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:

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- Nhuan 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 Bibliography.
Journal Publications, Conference Papers, Technical Reports, Ph.D. Dissertations, Book Contributions, etc.

1 Choice of base, floating point formats

[468, 713, 715, 694, 691, 852, 1094, 1085, 1966, 2195, 2316, 2469, 2693, 2707]

1.1 Precision and Rounding

[405, 526, 708, 808, 840, 855, 921, 989, 997, 1001, 1242, 1377, 1318, 1476, 1660, 2208, 2381, 2454, 2763, 3076, 3197]

1.2 Determination of parameters of floating point arithmetic

[651, 785, 1570, 2201, 2129]

1.3 IEEE standards for floating point arithmetic

[950, 1148, 1173, 1157, 1182, 1147, 1154, 1282, 1269, 1270, 1226, 1246, 1400, 1327, 1350, 1329, 1656, 1754, 1792, 1793, 1790, 2015, 2100, 2265, 2498, 2971]

1.4 Floating point arithmetic, general and implementation issues

[599, 683, 971, 992, 1038, 1050, 1049, 1184, 1186, 1161, 1220, 1212, 1416, 1433, 1922, 1942, 2145, 2146, 2297, 2371, 2274, 2453, 2694, 2695, 2624, 2692, 2928]

1.5 Floating point packages

[1233, 1631, 1611, 1704, 1662, 1814, 1779, 1815, 1897, 2008, 2030, 2132, 2226, 2227, 2228, 2404, 2405, 1294]

1.6 Floating point units

[390, 1105, 1264, 1224, 1273, 1296, 1266, 1291, 1216, 1259, 1267, 1438, 1478, 1437, 1471, 1493, 1594, 1511, 1513, 1514, 1612, 1545, 1542, 1549, 1576, 1647, 1552, 1719, 1706, 1647, 1688, 1716, 1649, 1727, 1938, 1900, 1928, 1894, 1947, 1886, 1879, 1880, 2056, 2010, 2081, 2173, 2202, 2234, 2178, 2204, 2179, 2111, 2141, 2247, 2190, 2142, 2214, 2386, 2332, 2333, 2357, 2249, 2368, 2330, 2327, 2241, 2349, 2388, 2288, 2250, 2369, 2255, 2489, 2424, 2444, 2484, 2439, 2416, 2487, 2470, 2461, 2582, 2690, 2653, 2875, 2790, 2858, 3015, 2965, 3106, 3264]
1.7 Test of floating point routines
[470, 1396, 1657, 1800, 1799, 1950, 1951, 1895, 2034, 2522, 2530, 2596, 2595, 2710, 2689, 2675, 2970]

2 Addition and Subtraction
[351, 1452]

2.1 Floating-point Summation
[301, 321, 338, 337, 538, 604, 642, 793, 1593, 2203, 2277]

2.2 Multiplication
[645, 1194, 1206, 1417, 1481, 1455, 1509, 1536, 1528, 1553, 1608, 1526, 1689]

2.3 Division
[187, 215, 201, 298, 410, 974, 1019, 1255, 1344, 1503, 1578, 1557, 1541, 1701, 1820, 1945, 1924, 2312, 2699, 2645, 2885, 2934, 6593, 2867]

3 Elementary functions, general
[360, 372, 554, 615, 582, 1076, 1211, 1561, 1588, 1687, 1650, 1648, 1724, 1770, 6513, 1875, 1981, 2082, 2026, 2205, 6531, 2485, 2522, 2472, 3251, 2474, 2443, 2620, 2771, 2584, 2733, 2734, 2613, 3284, 3252]

3.1 Elementary functions, CORDIC and related algorithms
[170, 171, 225, 240, 349, 493, 520, 624, 616, 632, 697, 815, 1023, 1039, 1239, 1393, 1630, 1827, 1639, 1741, 1893, 2087, 2306, 2237, 2466, 2492, 2639, 2731, 2927, 2922, 3046, 2986, 3032]

3.2 Elementary functions, function approximation
[217, 218, 453, 590, 731, 730, 940, 978, 1114, 1930, 2223, 2115, 2608, 2705, 2706]

3.2.1 Polynomial evaluation
[235, 255, 280, 398, 1016, 1177, 2276]
3.3 Square root, general
[1037, 1138, 1421, 1533, 1584, 2490, 2600]

3.3.1 Square root, bit-oriented, iterative, and table methods of computation

3.3.2 Square root, Newton’s method
[139, 256, 278, 350, 323, 319, 359, 423, 399, 483, 488, 502, 564, 553, 547, 549, 667, 1271, 1261, 1339, 1518, 2260, 2936, 2865]

3.4 Sine and Cosine
[160, 1023, 975, 980, 1127, 1340, 1482, 1598, 1597, 1696, 1783, 1883, 2048, 2159, 2531, 2879, 2876, 2800, 2898, 2992]

3.5 Logarithm
[135, 247, 307, 655, 955, 1066, 1245, 1468, 2035, 2036, 2532, 2657]

3.6 Exponential function
[122, 383, 1134, 1303, 1457, 1679, 1777, 2395, 2533, 2919]

3.7 Arctangent
[124, 140, 185]

3.8 Other transcendental functions
[469, 580, 141, 981, 341, 251, 336, 2028, 1109, 2781, 2972]

4 Binary-decimal conversion
[169, 153, 200, 447, 544, 649, 1117, 1237, 1238, 1346, 1586, 1640, 1932, 1905, 2434, 2526, 2450, 2777]
5 BCD arithmetic

[639, 690, 740, 741, 742, 743, 744, 745, 746, 1324, 1432, 1636, 1574, 1967, 2569, 2878]

6 Multiple precision arithmetic

[268, 306, 384, 400, 598, 583, 910, 959, 1054, 1053, 1211, 1292, 1372, 1480, 2726, 2711, 2951, 3171]

7 Conferences on computer arithmetic

[6454, 6464, 6468, 6477, 6480, 6492, 6510, 6511, 6552, 6582, 6590, 6584, 6616]

8 Additional contributions from Nelson H. F. Beebe


Title word cross-reference

#26 [5342].

\[(2^n)^m \] [3705]. \((10^{x_1} - 1)/9 \] [1906]. \((2^m) \] [4245, 4266, 4447, 4456, 4363]. \((2^n + 1) \] [1036, 4678, 3816]. \((2^n - 1) \] [4879]. \((2^n - 1, 2^{n+p}, 2^n + 1) \] [6082]. \((2^n+1) \] [5907]. \((2^n \pm 1) \] [5369, 4040]. \((2m) \] [4328]. \((2n + 3) \] [6303]. \((2n - (2p \pm 1)) \] [4732]. \((d,r) \] [752]. \((R) \] [2826]. \((p) \] [4245, 4328]. \((x+y) * (x-y) \] [6394]. \(-2 \]
X [1480, 2813, 423]. \( x^2 + ny^2 \) [3617]. \( x^n \) [5812, 3224]. \( y \) [4307]. \( Z \) [5191]. \( Z^2 \) [4907].


.NET [4942].

/m [4748]. /spl [4748].

0.18-CMOS [5614]. '00 [6691, 6696, 2465]. '01 [6705]. '03 [6734]. '04 [6742, 6750]. '07 [6784, 6790, 6792, 6797]. '08 [6801, 2950, 5238].

8 ADDITIONAL CONTRIBUTIONS FROM NELSON H. F. BEEBE


= [2720, 2721, 3260, 6451].

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Accumulated [1309, 542, 933]. Accumulation [6056, 1984, 1888, 159, 5753, 5994, 5165, 5753, 5902, 5390, 4317, 68, 425, 1026, 3612, 5645, 3638, 3661, 5586, 541, 5387, 2684, 82, 5299]. accumulations [4128].
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accurate [4620, 2874, 4622, 5925, 4143, 2073, 4388, 5078, 2920, 2758, 5308, 5097, 1049]. Accurately [3467, 6263, 2434, 5577, 4901, 2526, 4793, 6264, 6060, 4692, 4693, 5449, 5473]. ACE [902, 4971]. achieved [2938]. Achieving [5848, 5245, 5523, 6072, 1770, 4626, 5691].
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1987, 974, 1755, 2789, 5004, 2272, 1761, 2986, 3908, 5543, 6183, 1069, 1765, 400, 1053, 1744, 4845, 3469, 1437, 5526, 3633, 776, 5530, 1753, 2128, 5126, 3888, 2317, 2045, 6469, 5690, 2886, 1610, 5066, 4657, 429. Algebraic-integer [229].


8 ADDITIONAL CONTRIBUTIONS FROM NELSON H. F. BEEBE

700, 785, 836, 6388, 1456, 5882, 5356, 842, 5020, 2459, 6802, 4098, 4252, 3516, 4439, 3517, 3794, 1458, 1353, 1460, 3190, 4596, 4597, 3016, 3017, 5572, 2466, 3018, 5993, 2318, 2159, 4113, 789, 491, 1362, 3805, 6824, 492, 6396, 3029, 4449, 3206, 4270, 596, 5671, 5175, 2848.

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Am25S05 [588].

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Am29027 [2191].

Am29050 [2495].

Am29C327 [2241].

Am9511A [1322].

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analogue [516].

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[54, 979, 980, 981, 1066, 99, 105, 5931, 884, 245, 3429, 6050, 102, 89, 3095, 51].

Calculators [690, 978, 92]. calculator [25, 34]. calculs [34, 3069]. Calgary
[5123, 5331, 1530, 2802, 3914, 1168, 4453, 602, 650, 896, 3320, 5268, 2505]. Cent
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6809, 6735, 6752, 6476, 6670, 6781, 6519]. Decidability [4998]. Deciding
[5662]. Decimal [5102, 457, 4788, 4944, 5394, 245, 146, 2525, 503, 5259,
4996, 578, 825, 5327, 5647, 1324, 1328, 1525, 4999, 5127, 5335, 5336, 136,
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[2525]. decimal64 [5597, 5718, 5385, 5270, 5044]. D´ecimales [1111]. Decimals
[585, 37, 5164, 5377, 244, 1624]. decimation [3183]. decimation-in-time [3183].
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1253]. decNumber [5000, 5128]. Decodable [4238]. Decoded [5409]. Decoder
[6133, 4019]. decoders [4013]. Decoding [4386, 537, 4384, 1043, 2279,
4125, 5045, 4771, 1956, 4365]. decomposable [3904]. Decomposition [3012,
2312, 3202, 1816, 5185, 5047, 331, 4310, 735, 3585, 2903, 754, 2430,
4727, 2342, 448, 3255, 5077]. Decompositions [5162, 953]. Decompression
[3581]. Decreasing [3906, 2382]. decryption [3477]. DECSYSTEM [1341, 915].
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[412, 5178, 5179, 2033, 5046, 5819, 793, 863, 1372, 538, 5589, 6003, 3212, 2852, 2853, 2173, 2349, 6115, 2668, 4763, 2480, 604, 651, 2482, 5765, 6212, 1574, 2675, 5680, 4471, 495, 544, 1101, 3384, 5454, 4294, 939, 5385, 5188, 2357, 1694, 606, 1825, 2044, 2184, 2361, 2362, 3059, 4923, 5458, 6007, 6215, 1103, 2687, 2368, 2369, 6217, 6334, 874, 4930, 5054, 5196, 2900, 5476, 5695, 3590, 2386, 190, 2901, 2726, 2907, 3096, 3097, 3259, 3595, 3596, 2214, 1933, 609, 1267, 2498, 2190, 5832, 666, 4154, 5833, 2707, 2708, 3070, 6338, 5391, 4779, 5463, 5284, 5285, 6222, 2200, 2201, 1186, 3579, 6015, 2202, 950, 3076].

Floating-Point

[2203, 4497, 2204, 2718, 4940, 5292, 5293, 5466, 5777, 6401, 1612, 6138, 3838, 1481, 3998, 1396, 1705, 4788, 4944, 4332, 4643, 4945, 5613, 4947, 2900, 5476, 5695, 3590, 2386, 190, 2901, 2726, 2907, 3096, 3097, 3259, 3595, 3596, 2214, 1933, 609, 1267, 2498, 2190, 5832, 666, 4154, 5833, 2707, 2708, 3070, 6338, 5391, 4779, 5463, 5284, 5285, 6222, 2200, 2201, 1186, 3579, 6015, 2202, 950, 3076].

Floating-Point

[2203, 4497, 2204, 2718, 4940, 5292, 5293, 5466, 5777, 6401, 1612, 6138, 3838, 1481, 3998, 1396, 1705, 4788, 4944, 4332, 4643, 4945, 5613, 4947, 2900, 5476, 5695, 3590, 2386, 190, 2901, 2726, 2907, 3096, 3097, 3259, 3595, 3596, 2214, 1933, 609, 1267, 2498, 2190, 5832, 666, 4154, 5833, 2707, 2708, 3070, 6338, 5391, 4779, 5463, 5284, 5285, 6222, 2200, 2201, 1186, 3579, 6015, 2202, 950, 3076].

Floating-Point

[2203, 4497, 2204, 2718, 4940, 5292, 5293, 5466, 5777, 6401, 1612, 6138, 3838, 1481, 3998, 1396, 1705, 4788, 4944, 4332, 4643, 4945, 5613, 4947, 2900, 5476, 5695, 3590, 2386, 190, 2901, 2726, 2907, 3096, 3097, 3259, 3595, 3596, 2214, 1933, 609, 1267, 2498, 2190, 5832, 666, 4154, 5833, 2707, 2708, 3070, 6338, 5391, 4779, 5463, 5284, 5285, 6222, 2200, 2201, 1186, 3579, 6015, 2202, 950, 3076].
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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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for the SRI computer). ... The value of BH was much higher than expected because the early part of the trajectory of Ariane 5 differs from that of Ariane 4, which results in considerably higher horizontal velocity values."


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Constantinides:2000:MPR


Corsonello:2000:PCB


DAmora:2000:RPD


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Hasan:2000:LTB


Hassibi:2000:ESR


Hassibi:2000:FSR


He:2000:UAA


Hiasat:2000:NES
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Kobayashi:2000:HBF


Koren:2000:GEI


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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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Burgess:2001:DIR


Busaba:2001:IZD


Cao:2001:HPA


Chen:2001:ADF


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\]
and that function is always a rational number. Its values are:

- \( p(n) = 1, 3/4, 2/3, 115/192, 11/20, 5887/11520, 151/315, 259723/573440, \ldots \) for \( n = 1 \) to 8.

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• 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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