```
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
tc1_power2_4ary_i0 R=4 i=0
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
quaternary angle tree search (N=12)
theta= atan(pow(2,0) =   0.785398

.....................................
* A: the leaf optimal path  R=4 i=0
.....................................
* leaf min node : depth= 11 theta= +2.071228e-07 id=2414597

path type : leafmin
dp= 0 th=+0.785398       br= 0  :  -1.249046  -0.321751   0.321751   1.249046
dp= 1 th=-0.463648       br= 3  :  -0.369334  -0.120624   0.120624   0.369334
dp= 2 th=-0.094314       br= 3  :  -0.093659  -0.031179   0.031179   0.093659
dp= 3 th=-0.000655308    br= 2  :  -0.023436  -0.007811   0.007811   0.023436
dp= 4 th=+0.00715608     br= 0  :  -0.005859  -0.001953   0.001953   0.005859
dp= 5 th=+0.00129673     br= 0  :  -0.001465  -0.000488   0.000488   0.001465
dp= 6 th=-0.000168116    br= 2  :  -0.000366  -0.000122   0.000122   0.000366
dp= 7 th=-4.60461e-05    br= 2  :  -0.000092  -0.000031   0.000031   0.000092
dp= 8 th=-1.55285e-05    br= 3  :  -0.000023  -0.000008   0.000008   0.000023
dp= 9 th=+7.35968e-06    br= 0  :  -0.000006  -0.000002   0.000002   0.000006
dp=10 th=+1.63763e-06    br= 0  :  -0.000001  -0.000000   0.000000   0.000001
dp=11 th=+2.07123e-07

.....................................
* B: the global optimal path  R=4 i=0
.....................................
level min node : depth=  0 theta= +7.853982e-01 id=0
level min node : depth=  1 theta= -4.636476e-01 id=1
level min node : depth=  2 theta= -9.431395e-02 id=8
level min node : depth=  3 theta= -6.553079e-04 id=36
level min node : depth=  4 theta= +7.156080e-03 id=147
level min node : depth=  5 theta= +1.296727e-03 id=589
level min node : depth=  6 theta= -1.681164e-04 id=2357
level min node : depth=  7 theta= -4.604608e-05 id=9431
level min node : depth=  8 theta= -1.552850e-05 id=37727
level min node : depth=  9 theta= +7.359680e-06 id=150912
level min node : depth= 10 theta= +1.637634e-06 id=603649
level min node : depth= 11 theta= +2.071228e-07 id=2414597

* global min node : depth= 11 theta= +2.071228e-07 id=2414597

path type : globalmin
dp= 0 th=+0.785398       br= 0  :  -1.249046  -0.321751   0.321751   1.249046
dp= 1 th=-0.463648       br= 3  :  -0.369334  -0.120624   0.120624   0.369334
dp= 2 th=-0.094314       br= 3  :  -0.093659  -0.031179   0.031179   0.093659
dp= 3 th=-0.000655308    br= 2  :  -0.023436  -0.007811   0.007811   0.023436
dp= 4 th=+0.00715608     br= 0  :  -0.005859  -0.001953   0.001953   0.005859
dp= 5 th=+0.00129673     br= 0  :  -0.001465  -0.000488   0.000488   0.001465
dp= 6 th=-0.000168116    br= 2  :  -0.000366  -0.000122   0.000122   0.000366
dp= 7 th=-4.60461e-05    br= 2  :  -0.000092  -0.000031   0.000031   0.000092
dp= 8 th=-1.55285e-05    br= 3  :  -0.000023  -0.000008   0.000008   0.000023
dp= 9 th=+7.35968e-06    br= 0  :  -0.000006  -0.000002   0.000002   0.000006
dp=10 th=+1.63763e-06    br= 0  :  -0.000001  -0.000000   0.000000   0.000001
dp=11 th=+2.07123e-07

.....................................
* C: the cordic path R=4 i=0
.....................................
* cordic min node : depth= 11 theta= +2.071228e-07 id=2414597

path type : cordic
dp= 0 th=+0.785398       br= 0  :  -1.249046  -0.321751   0.321751   1.249046
dp= 1 th=-0.463648       br= 3  :  -0.369334  -0.120624   0.120624   0.369334
dp= 2 th=-0.094314       br= 3  :  -0.093659  -0.031179   0.031179   0.093659
dp= 3 th=-0.000655308    br= 2  :  -0.023436  -0.007811   0.007811   0.023436
dp= 4 th=+0.00715608     br= 0  :  -0.005859  -0.001953   0.001953   0.005859
```

```
dp= 5 th=+0.00129673     br= 0  :  -0.001465  -0.000488   0.000488   0.001465
dp= 6 th=-0.000168116    br= 2  :  -0.000366  -0.000122   0.000122   0.000366
dp= 7 th=-4.60461e-05    br= 2  :  -0.000092  -0.000031   0.000031   0.000092
dp= 8 th=-1.55285e-05    br= 3  :  -0.000023  -0.000008   0.000008   0.000023
dp= 9 th=+7.35968e-06    br= 0  :  -0.000006  -0.000002   0.000002   0.000006
dp=10 th=+1.63763e-06    br= 0  :  -0.000001  -0.000000   0.000000   0.000001
dp=11 th=+2.07123e-07
* deallocate nodes in the leafmin path
* deallocate nodes in the globalmin path
* deallocate nodes in the cordic path
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
tc1_power2_4ary_i1 R=4 i=1
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
quaternary angle tree search (N=12)
theta= atan(pow(2,-1) =   0.463648

.....................................
* A: the leaf optimal path  R=4 i=1
.....................................
* leaf min node : depth= 11 theta= -4.286703e-07 id=2817512

path type : leafmin
dp= 0 th=+0.463648       br= 1  :  -1.249046  -0.321751   0.321751   1.249046
dp= 1 th=+0.141897       br= 1  :  -0.369334  -0.120624   0.120624   0.369334
dp= 2 th=+0.0212734      br= 1  :  -0.093659  -0.031179   0.031179   0.093659
dp= 3 th=-0.00990559     br= 2  :  -0.023436  -0.007811   0.007811   0.023436
dp= 4 th=-0.0020942      br= 2  :  -0.005859  -0.001953   0.001953   0.005859
dp= 5 th=-0.000141095    br= 2  :  -0.001465  -0.000488   0.000488   0.001465
dp= 6 th=+0.000347186    br= 0  :  -0.000366  -0.000122   0.000122   0.000366
dp= 7 th=-1.90253e-05    br= 2  :  -0.000092  -0.000031   0.000031   0.000092
dp= 8 th=+1.14923e-05    br= 1  :  -0.000023  -0.000008   0.000008   0.000023
dp= 9 th=+3.86286e-06    br= 0  :  -0.000006  -0.000002   0.000002   0.000006
dp=10 th=-1.85918e-06    br= 3  :  -0.000001  -0.000000   0.000000   0.000001
dp=11 th=-4.2867e-07

.....................................
* B: the global optimal path  R=4 i=1
.....................................
level min node : depth=  0 theta= +4.636476e-01 id=0
level min node : depth=  1 theta= +1.418971e-01 id=2
level min node : depth=  2 theta= +2.127339e-02 id=10
level min node : depth=  3 theta= -9.905591e-03 id=42
level min node : depth=  4 theta= -2.094203e-03 id=171
level min node : depth=  5 theta= -1.410954e-04 id=687
level min node : depth=  6 theta= +3.471856e-04 id=2751
level min node : depth=  7 theta= -1.902532e-05 id=11005
level min node : depth=  8 theta= +1.149226e-05 id=44023
level min node : depth=  9 theta= +3.862864e-06 id=176094
level min node : depth= 10 theta= -1.859182e-06 id=704377
level min node : depth= 11 theta= -4.286703e-07 id=2817512

* global min node : depth= 11 theta= -4.286703e-07 id=2817512

path type : globalmin
dp= 0 th=+0.463648       br= 1  :  -1.249046  -0.321751   0.321751   1.249046
dp= 1 th=+0.141897       br= 1  :  -0.369334  -0.120624   0.120624   0.369334
dp= 2 th=+0.0212734      br= 1  :  -0.093659  -0.031179   0.031179   0.093659
dp= 3 th=-0.00990559     br= 2  :  -0.023436  -0.007811   0.007811   0.023436
dp= 4 th=-0.0020942      br= 2  :  -0.005859  -0.001953   0.001953   0.005859
dp= 5 th=-0.000141095    br= 2  :  -0.001465  -0.000488   0.000488   0.001465
dp= 6 th=+0.000347186    br= 0  :  -0.000366  -0.000122   0.000122   0.000366
dp= 7 th=-1.90253e-05    br= 2  :  -0.000092  -0.000031   0.000031   0.000092
dp= 8 th=+1.14923e-05    br= 1  :  -0.000023  -0.000008   0.000008   0.000023
dp= 9 th=+3.86286e-06    br= 0  :  -0.000006  -0.000002   0.000002   0.000006
dp=10 th=-1.85918e-06    br= 3  :  -0.000001  -0.000000   0.000000   0.000001
dp=11 th=-4.2867e-07

.....................................
```

```
* C: the cordic path R=4 i=1
.....................................
* cordic min node : depth= 11 theta= -4.286703e-07 id=2817509

path type : cordic
dp= 0 th=+0.463648       br= 1  :  -1.249046  -0.321751   0.321751   1.249046
dp= 1 th=+0.141897       br= 1  :  -0.369334  -0.120624   0.120624   0.369334
dp= 2 th=+0.0212734      br= 1  :  -0.093659  -0.031179   0.031179   0.093659
dp= 3 th=-0.00990559     br= 2  :  -0.023436  -0.007811   0.007811   0.023436
dp= 4 th=-0.0020942      br= 2  :  -0.005859  -0.001953   0.001953   0.005859
dp= 5 th=-0.000141095    br= 2  :  -0.001465  -0.000488   0.000488   0.001465
dp= 6 th=+0.000347186    br= 0  :  -0.000366  -0.000122   0.000122   0.000366
dp= 7 th=-1.90253e-05    br= 2  :  -0.000092  -0.000031   0.000031   0.000092
dp= 8 th=+1.14923e-05    br= 1  :  -0.000023  -0.000008   0.000008   0.000023
dp= 9 th=+3.86286e-06    br= 0  :  -0.000006  -0.000002   0.000002   0.000006
dp=10 th=-1.85918e-06    br= 3  :  -0.000001  -0.000000   0.000000   0.000001
dp=11 th=-4.2867e-07
* deallocate nodes in the leafmin path
* deallocate nodes in the globalmin path
* deallocate nodes in the cordic path
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
tc1_power2_4ary_i2 R=4 i=2
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
quaternary angle tree search (N=12)
theta= atan(pow(2,-2) =   0.244979

.....................................
* A: the leaf optimal path  R=4 i=2
.....................................
* leaf min node : depth= 11 theta= +8.036423e-08 id=3055979

path type : leafmin
dp= 0 th=+0.244979       br= 1  :  -1.249046  -0.321751   0.321751   1.249046
dp= 1 th=-0.0767719      br= 2  :  -0.369334  -0.120624   0.120624   0.369334
dp= 2 th=+0.0438518      br= 1  :  -0.093659  -0.031179   0.031179   0.093659
dp= 3 th=+0.0126728      br= 1  :  -0.023436  -0.007811   0.007811   0.023436
dp= 4 th=+0.00486141     br= 0  :  -0.005859  -0.001953   0.001953   0.005859
dp= 5 th=-0.000997939    br= 3  :  -0.001465  -0.000488   0.000488   0.001465
dp= 6 th=+0.000466904    br= 0  :  -0.000366  -0.000122   0.000122   0.000366
dp= 7 th=+0.000100693    br= 0  :  -0.000092  -0.000031   0.000031   0.000092
dp= 8 th=+9.14027e-06    br= 1  :  -0.000023  -0.000008   0.000008   0.000023
dp= 9 th=+1.51088e-06    br= 1  :  -0.000006  -0.000002   0.000002   0.000006
dp=10 th=-3.96473e-07    br= 2  :  -0.000001  -0.000000   0.000000   0.000001
dp=11 th=+8.03642e-08

.....................................
* B: the global optimal path  R=4 i=2
.....................................
level min node : depth=  0 theta= +2.449787e-01 id=0
level min node : depth=  1 theta= -7.677189e-02 id=2
level min node : depth=  2 theta= +4.385178e-02 id=11
level min node : depth=  3 theta= +1.267280e-02 id=46
level min node : depth=  4 theta= +4.861413e-03 id=186
level min node : depth=  5 theta= -9.979395e-04 id=745
level min node : depth=  6 theta= +4.669039e-04 id=2984
level min node : depth=  7 theta= +1.006930e-04 id=11937
level min node : depth=  8 theta= +9.140270e-06 id=47749
level min node : depth=  9 theta= +1.510876e-06 id=190998
level min node : depth= 10 theta= -3.964729e-07 id=763994
level min node : depth= 11 theta= +8.036423e-08 id=3055979

* global min node : depth= 11 theta= +8.036423e-08 id=3055979

path type : globalmin
dp= 0 th=+0.244979       br= 1  :  -1.249046  -0.321751   0.321751   1.249046
dp= 1 th=-0.0767719      br= 2  :  -0.369334  -0.120624   0.120624   0.369334
dp= 2 th=+0.0438518      br= 1  :  -0.093659  -0.031179   0.031179   0.093659
dp= 3 th=+0.0126728      br= 1  :  -0.023436  -0.007811   0.007811   0.023436
```

```
dp= 4 th=+0.00486141     br= 0  :  -0.005859  -0.001953   0.001953   0.005859
dp= 5 th=-0.000997939    br= 3  :  -0.001465  -0.000488   0.000488   0.001465
dp= 6 th=+0.000466904    br= 0  :  -0.000366  -0.000122   0.000122   0.000366
dp= 7 th=+0.000100693    br= 0  :  -0.000092  -0.000031   0.000031   0.000092
dp= 8 th=+9.14027e-06    br= 1  :  -0.000023  -0.000008   0.000008   0.000023
dp= 9 th=+1.51088e-06    br= 1  :  -0.000006  -0.000002   0.000002   0.000006
dp=10 th=-3.96473e-07    br= 2  :  -0.000001  -0.000000   0.000000   0.000001
dp=11 th=+8.03642e-08

.....................................
* C: the cordic path R=4 i=2
.....................................
* cordic min node : depth= 11 theta= +8.036423e-08 id=3055977

path type : cordic
dp= 0 th=+0.244979       br= 1  :  -1.249046  -0.321751   0.321751   1.249046
dp= 1 th=-0.0767719      br= 2  :  -0.369334  -0.120624   0.120624   0.369334
dp= 2 th=+0.0438518      br= 1  :  -0.093659  -0.031179   0.031179   0.093659
dp= 3 th=+0.0126728      br= 1  :  -0.023436  -0.007811   0.007811   0.023436
dp= 4 th=+0.00486141     br= 0  :  -0.005859  -0.001953   0.001953   0.005859
dp= 5 th=-0.000997939    br= 3  :  -0.001465  -0.000488   0.000488   0.001465
dp= 6 th=+0.000466904    br= 0  :  -0.000366  -0.000122   0.000122   0.000366
dp= 7 th=+0.000100693    br= 0  :  -0.000092  -0.000031   0.000031   0.000092
dp= 8 th=+9.14027e-06    br= 1  :  -0.000023  -0.000008   0.000008   0.000023
dp= 9 th=+1.51088e-06    br= 1  :  -0.000006  -0.000002   0.000002   0.000006
dp=10 th=-3.96473e-07    br= 2  :  -0.000001  -0.000000   0.000000   0.000001
dp=11 th=+8.03642e-08
* deallocate nodes in the leafmin path
* deallocate nodes in the globalmin path
* deallocate nodes in the cordic path
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
tc1_power2_4ary_i3 R=4 i=3
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
quaternary angle tree search (N=12)
theta= atan(pow(2,-3) =   0.124355

.....................................
* A: the leaf optimal path  R=4 i=3
.....................................
* leaf min node : depth= 11 theta= -1.821627e-08 id=3545729

path type : leafmin
dp= 0 th=+0.124355       br= 2  :  -1.249046  -0.321751   0.321751   1.249046
dp= 1 th=+0.446106       br= 0  :  -0.369334  -0.120624   0.120624   0.369334
dp= 2 th=+0.0767719      br= 0  :  -0.093659  -0.031179   0.031179   0.093659
dp= 3 th=-0.0168868      br= 3  :  -0.023436  -0.007811   0.007811   0.023436
dp= 4 th=+0.00654932     br= 0  :  -0.005859  -0.001953   0.001953   0.005859
dp= 5 th=+0.000689965    br= 1  :  -0.001465  -0.000488   0.000488   0.001465
dp= 6 th=+0.000201684    br= 1  :  -0.000366  -0.000122   0.000122   0.000366
dp= 7 th=+7.96136e-05    br= 0  :  -0.000092  -0.000031   0.000031   0.000092
dp= 8 th=-1.19391e-05    br= 2  :  -0.000023  -0.000008   0.000008   0.000023
dp= 9 th=-4.30975e-06    br= 3  :  -0.000006  -0.000002   0.000002   0.000006
dp=10 th=+1.4123e-06     br= 0  :  -0.000001  -0.000000   0.000000   0.000001
dp=11 th=-1.82163e-08

.....................................
* B: the global optimal path  R=4 i=3
.....................................
level min node : depth=  0 theta= +1.243550e-01 id=0
level min node : depth=  1 theta= -1.973956e-01 id=2
level min node : depth=  2 theta= -7.677189e-02 id=11
level min node : depth=  3 theta= -1.688675e-02 id=53
level min node : depth=  4 theta= -6.549318e-03 id=193
level min node : depth=  5 theta= -6.899649e-04 id=776
level min node : depth=  6 theta= -2.016839e-04 id=3107
level min node : depth=  7 theta= -7.961359e-05 id=12431
level min node : depth=  8 theta= -1.193915e-05 id=55401
level min node : depth=  9 theta= -4.309751e-06 id=221607
```

```
level min node : depth= 10 theta= -1.412295e-06 id=795657
level min node : depth= 11 theta= -1.821627e-08 id=3545729

* global min node : depth= 11 theta= -1.821627e-08 id=3545729

path type : globalmin
dp= 0 th=+0.124355       br= 2  :  -1.249046  -0.321751   0.321751   1.249046
dp= 1 th=+0.446106       br= 0  :  -0.369334  -0.120624   0.120624   0.369334
dp= 2 th=+0.0767719      br= 0  :  -0.093659  -0.031179   0.031179   0.093659
dp= 3 th=-0.0168868      br= 3  :  -0.023436  -0.007811   0.007811   0.023436
dp= 4 th=+0.00654932     br= 0  :  -0.005859  -0.001953   0.001953   0.005859
dp= 5 th=+0.000689965    br= 1  :  -0.001465  -0.000488   0.000488   0.001465
dp= 6 th=+0.000201684    br= 1  :  -0.000366  -0.000122   0.000122   0.000366
dp= 7 th=+7.96136e-05    br= 0  :  -0.000092  -0.000031   0.000031   0.000092
dp= 8 th=-1.19391e-05    br= 2  :  -0.000023  -0.000008   0.000008   0.000023
dp= 9 th=-4.30975e-06    br= 3  :  -0.000006  -0.000002   0.000002   0.000006
dp=10 th=+1.4123e-06     br= 0  :  -0.000001  -0.000000   0.000000   0.000001
dp=11 th=-1.82163e-08

.....................................
* C: the cordic path R=4 i=3
.....................................
* cordic min node : depth= 11 theta= +1.821627e-08 id=3182629

path type : cordic
dp= 0 th=+0.124355       br= 1  :  -1.249046  -0.321751   0.321751   1.249046
dp= 1 th=-0.197396       br= 2  :  -0.369334  -0.120624   0.120624   0.369334
dp= 2 th=-0.0767719      br= 3  :  -0.093659  -0.031179   0.031179   0.093659
dp= 3 th=+0.0168868      br= 0  :  -0.023436  -0.007811   0.007811   0.023436
dp= 4 th=-0.00654932     br= 3  :  -0.005859  -0.001953   0.001953   0.005859
dp= 5 th=-0.000689965    br= 2  :  -0.001465  -0.000488   0.000488   0.001465
dp= 6 th=-0.000201684    br= 2  :  -0.000366  -0.000122   0.000122   0.000366
dp= 7 th=-7.96136e-05    br= 3  :  -0.000092  -0.000031   0.000031   0.000092
dp= 8 th=+1.19391e-05    br= 1  :  -0.000023  -0.000008   0.000008   0.000023
dp= 9 th=+4.30975e-06    br= 0  :  -0.000006  -0.000002   0.000002   0.000006
dp=10 th=-1.4123e-06     br= 3  :  -0.000001  -0.000000   0.000000   0.000001
dp=11 th=+1.82163e-08
* deallocate nodes in the leafmin path
* deallocate nodes in the globalmin path
* deallocate nodes in the cordic path
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
tc1_power2_4ary_i4 R=4 i=4
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
quaternary angle tree search (N=12)
theta= atan(pow(2,-4) =  0.0624188

.....................................
* A: the leaf optimal path  R=4 i=4
.....................................
* leaf min node : depth= 11 theta= -1.301979e-07 id=3610695

path type : leafmin
dp= 0 th=+0.0624188      br= 2  :  -1.249046  -0.321751   0.321751   1.249046
dp= 1 th=+0.384169       br= 0  :  -0.369334  -0.120624   0.120624   0.369334
dp= 2 th=+0.0148357      br= 1  :  -0.093659  -0.031179   0.031179   0.093659
dp= 3 th=-0.0163433      br= 3  :  -0.023436  -0.007811   0.007811   0.023436
dp= 4 th=+0.0070928      br= 0  :  -0.005859  -0.001953   0.001953   0.005859
dp= 5 th=+0.00123345     br= 0  :  -0.001465  -0.000488   0.000488   0.001465
dp= 6 th=-0.000231396    br= 2  :  -0.000366  -0.000122   0.000122   0.000366
dp= 7 th=-0.000109326    br= 3  :  -0.000092  -0.000031   0.000031   0.000092
dp= 8 th=-1.77732e-05    br= 3  :  -0.000023  -0.000008   0.000008   0.000023
dp= 9 th=+5.11501e-06    br= 0  :  -0.000006  -0.000002   0.000002   0.000006
dp=10 th=-6.07035e-07    br= 2  :  -0.000001  -0.000000   0.000000   0.000001
dp=11 th=-1.30198e-07

.....................................
* B: the global optimal path  R=4 i=4
.....................................
```

```
level min node : depth=  0 theta= +6.241881e-02 id=0
level min node : depth=  1 theta= -2.593317e-01 id=2
level min node : depth=  2 theta= +1.483571e-02 id=13
level min node : depth=  3 theta= -1.634327e-02 id=54
level min node : depth=  4 theta= -7.092800e-03 id=197
level min node : depth=  5 theta= -1.233447e-03 id=792
level min node : depth=  6 theta= -2.313962e-04 id=3525
level min node : depth=  7 theta= -1.093259e-04 id=14103
level min node : depth=  8 theta= -1.777317e-05 id=56416
level min node : depth=  9 theta= -5.115011e-06 id=203045
level min node : depth= 10 theta= -6.070351e-07 id=902673
level min node : depth= 11 theta= -1.301979e-07 id=3610695

* global min node : depth= 11 theta= -1.301979e-07 id=3610695

path type : globalmin
dp= 0 th=+0.0624188      br= 2  :  -1.249046  -0.321751   0.321751   1.249046
dp= 1 th=+0.384169       br= 0  :  -0.369334  -0.120624   0.120624   0.369334
dp= 2 th=+0.0148357      br= 1  :  -0.093659  -0.031179   0.031179   0.093659
dp= 3 th=-0.0163433      br= 3  :  -0.023436  -0.007811   0.007811   0.023436
dp= 4 th=+0.0070928      br= 0  :  -0.005859  -0.001953   0.001953   0.005859
dp= 5 th=+0.00123345     br= 0  :  -0.001465  -0.000488   0.000488   0.001465
dp= 6 th=-0.000231396    br= 2  :  -0.000366  -0.000122   0.000122   0.000366
dp= 7 th=-0.000109326    br= 3  :  -0.000092  -0.000031   0.000031   0.000092
dp= 8 th=-1.77732e-05    br= 3  :  -0.000023  -0.000008   0.000008   0.000023
dp= 9 th=+5.11501e-06    br= 0  :  -0.000006  -0.000002   0.000002   0.000006
dp=10 th=-6.07035e-07    br= 2  :  -0.000001  -0.000000   0.000000   0.000001
dp=11 th=-1.30198e-07

.....................................
* C: the cordic path R=4 i=4
.....................................
* cordic min node : depth= 11 theta= +1.301979e-07 id=3248737

path type : cordic
dp= 0 th=+0.0624188      br= 1  :  -1.249046  -0.321751   0.321751   1.249046
dp= 1 th=-0.259332       br= 3  :  -0.369334  -0.120624   0.120624   0.369334
dp= 2 th=+0.110002       br= 0  :  -0.093659  -0.031179   0.031179   0.093659
dp= 3 th=+0.0163433      br= 0  :  -0.023436  -0.007811   0.007811   0.023436
dp= 4 th=-0.0070928      br= 3  :  -0.005859  -0.001953   0.001953   0.005859
dp= 5 th=-0.00123345     br= 3  :  -0.001465  -0.000488   0.000488   0.001465
dp= 6 th=+0.000231396    br= 1  :  -0.000366  -0.000122   0.000122   0.000366
dp= 7 th=+0.000109326    br= 0  :  -0.000092  -0.000031   0.000031   0.000092
dp= 8 th=+1.77732e-05    br= 0  :  -0.000023  -0.000008   0.000008   0.000023
dp= 9 th=-5.11501e-06    br= 3  :  -0.000006  -0.000002   0.000002   0.000006
dp=10 th=+6.07035e-07    br= 1  :  -0.000001  -0.000000   0.000000   0.000001
dp=11 th=+1.30198e-07
* deallocate nodes in the leafmin path
* deallocate nodes in the globalmin path
* deallocate nodes in the cordic path
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
tc1_power2_4ary_i5 R=4 i=5
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
quaternary angle tree search (N=12)
theta= atan(pow(2,-5) =  0.0312398

.....................................
* A: the leaf optimal path  R=4 i=5
.....................................
* leaf min node : depth= 11 theta= +5.367653e-08 id=3643535

path type : leafmin
dp= 0 th=+0.0312398      br= 2  :  -1.249046  -0.321751   0.321751   1.249046
dp= 1 th=+0.35299        br= 0  :  -0.369334  -0.120624   0.120624   0.369334
dp= 2 th=-0.0163433      br= 2  :  -0.093659  -0.031179   0.031179   0.093659
dp= 3 th=+0.0148357      br= 1  :  -0.023436  -0.007811   0.007811   0.023436
dp= 4 th=+0.00702432     br= 0  :  -0.005859  -0.001953   0.001953   0.005859
dp= 5 th=+0.00116497     br= 0  :  -0.001465  -0.000488   0.000488   0.001465
```

```
dp= 6 th=-0.000299877    br= 3  :  -0.000366  -0.000122   0.000122   0.000366
dp= 7 th=+6.6334e-05     br= 0  :  -0.000092  -0.000031   0.000031   0.000092
dp= 8 th=-2.52187e-05    br= 3  :  -0.000023  -0.000008   0.000008   0.000023
dp= 9 th=-2.33051e-06    br= 2  :  -0.000006  -0.000002   0.000002   0.000006
dp=10 th=-4.23161e-07    br= 2  :  -0.000001  -0.000000   0.000000   0.000001
dp=11 th=+5.36765e-08

.....................................
* B: the global optimal path  R=4 i=5
.....................................
level min node : depth=  0 theta= +3.123983e-02 id=0
level min node : depth=  1 theta= -2.905107e-01 id=2
level min node : depth=  2 theta= -1.634327e-02 id=13
level min node : depth=  3 theta= +1.483571e-02 id=55
level min node : depth=  4 theta= +7.024319e-03 id=222
level min node : depth=  5 theta= +1.164967e-03 id=889
level min node : depth=  6 theta= +2.998769e-04 id=3204
level min node : depth=  7 theta= +6.633404e-05 id=14232
level min node : depth=  8 theta= +2.521869e-05 id=51272
level min node : depth=  9 theta= +2.330509e-06 id=205089
level min node : depth= 10 theta= +4.231606e-07 id=820358
level min node : depth= 11 theta= +5.367653e-08 id=3643535

* global min node : depth= 11 theta= +5.367653e-08 id=3643535

path type : globalmin
dp= 0 th=+0.0312398      br= 2  :  -1.249046  -0.321751   0.321751   1.249046
dp= 1 th=+0.35299        br= 0  :  -0.369334  -0.120624   0.120624   0.369334
dp= 2 th=-0.0163433      br= 2  :  -0.093659  -0.031179   0.031179   0.093659
dp= 3 th=+0.0148357      br= 1  :  -0.023436  -0.007811   0.007811   0.023436
dp= 4 th=+0.00702432     br= 0  :  -0.005859  -0.001953   0.001953   0.005859
dp= 5 th=+0.00116497     br= 0  :  -0.001465  -0.000488   0.000488   0.001465
dp= 6 th=-0.000299877    br= 3  :  -0.000366  -0.000122   0.000122   0.000366
dp= 7 th=+6.6334e-05     br= 0  :  -0.000092  -0.000031   0.000031   0.000092
dp= 8 th=-2.52187e-05    br= 3  :  -0.000023  -0.000008   0.000008   0.000023
dp= 9 th=-2.33051e-06    br= 2  :  -0.000006  -0.000002   0.000002   0.000006
dp=10 th=-4.23161e-07    br= 2  :  -0.000001  -0.000000   0.000000   0.000001
dp=11 th=+5.36765e-08

.....................................
* C: the cordic path R=4 i=5
.....................................
* cordic min node : depth= 11 theta= -5.367653e-08 id=3281433

path type : cordic
dp= 0 th=+0.0312398      br= 1  :  -1.249046  -0.321751   0.321751   1.249046
dp= 1 th=-0.290511       br= 3  :  -0.369334  -0.120624   0.120624   0.369334
dp= 2 th=+0.0788229      br= 0  :  -0.093659  -0.031179   0.031179   0.093659
dp= 3 th=-0.0148357      br= 2  :  -0.023436  -0.007811   0.007811   0.023436
dp= 4 th=-0.00702432     br= 3  :  -0.005859  -0.001953   0.001953   0.005859
dp= 5 th=-0.00116497     br= 3  :  -0.001465  -0.000488   0.000488   0.001465
dp= 6 th=+0.000299877    br= 0  :  -0.000366  -0.000122   0.000122   0.000366
dp= 7 th=-6.6334e-05     br= 3  :  -0.000092  -0.000031   0.000031   0.000092
dp= 8 th=+2.52187e-05    br= 0  :  -0.000023  -0.000008   0.000008   0.000023
dp= 9 th=+2.33051e-06    br= 1  :  -0.000006  -0.000002   0.000002   0.000006
dp=10 th=+4.23161e-07    br= 1  :  -0.000001  -0.000000   0.000000   0.000001
dp=11 th=-5.36765e-08
* deallocate nodes in the leafmin path
* deallocate nodes in the globalmin path
* deallocate nodes in the cordic path
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
tc1_power2_4ary_i6 R=4 i=6
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
quaternary angle tree search (N=12)
theta= atan(pow(2,-6) =  0.0156237

.....................................
* A: the leaf optimal path  R=4 i=6
```

```
.....................................
* leaf min node : depth= 11 theta= +4.826728e-08 id=3659912

path type : leafmin
dp= 0 th=+0.0156237      br= 2  :  -1.249046  -0.321751   0.321751   1.249046
dp= 1 th=+0.337374       br= 0  :  -0.369334  -0.120624   0.120624   0.369334
dp= 2 th=-0.0319594      br= 2  :  -0.093659  -0.031179   0.031179   0.093659
dp= 3 th=-0.000780398    br= 2  :  -0.023436  -0.007811   0.007811   0.023436
dp= 4 th=+0.00703099     br= 0  :  -0.005859  -0.001953   0.001953   0.005859
dp= 5 th=+0.00117164     br= 0  :  -0.001465  -0.000488   0.000488   0.001465
dp= 6 th=-0.000293207    br= 3  :  -0.000366  -0.000122   0.000122   0.000366
dp= 7 th=+7.30044e-05    br= 0  :  -0.000092  -0.000031   0.000031   0.000092
dp= 8 th=-1.85484e-05    br= 3  :  -0.000023  -0.000008   0.000008   0.000023
dp= 9 th=+4.3398e-06     br= 0  :  -0.000006  -0.000002   0.000002   0.000006
dp=10 th=-1.38224e-06    br= 3  :  -0.000001  -0.000000   0.000000   0.000001
dp=11 th=+4.82673e-08

.....................................
* B: the global optimal path  R=4 i=6
.....................................
level min node : depth=  0 theta= +1.562373e-02 id=0
level min node : depth=  1 theta= -3.061268e-01 id=2
level min node : depth=  2 theta= -3.195937e-02 id=13
level min node : depth=  3 theta= -7.803981e-04 id=55
level min node : depth=  4 theta= -7.015742e-03 id=200
level min node : depth=  5 theta= -1.156389e-03 id=804
level min node : depth=  6 theta= -2.932066e-04 id=3573
level min node : depth=  7 theta= -5.775673e-05 id=12881
level min node : depth=  8 theta= -1.854838e-05 id=57185
level min node : depth=  9 theta= +4.339802e-06 id=228744
level min node : depth= 10 theta= +1.371077e-06 id=824452
level min node : depth= 11 theta= +4.826728e-08 id=3659912

* global min node : depth= 11 theta= +4.826728e-08 id=3659912

path type : globalmin
dp= 0 th=+0.0156237      br= 2  :  -1.249046  -0.321751   0.321751   1.249046
dp= 1 th=+0.337374       br= 0  :  -0.369334  -0.120624   0.120624   0.369334
dp= 2 th=-0.0319594      br= 2  :  -0.093659  -0.031179   0.031179   0.093659
dp= 3 th=-0.000780398    br= 2  :  -0.023436  -0.007811   0.007811   0.023436
dp= 4 th=+0.00703099     br= 0  :  -0.005859  -0.001953   0.001953   0.005859
dp= 5 th=+0.00117164     br= 0  :  -0.001465  -0.000488   0.000488   0.001465
dp= 6 th=-0.000293207    br= 3  :  -0.000366  -0.000122   0.000122   0.000366
dp= 7 th=+7.30044e-05    br= 0  :  -0.000092  -0.000031   0.000031   0.000092
dp= 8 th=-1.85484e-05    br= 3  :  -0.000023  -0.000008   0.000008   0.000023
dp= 9 th=+4.3398e-06     br= 0  :  -0.000006  -0.000002   0.000002   0.000006
dp=10 th=-1.38224e-06    br= 3  :  -0.000001  -0.000000   0.000000   0.000001
dp=11 th=+4.82673e-08

.....................................
* C: the cordic path R=4 i=6
.....................................
* cordic min node : depth= 11 theta= -5.943496e-08 id=3297809

path type : cordic
dp= 0 th=+0.0156237      br= 1  :  -1.249046  -0.321751   0.321751   1.249046
dp= 1 th=-0.306127       br= 3  :  -0.369334  -0.120624   0.120624   0.369334
dp= 2 th=+0.0632068      br= 0  :  -0.093659  -0.031179   0.031179   0.093659
dp= 3 th=-0.0304518      br= 3  :  -0.023436  -0.007811   0.007811   0.023436
dp= 4 th=-0.00701574     br= 3  :  -0.005859  -0.001953   0.001953   0.005859
dp= 5 th=-0.00115639     br= 3  :  -0.001465  -0.000488   0.000488   0.001465
dp= 6 th=+0.000308454    br= 0  :  -0.000366  -0.000122   0.000122   0.000366
dp= 7 th=-5.77567e-05    br= 2  :  -0.000092  -0.000031   0.000031   0.000092
dp= 8 th=-2.72392e-05    br= 3  :  -0.000023  -0.000008   0.000008   0.000023
dp= 9 th=-4.35097e-06    br= 3  :  -0.000006  -0.000002   0.000002   0.000006
dp=10 th=+1.37108e-06    br= 0  :  -0.000001  -0.000000   0.000000   0.000001
dp=11 th=-5.9435e-08
* deallocate nodes in the leafmin path
```

```
* deallocate nodes in the globalmin path
* deallocate nodes in the cordic path
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
tc1_power2_4ary_i7 R=4 i=7
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
quaternary angle tree search (N=12)
theta= atan(pow(2,-7) = 0.00781234

.....................................
* A: the leaf optimal path  R=4 i=7
.....................................
* leaf min node : depth= 11 theta= +1.672965e-07 id=3668103

path type : leafmin
dp= 0 th=+0.00781234     br= 2  :  -1.249046  -0.321751   0.321751   1.249046
dp= 1 th=+0.329563       br= 0  :  -0.369334  -0.120624   0.120624   0.369334
dp= 2 th=-0.0397708      br= 2  :  -0.093659  -0.031179   0.031179   0.093659
dp= 3 th=-0.00859179     br= 2  :  -0.023436  -0.007811   0.007811   0.023436
dp= 4 th=-0.000780398    br= 2  :  -0.005859  -0.001953   0.001953   0.005859
dp= 5 th=+0.00117271     br= 0  :  -0.001465  -0.000488   0.000488   0.001465
dp= 6 th=-0.000292134    br= 3  :  -0.000366  -0.000122   0.000122   0.000366
dp= 7 th=+7.40771e-05    br= 0  :  -0.000092  -0.000031   0.000031   0.000092
dp= 8 th=-1.74757e-05    br= 3  :  -0.000023  -0.000008   0.000008   0.000023
dp= 9 th=+5.41251e-06    br= 0  :  -0.000006  -0.000002   0.000002   0.000006
dp=10 th=-3.09541e-07    br= 2  :  -0.000001  -0.000000   0.000000   0.000001
dp=11 th=+1.67297e-07

.....................................
* B: the global optimal path  R=4 i=7
.....................................
level min node : depth=  0 theta= +7.812341e-03 id=0
level min node : depth=  1 theta= -3.139382e-01 id=2
level min node : depth=  2 theta= -3.977076e-02 id=13
level min node : depth=  3 theta= -8.591786e-03 id=55
level min node : depth=  4 theta= +7.803981e-04 id=201
level min node : depth=  5 theta= +1.172710e-03 id=895
level min node : depth=  6 theta= +2.921339e-04 id=3228
level min node : depth=  7 theta= +7.407706e-05 id=14328
level min node : depth=  8 theta= +1.747568e-05 id=51656
level min node : depth=  9 theta= +5.412505e-06 id=229256
level min node : depth= 10 theta= +3.095406e-07 id=826504
level min node : depth= 11 theta= +1.672965e-07 id=3668103

* global min node : depth= 11 theta= +1.672965e-07 id=3668103

path type : globalmin
dp= 0 th=+0.00781234     br= 2  :  -1.249046  -0.321751   0.321751   1.249046
dp= 1 th=+0.329563       br= 0  :  -0.369334  -0.120624   0.120624   0.369334
dp= 2 th=-0.0397708      br= 2  :  -0.093659  -0.031179   0.031179   0.093659
dp= 3 th=-0.00859179     br= 2  :  -0.023436  -0.007811   0.007811   0.023436
dp= 4 th=-0.000780398    br= 2  :  -0.005859  -0.001953   0.001953   0.005859
dp= 5 th=+0.00117271     br= 0  :  -0.001465  -0.000488   0.000488   0.001465
dp= 6 th=-0.000292134    br= 3  :  -0.000366  -0.000122   0.000122   0.000366
dp= 7 th=+7.40771e-05    br= 0  :  -0.000092  -0.000031   0.000031   0.000092
dp= 8 th=-1.74757e-05    br= 3  :  -0.000023  -0.000008   0.000008   0.000023
dp= 9 th=+5.41251e-06    br= 0  :  -0.000006  -0.000002   0.000002   0.000006
dp=10 th=-3.09541e-07    br= 2  :  -0.000001  -0.000000   0.000000   0.000001
dp=11 th=+1.67297e-07

.....................................
* C: the cordic path R=4 i=7
.....................................
* cordic min node : depth= 11 theta= -1.672965e-07 id=3306017

path type : cordic
dp= 0 th=+0.00781234     br= 1  :  -1.249046  -0.321751   0.321751   1.249046
dp= 1 th=-0.313938       br= 3  :  -0.369334  -0.120624   0.120624   0.369334
dp= 2 th=+0.0553954      br= 1  :  -0.093659  -0.031179   0.031179   0.093659
```

```
dp= 3 th=+0.0242165      br= 0  :  -0.023436  -0.007811   0.007811   0.023436
dp= 4 th=+0.000780398    br= 1  :  -0.005859  -0.001953   0.001953   0.005859
dp= 5 th=-0.00117271     br= 3  :  -0.001465  -0.000488   0.000488   0.001465
dp= 6 th=+0.000292134    br= 0  :  -0.000366  -0.000122   0.000122   0.000366
dp= 7 th=-7.40771e-05    br= 3  :  -0.000092  -0.000031   0.000031   0.000092
dp= 8 th=+1.74757e-05    br= 0  :  -0.000023  -0.000008   0.000008   0.000023
dp= 9 th=-5.41251e-06    br= 3  :  -0.000006  -0.000002   0.000002   0.000006
dp=10 th=+3.09541e-07    br= 1  :  -0.000001  -0.000000   0.000000   0.000001
dp=11 th=-1.67297e-07
* deallocate nodes in the leafmin path
* deallocate nodes in the globalmin path
* deallocate nodes in the cordic path
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
tc1_power2_4ary_i8 R=4 i=8
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
quaternary angle tree search (N=12)
theta= atan(pow(2,-8) = 0.00390623

.....................................
* A: the leaf optimal path  R=4 i=8
.....................................
* leaf min node : depth= 11 theta= -6.299368e-08 id=3310114

path type : leafmin
dp= 0 th=+0.00390623     br= 1  :  -1.249046  -0.321751   0.321751   1.249046
dp= 1 th=-0.317844       br= 3  :  -0.369334  -0.120624   0.120624   0.369334
dp= 2 th=+0.0514893      br= 1  :  -0.093659  -0.031179   0.031179   0.093659
dp= 3 th=+0.0203104      br= 0  :  -0.023436  -0.007811   0.007811   0.023436
dp= 4 th=-0.00312571     br= 2  :  -0.005859  -0.001953   0.001953   0.005859
dp= 5 th=-0.00117261     br= 3  :  -0.001465  -0.000488   0.000488   0.001465
dp= 6 th=+0.000292238    br= 0  :  -0.000366  -0.000122   0.000122   0.000366
dp= 7 th=-7.39728e-05    br= 3  :  -0.000092  -0.000031   0.000031   0.000092
dp= 8 th=+1.758e-05      br= 0  :  -0.000023  -0.000008   0.000008   0.000023
dp= 9 th=-5.3082e-06     br= 3  :  -0.000006  -0.000002   0.000002   0.000006
dp=10 th=+4.13843e-07    br= 1  :  -0.000001  -0.000000   0.000000   0.000001
dp=11 th=-6.29937e-08

.....................................
* B: the global optimal path  R=4 i=8
.....................................
level min node : depth=  0 theta= +3.906230e-03 id=0
level min node : depth=  1 theta= -3.178443e-01 id=2
level min node : depth=  2 theta= -4.367687e-02 id=13
level min node : depth=  3 theta= -1.249790e-02 id=55
level min node : depth=  4 theta= -3.125713e-03 id=201
level min node : depth=  5 theta= -1.172605e-03 id=807
level min node : depth=  6 theta= -2.919998e-04 id=3585
level min node : depth=  7 theta= -7.397275e-05 id=12929
level min node : depth=  8 theta= -1.734157e-05 id=57377
level min node : depth=  9 theta= -5.308202e-06 id=206881
level min node : depth= 10 theta= -1.754358e-07 id=918049
level min node : depth= 11 theta= -6.299368e-08 id=3310114

* global min node : depth= 11 theta= -6.299368e-08 id=3310114

path type : globalmin
dp= 0 th=+0.00390623     br= 1  :  -1.249046  -0.321751   0.321751   1.249046
dp= 1 th=-0.317844       br= 3  :  -0.369334  -0.120624   0.120624   0.369334
dp= 2 th=+0.0514893      br= 1  :  -0.093659  -0.031179   0.031179   0.093659
dp= 3 th=+0.0203104      br= 0  :  -0.023436  -0.007811   0.007811   0.023436
dp= 4 th=-0.00312571     br= 2  :  -0.005859  -0.001953   0.001953   0.005859
dp= 5 th=-0.00117261     br= 3  :  -0.001465  -0.000488   0.000488   0.001465
dp= 6 th=+0.000292238    br= 0  :  -0.000366  -0.000122   0.000122   0.000366
dp= 7 th=-7.39728e-05    br= 3  :  -0.000092  -0.000031   0.000031   0.000092
dp= 8 th=+1.758e-05      br= 0  :  -0.000023  -0.000008   0.000008   0.000023
dp= 9 th=-5.3082e-06     br= 3  :  -0.000006  -0.000002   0.000002   0.000006
dp=10 th=+4.13843e-07    br= 1  :  -0.000001  -0.000000   0.000000   0.000001
dp=11 th=-6.29937e-08
```

```
.....................................
* C: the cordic path R=4 i=8
.....................................
* cordic min node : depth= 11 theta= -6.299368e-08 id=3310113

path type : cordic
dp= 0 th=+0.00390623     br= 1  :  -1.249046  -0.321751   0.321751   1.249046
dp= 1 th=-0.317844       br= 3  :  -0.369334  -0.120624   0.120624   0.369334
dp= 2 th=+0.0514893      br= 1  :  -0.093659  -0.031179   0.031179   0.093659
dp= 3 th=+0.0203104      br= 0  :  -0.023436  -0.007811   0.007811   0.023436
dp= 4 th=-0.00312571     br= 2  :  -0.005859  -0.001953   0.001953   0.005859
dp= 5 th=-0.00117261     br= 3  :  -0.001465  -0.000488   0.000488   0.001465
dp= 6 th=+0.000292238    br= 0  :  -0.000366  -0.000122   0.000122   0.000366
dp= 7 th=-7.39728e-05    br= 3  :  -0.000092  -0.000031   0.000031   0.000092
dp= 8 th=+1.758e-05      br= 0  :  -0.000023  -0.000008   0.000008   0.000023
dp= 9 th=-5.3082e-06     br= 3  :  -0.000006  -0.000002   0.000002   0.000006
dp=10 th=+4.13843e-07    br= 1  :  -0.000001  -0.000000   0.000000   0.000001
dp=11 th=-6.29937e-08
* deallocate nodes in the leafmin path
* deallocate nodes in the globalmin path
* deallocate nodes in the cordic path
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
tc1_power2_4ary_i9 R=4 i=9
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
quaternary angle tree search (N=12)
theta= atan(pow(2,-9) = 0.00195312

.....................................
* A: the leaf optimal path  R=4 i=9
.....................................
* leaf min node : depth= 11 theta= -4.995533e-08 id=3312162

path type : leafmin
dp= 0 th=+0.00195312     br= 1  :  -1.249046  -0.321751   0.321751   1.249046
dp= 1 th=-0.319797       br= 3  :  -0.369334  -0.120624   0.120624   0.369334
dp= 2 th=+0.0495362      br= 1  :  -0.093659  -0.031179   0.031179   0.093659
dp= 3 th=+0.0183572      br= 0  :  -0.023436  -0.007811   0.007811   0.023436
dp= 4 th=-0.00507882     br= 3  :  -0.005859  -0.001953   0.001953   0.005859
dp= 5 th=+0.000780532    br= 1  :  -0.001465  -0.000488   0.000488   0.001465
dp= 6 th=+0.000292251    br= 0  :  -0.000366  -0.000122   0.000122   0.000366
dp= 7 th=-7.39597e-05    br= 3  :  -0.000092  -0.000031   0.000031   0.000092
dp= 8 th=+1.7593e-05     br= 0  :  -0.000023  -0.000008   0.000008   0.000023
dp= 9 th=-5.29516e-06    br= 3  :  -0.000006  -0.000002   0.000002   0.000006
dp=10 th=+4.26882e-07    br= 1  :  -0.000001  -0.000000   0.000000   0.000001
dp=11 th=-4.99553e-08

.....................................
* B: the global optimal path  R=4 i=9
.....................................
level min node : depth=  0 theta= +1.953123e-03 id=0
level min node : depth=  1 theta= -3.197974e-01 id=2
level min node : depth=  2 theta= -4.562998e-02 id=13
level min node : depth=  3 theta= -1.445100e-02 id=55
level min node : depth=  4 theta= -5.078820e-03 id=201
level min node : depth=  5 theta= -7.802640e-04 id=896
level min node : depth=  6 theta= -2.919830e-04 id=3587
level min node : depth=  7 theta= -7.395971e-05 id=12937
level min node : depth=  8 theta= -1.732481e-05 id=57409
level min node : depth=  9 theta= -5.295164e-06 id=207009
level min node : depth= 10 theta= -1.586722e-07 id=918561
level min node : depth= 11 theta= -4.995533e-08 id=3312162

* global min node : depth= 11 theta= -4.995533e-08 id=3312162

path type : globalmin
dp= 0 th=+0.00195312     br= 1  :  -1.249046  -0.321751   0.321751   1.249046
dp= 1 th=-0.319797       br= 3  :  -0.369334  -0.120624   0.120624   0.369334
```

```
dp= 2 th=+0.0495362     br= 1  :  -0.093659  -0.031179   0.031179   0.093659
dp= 3 th=+0.0183572     br= 0  :  -0.023436  -0.007811   0.007811   0.023436
dp= 4 th=-0.00507882    br= 3  :  -0.005859  -0.001953   0.001953   0.005859
dp= 5 th=+0.000780532   br= 1  :  -0.001465  -0.000488   0.000488   0.001465
dp= 6 th=+0.000292251   br= 0  :  -0.000366  -0.000122   0.000122   0.000366
dp= 7 th=-7.39597e-05   br= 3  :  -0.000092  -0.000031   0.000031   0.000092
dp= 8 th=+1.7593e-05    br= 0  :  -0.000023  -0.000008   0.000008   0.000023
dp= 9 th=-5.29516e-06   br= 3  :  -0.000006  -0.000002   0.000002   0.000006
dp=10 th=+4.26882e-07   br= 1  :  -0.000001  -0.000000   0.000000   0.000001
dp=11 th=-4.99553e-08

.....................................
* C: the cordic path R=4 i=9
.....................................
* cordic min node : depth= 11 theta= -4.995533e-08 id=3312161

path type : cordic
dp= 0 th=+0.00195312    br= 1  :  -1.249046  -0.321751   0.321751   1.249046
dp= 1 th=-0.319797      br= 3  :  -0.369334  -0.120624   0.120624   0.369334
dp= 2 th=+0.0495362     br= 1  :  -0.093659  -0.031179   0.031179   0.093659
dp= 3 th=+0.0183572     br= 0  :  -0.023436  -0.007811   0.007811   0.023436
dp= 4 th=-0.00507882    br= 3  :  -0.005859  -0.001953   0.001953   0.005859
dp= 5 th=+0.000780532   br= 1  :  -0.001465  -0.000488   0.000488   0.001465
dp= 6 th=+0.000292251   br= 0  :  -0.000366  -0.000122   0.000122   0.000366
dp= 7 th=-7.39597e-05   br= 3  :  -0.000092  -0.000031   0.000031   0.000092
dp= 8 th=+1.7593e-05    br= 0  :  -0.000023  -0.000008   0.000008   0.000023
dp= 9 th=-5.29516e-06   br= 3  :  -0.000006  -0.000002   0.000002   0.000006
dp=10 th=+4.26882e-07   br= 1  :  -0.000001  -0.000000   0.000000   0.000001
dp=11 th=-4.99553e-08
* deallocate nodes in the leafmin path
* deallocate nodes in the globalmin path
* deallocate nodes in the cordic path
```