]. \((2^n)\) [4170, 4191, 4370, 4379, 4287]. \((2^n + 1)\) [1009, 4599, 3748]. \((2^n - 1)\) [4799]. \((2^n-2\)) [5788]. \((2^n \pm 1)\) [5281, 3969]. \((2m)\) [4252]. \((2n - (2p \pm 1))\) [4653]. \((d, r)\) [731]. \((\mathcal{R})\) [2775]. \((p)\) [4170, 4252]. \(-2\) [689, 155, 176, 879, 741]. \(-\infty < n < +\infty\)
8 ADDITIONAL CONTRIBUTIONS FROM NELSON H. F. BEEBE
ADDITIONAL CONTRIBUTIONS FROM NELSON H. F. BEEBE


.NET [4862].

/m [4669]. /spl [4669].

0.18-CMOS [5517]. '00 [6336, 2422]. '01 [6349]. '03 [6378]. '04 [6386, 6394]. '07 [6428, 6434, 6436, 6441]. '08 [6445, 2895, 5156].

1 [187, 3397, 3270, 2745, 197, 517, 3135, 3901, 4226, 1088, 5517, 1830, 3704].


11i [4720]. 11th [6347, 6244, 6261, 3044]. 120B [1047]. 128-bit [3949].


8 ADDITIONAL CONTRIBUTIONS FROM NELSON H. F. BEEBE


= [2671, 2672, 3202, 6102].

Additional Contributions from Nelson H. F. Beebe

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adder-based [2966, 2967, 2968, 2969]. adder/subtractor [4677, 5501].

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Addition/Subtraction [3986, 5652, 4528, 3696, 4475]. additional [3224]. additions [3459, 3311, 1833]. Additive [4333, 4828, 5499, 444, 3441, 1563].


Advanced [3683, 4162, 5073, 3300, 6434, 4377, 6178, 6294, 6328, 6339, 6367, 6381, 6397, 3324, 3334, 5303, 6245, 6234, 1448, 2176, 864, 5007, 4285, 1709, 6419, 1927, 6354, 6412]. Advances [6071, 6082, 1144]. Advancing [2216].


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ADDITIONAL CONTRIBUTIONS FROM NELSON H. F. BEEBE

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algorism [4484, 956]. Algorithm [1605, 5019, 1606, 1179, 3796, 4749, 2898,
3078, 3560, 3688, 1703, 3400, 2901, 672, 5028, 1287, 746, 1402, 1944, 5234,
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3148, 2608, 766, 5655, 5786, 3312, 280, 5091, 5092, 3896, 2306, 4828, 977, 5358,
[2145, 5112, 2448, 5870, 6009, 1554, 1794, 4229, 2647, 2823, 4231, 1440, 1561,
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Algorithm [1045, 1129, 4791, 5263, 393, 3853, 468, 5999, 518, 1982, 3513, 5210,
237, 2677, 3776, 4258, 5403]. algorithm-based [2137, 3366, 3059, 3220, 3230].
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2629]. Algorithmic [5557, 3736, 220, 3505, 2668]. algorithmics [4297].
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580, 5571, 5093, 2796, 1437, 3897, 2981, 2799, 3155, 6294, 6412]. Algorithms
[978, 3486, 1541, 1784, 635, 1542, 639, 1543, 6191, 4217, 4837, 4396, 3159, 408,
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Am29050 [2154].

Am29027 [2154].

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Am9511A/Am9512 [1295].

Am9512 [1189, 1295].

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amount [3857].

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AN-Codes [4163].

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Analog [423, 88, 4014, 3443, 112, 113, 199, 90, 201, 404, 335, 3927, 107, 123, 3968, 4560, 3869, 638, 4707, 1585, 3538, 2197].

Analog-To-Digital [3968, 4014, 4650, 3538].

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analogue-to-digital [3065].

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analysis [914, 2822, 3005, 3643, 4075, 919, 2155, 2157, 334, 1083, 4243, 2468, 5878, 5676, 3767, 775, 3032, 3033, 3198, 3358, 993, 4986, 1452, 3203, 3536, 2181, 1821, 341, 3663, 3664, 4267, 1099, 6206, 2696, 3052, 1170, 664, 735, 2869, 5397, 1601, 6137, 1106, 2503, 3677, 1713, 6232].

Analysis-Based [4700].

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Approaching
Approved
Approximate
Approximated
Approximating
Approximation
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Arbitrarily
Arbitrary
Arbitrary-Precision
Arbor
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Architectural
Architecture
Architecture
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Arctan
Arctangent
Area
Area-Efficient
ADDITIONAL CONTRIBUTIONS FROM NELSON H. F. BEEBE

Area-Optimal

Area-Time

Area/Performance

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ADDITIONAL CONTRIBUTIONS FROM NELSON H. F. BEEBE

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408, 6077, 322, 323, 437, 704, 769, 911, 980, 981, 4969, 3629, 2999, 2315, 5719, 285, 644, 5296, 5107, 5108, 3494, 5298, 1236, 1895, 5365, 5113, 3164, 5723, 1662, 2450, 5586, 914, 4543, 2149, 3005, 3, 1078, 1153, 2331, 4546, 3175, 533, 4975, 3914, 4695, 2454, 1357, 1563, 5590, 5971, 4071, 4854, 3010, 4073, 5370, 647, 3641, 3642, 3643, 3919, 4075, 4549, 2457, 2458, 5120, 649, 919, 3644, 2460, 2158, 2461, 3184, 774, 3186, 1245, 4702, 1443, 2839, 3514.

arithmetic

[322, 3515, 5121, 5203, 180, 4857, 5731, 4246, 2840, 3188, 1163, 1907, 1576, 6056, 5377, 5378, 2032, 4420, 4421, 5392, 994, 995, 1678, 1914, 1915, 1093, 3661, 4991, 2681, 2858, 604, 1375, 4262, 4716, 4263, 1376, 1920, 4264, 290, 4719, 416, 5392, 1379, 2044, 2184, 2865, 2866, 782, 5393, 3207, 1261, 3955, 4098, 490, 2694, 1262, 2358, 3052, 3783, 4275, 3542, 2188].

Arithmetic-Based

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Arithmetic-Friendly

[6041].

Arithmetic-Geometric

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[4, 40, 468, 5571, 5655, 5786, 5962, 4166, 364].

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[167, 5263, 4175, 5498, 4393, 3760, 2836, 185, 1176, 1838, 1017, 1113, 1283, 4121, 5252, 4791, 767, 830, 698, 702, 1351, 2461, 5512, 1677].

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[1022, 826, 368, 1382, 936, 937, 1403, 1973, 694, 2800, 930, 2189, 2190, 2191, 2364, 2365, 1389].

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[4671, 1899, 650, 4298, 4129, 3264, 4161, 5101, 4297, 4318, 919].

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[787, 1476, 613, 672, 746, 676, 6266, 6279, 2912, 3263, 1298, 1490, 1498, 1305, 1047, 1506, 760, 4804, 1141, 5472, 2272, 1331, 3149, 766, 3479, 1346, 586, 587, 634, 1348, 2994, 597, 1158, 2028, 1574, 1674, 869, 2695, 6262, 1105, 1836, 2377, 2068, 2521, 3262, 2095, 2555, 2742, 233, 4516, 2298, 4206, 3622, 4212, 1895, 2330, 2827, 596, 2169, 3364, 1595, 1465].

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[6385, 6402, 1110, 1720, 805, 5702, 3107, 2578, 1062, 3893, 2796, 5715, 2983, 3316, 908, 3233, 592, 1564, 2023, 2666, 5389, 6371, 2564, 2288, 2984, 3334, 3366, 4101, 3059, 3220].

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[6175, 2161, 2835, 5808, 1102, 6112].

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8 ADDITIONAL CONTRIBUTIONS FROM NELSON H. F. BEEBE

Begründung [904]. Behavior [4746, 813, 5603, 812, 5718]. Behavioral
[3717, 4118, 3842]. behaviour [2473, 2493]. Behind [5342, 3287]. Behrooz
[3574, 3359]. Benchmark
[5837, 1637, 1767, 1648, 1661, 1630, 1631, 1633, 3421].
Benutzerhandbuch [1382]. Berechnung
[3479, 2308, 2982]. Bergman [4430]. Berichtigung
[6118, 6150, 6356]. Berlin/Wendisch
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[2489]. Besieg{s} [4808]. besonderer [1597]. Bessel [5275]. Best
[5635, 2561, 470, 532, 2166, 551, 3240, 441]. bester [470]. Bestimmung
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[4271, 4272, 4717]. Betriebssystem
[224]. better [2082, 4049]. Between
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[6425]. Bi
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[1092, 929]. Biased
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[3362]. BiCMOS
[3443, 3121]. BID
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[128]. biennial
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[3510]. Big
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[4615, 4434]. BigNum
[4988, 4989]. bilinear
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[5183]. Billion
[3587]. Bimodal
[5655]. binäres [3193]. binärer [1871]. Binary
[2599, 2784, 2432, 2297, 5575, 4051, 1343, 1655, 203, 365, 2987, 4394, 4536, 643, 769, 3749, 5366, 1153, 6010, 2652, 3515, 4703, 1576, 5676, 2472, 1912, 5520, 2347, 1375, 1824, 3541, 5395, 5524, 3212, 3213, 2700, 3224, 5148, 5151, 4448, 4586, 4587]. Binary-BCD
[1090].

8 ADDITIONAL CONTRIBUTIONS FROM NELSON H. F. BEEBE

Components

Componentwise

Composite

Composite-Field

Composition

Compostela

Compound

Compressed

Compression

Compression/Decompression

Compressors

Comprising

COMPSAC

Comput

Computable

Computation

Computationally

Compute

Computed

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Loop
Lookup
Lost

Look-Ahead
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Lossless

Low-

Low-

London

Log

Logarithmic

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Perfectly

Pentium(R)

Peculiar

pattern

Pat

Parallelizable

Parameter

Parameterisable

parameters

parametrisable

Paranoia

parasitic

paranitary

Park

Parliament

Par[...]

Parallelism

Parallelization

Parallel-array

Parallel-Prefix

Parallel-Verarbeitung

Parallelism

Parallelizable

Parallelization

Parameter

Parameterisable

Parameters

parametric

Paralysis

Paris

Part

Partition

Partitioned

Partitioning

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Parallelogram

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Pass

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Paths

Patriot

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Paul

PBHD

PC

PC/AT

PC

PC/AT-based

PC/AT

PC/XT/AT

PCE

PC/AT

Part

Paso

PASCA[...]

PASCAL-SC

Paso

Pass

Pass

Pat[...]

Path

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Paths

Patriot

pattern

patterns

Paul

PBHD

PC

PC/AT

PC/AT-based

PC/XT/AT

PCE

PC/AT
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Resistant

Resistor

Resistors

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Resolution

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Resource

Resource-constrained

Resource-Efficient

Resource

Respect

Response

Rest

Restorable

Restoring

Results

Retaining

Retrofitting

Retrospective

Return

reusable

reveal

revealing

Reverse

Reverse-Carry

Reversed

reversion

Review

Retaining

Retrofitting

Retrospective

Return

reusable

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revealing

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1. Table 5 (page 124):
   insert k <-- 0 after assertion, and also delete k <-- 0 from Table 6.

2. Table 9 (page 125):
   for -1:USER!(""); substitute -1:USER!("0"); and delete the comment.

3. Table 10 (page 125):
   for fill(-k, "0") substitute fill(-k-1, "0")


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The main aim is to produce a usably efficient implementation, which can be easily interfaced with existing C++ code. This contrasts with previous implementations in functional languages (Haskell, Miranda etc.), which, although theoretically important, seem to be rather too slow for real use.

This code is designed as an add-on to Victor Shoup’s arbitrary-precision arithmetic package NTL, and implements a new type XR, to complement NTL’s ZZ and RR integer and real types.


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Pehrson:1994:IPP


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Kearfott:1996:AICa


- branch and bound algorithms for global optimization,
- constraint propagation,
- solution sets of linear systems,
- hardware and software systems for interval computations, and
- fuzzy logic.

Actual applications described in the book include:

- economic input-output models,
- quality control in manufacturing design,
- a computer-assisted proof in quantum mechanics,
- medical expert systems,
- and others.

A realistic view of interval computations is taken: the articles indicate when and how overestimation and other challenges can be overcome. An introductory chapter explains the content of the papers in terminology accessible to mathematically literate graduate students. The style of
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the individual, refereed contributions has been made uniform and understandable, and there is an extensive book-wide index. Audience: Valuable to students and researchers interested in automatic result verification. Detailed information, including contents, contributors, and an order form can be found:

- on Kluwer homepage http://www.wkap.nl, or

The information on the Interval Computations homepage is basically a mirror image of the Kluwer one (the only difference is that the fonts are fancier).

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