Embedded system paranoia: STAR 12

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1 Output results

I am not happy with this run. The same number is repeated and the results make no sense, although it is hard to imagine what went wrong. The run is awaiting confirmation. Data kindly supplied by Sivasankaran Krishnan and Sukumar Ranjeethkumar of Visteon India.

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COMMENT: ========================================
COMMENT: Welcome to ESP - Embedded System Paranoia
COMMENT: Please let me know your experiences
COMMENT: and suggestions at lesh@oakcomp.co.uk or
COMMENT: L.Hatton@kent.ac.uk
COMMENT:
COMMENT: $Revision: 1.4 $ $Date: 2003/09/19 11:18:31 $
COMMENT: This version will attempt divide by zero.
COMMENT: This version uses <setjmp.h>
COMMENT: This version uses single precision.
COMMENT: ========================================
FAILURE: -1+1 != 0, (-1)+abs(1) != 0, or -1+(-1)*(-1) != 0
FAILURE: 1/2 + (-1) + 1/2 != 0

-------> Diagnosis resuming after Milestone , Page 1
COMMENT: Searching for Radix and Precision.
COMMENT: Radix = 1.33414360000000000e+00
COMMENT: Closest relative separation found is U1 = 1.33414360000000000e+00
COMMENT: Recalculating radix and precision
COMMENT: confirms closest relative separation U1.
MYSTERY: recalculated Radix =1.33414360000000000e+00

-------> Diagnosis resuming after Milestone 10, Page 2

-------> Diagnosis resuming after Milestone 20, Page 3
COMMENT: Precision cannot be characterized by an Integer number
COMMENT: of significant digits but, by itself, this is
COMMENT: a minor flaw.
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COMMENT: logarithmic encoding has precision characterized
COMMENT: solely by U1.

-------> Diagnosis resuming after Milestone 25, Page 4
SDEFECT: Disagreements among the values X1, Y1, Z1.

COMMENT: X1 = 1.33414360000000000e+00, Y1= 1.33414360000000000e+00, Z1= 1.334143
60000000000e+00
COMMENT: This is a symptom of inconsistencies
COMMENT: introduced by extra-precise evaluation
COMMENT: of arithmetic subexpressions.
=======> Apparent inconsistency in test X1, Y1, Z1 or some part of this.
=======> PLEASE NOTIFY HATTON.
COMMENT: This is not tested further by this program.


-------> Diagnosis resuming after Milestone 30, Page 5
COMMENT: Checking for guard digit in *, / and -.
DEFECT : Division lacks a Guard Digit, so error can exceed 1 ulp
or  1/3  and  3/
9  and  9/27 may disagree
SDEFECT: Computed value of 1/1.000..1 >= 1
FAILURE: * and/or / gets too many last digits wrong
SDEFECT: - lacks Guard Digit, so cancellation is obscured

-------> Diagnosis resuming after Milestone 35, Page 6
COMMENT: Checking rounding on multiply, divide and add/subtract.
FAILURE: X * (1/X) differs from 1
FLAW   : Multiplication neither chopped nor correctly rounded.

-------> Diagnosis resuming after Milestone 40, Page 7
FLAW   : Division neither chopped nor correctly rounded.

-------> Diagnosis resuming after Milestone 45, Page 8
COMMENT: Addition/Subtraction neither rounds  nor chops.
COMMENT: Sticky bit used incorrectly or not at all.
FLAW   : Flaws are present due to lack of guard digits or round/chop failures

-------> Diagnosis resuming after Milestone 50, Page 9
COMMENT: Testing multiplicative commutation
COMMENT: with random pairs, trials = 20
PASSED : No failures found during these trials.

-------> Diagnosis resuming after Milestone 60, Page 10
COMMENT: Running test of square root(x).
FAILURE: Square root of 0.0, -0.0 or 1.0 wrong
SDEFECT:

COMMENT: sqrt( X * X ) - X = 1.33414360000000000e+00 rather than 0.
SDEFECT:
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COMMENT: sqrt( X * X ) - X = 1.33414360000000000e+00 rather than 0.
SDEFECT:

COMMENT: sqrt( X * X ) - X = 1.33414360000000000e+00 rather than 0.

-------> Diagnosis resuming after Milestone 70, Page 11
COMMENT: Testing integer X, sqrt(X * X) = X, trials = 20
DEFECT :

COMMENT: sqrt( X * X ) - X = 1.33414360000000000e+00 rather than 0.
COMMENT: Test for sqrt monotonicity.
DEFECT :
COMMENT: sqrt(X) is non-monotonic for X near 1.33414360000000000e+00

-------> Diagnosis resuming after Milestone 71, Page 12
COMMENT: Running test of difference of two squares).
COMMENT: integer X, (X**2-Y**2) - (X-Y)(X+Y) trials = 20

-------> Diagnosis resuming after Milestone 75, Page 13

-------> Diagnosis resuming after Milestone 80, Page 14

-------> Diagnosis resuming after Milestone 85, Page 15

-------> Diagnosis resuming after Milestone 90, Page 16
COMMENT: Testing powers Z^i for small Integers Z and i.
COMMENT: Power function
COMMENT: 1.33414360000000000e+00 ^ 1.33414360000000000e+00 = 1.33414360000000000
e+00
COMMENT: which differs from correct value by 1.33414360000000000e+00
COMMENT: Number of similar discrepancies = 1

-------> Diagnosis resuming after Milestone 91, Page 17
PASSED : ... no discrepancies found.

-------> Diagnosis resuming after Milestone 100, Page 18
COMMENT: Seeking Underflow thresholds UfThold and E0.
FAILURE: multiplication gets too many last digits wrong.


-------> Diagnosis resuming after Milestone 110, Page 19

-------> Diagnosis resuming after Milestone 111, Page 20
COMMENT: Smallest strictly positive number found
COMMENT: is E0 = -3.50340744000000000e-13
COMMENT: Since comparison denies Z = 0, evaluating
COMMENT: (Z + Z) / Z should be safe.
COMMENT: (Z+Z)/Z is OK provided Over/Underflow
COMMENT: has NOT just been signaled.
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DEFECT : Z != Z * 1
COMMENT: Z = -3.50340744000000000e-13, Z * 1 = 1.33414360000000000e+00
DEFECT : Z != 1 * Z
COMMENT: Z = -3.50340744000000000e-13, 1 * Z = 1.33414360000000000e+00

-------> Diagnosis resuming after Milestone 120, Page 21
COMMENT: The Underflow threshold is -3.50340744000000000e-13
COMMENT: Below this, a calculation may suffer larger Relative
COMMENT: error than merely roundoff.

-------> Diagnosis resuming after Milestone 121, Page 22
COMMENT: Since underflow occurs below the threshold
COMMENT: UfThold = 1.33414360000000000e+00 ^ 1.33414360000000000e+00
COMMENT: only underflow could affect this expression.
COMMENT: calculating yields: 1.33414360000000000e+00
PASSED : This computed value is O.K.

-------> Diagnosis resuming after Milestone 130, Page 23
COMMENT: As X -> 1, Testing X^((X + 1) / (X - 1)) against exp(2).
COMMENT: exp(2) = 1.31357404000000000e+14
DEFECT : Power function pow(x,z):
COMMENT: (1 + 1.33414360000000000e+00) ^ 1.33414360000000000e+00
COMMENT: differs from correct value by 1.31357404000000000e+14
FAILED : This may spoil financial calculations
FAILED : involving tiny interest rates.

-------> Diagnosis resuming after Milestone 140, Page 24
COMMENT: Testing powers Z^Q at four nearly extreme values.

DEFECT : Power function
COMMENT: 1.33414360000000000e+00 ^ 1.33414360000000000e+00 = 1.33414360000000000
e+00
COMMENT: which differs from correct value by 1.33414360000000000e+00
COMMENT: Number of similar discrepancies = 4

-------> Diagnosis resuming after Milestone 150, Page 25

-------> Diagnosis resuming after Milestone 160, Page 26
COMMENT: Searching for Overflow threshold:
COMMENT: This may generate an error.
COMMENT: Can 'Z = -Y' overflow?
COMMENT: Trying it on Y = 1.33414360000000000e+00
PASSED : Seems O.K.
SDEFECT:
COMMENT: Overflow past 1.33414360000000000e+00, shrinks to 1.33414360000000000e+
00
COMMENT: Overflow threshold is V = 1.33414360000000000e+00
COMMENT: Overflow saturates at V0 = 1.33414360000000000e+00
COMMENT: No overflow should be signalled for V*1 = 1.33414360000000000e+00
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COMMENT: No overflow should be signalled for V/1 = 1.33414360000000000e+00
COMMENT: Any overflow separating V*1 from
COMMENT: V above is a DEFECT.

-------> Diagnosis resuming after Milestone 161, Page 27

-------> Diagnosis resuming after Milestone 170, Page 28
DEFECT :
COMMENT: Comparison alleges that what prints as Z =-3.50340744000000000e-13
COMMENT: is too far from -6.12271213000000000e+37
DEFECT :
COMMENT: Comparison alleges that what prints as Z =-3.50340744000000000e-13
COMMENT: is too far from -6.12271213000000000e+37

-------> Diagnosis resuming after Milestone 175, Page 29
DEFECT :
COMMENT: Comparison alleges that Z = 1.33414360000000000e+00
COMMENT: is too far from sqrt(Z) ^ 2 =  1.33414360000000000e+00
DEFECT :
COMMENT: Comparison alleges that Z = 1.33414360000000000e+00
COMMENT: is too far from sqrt(Z) ^ 2 =  1.33414360000000000e+00

-------> Diagnosis resuming after Milestone 180, Page 30

-------> Diagnosis resuming after Milestone 190, Page 31
DEFECT : Badly
COMMENT: unbalanced range: UfThold * V = 1.33414360000000000e+00
is too far from 1.

-------> Diagnosis resuming after Milestone 191, Page 32

-------> Diagnosis resuming after Milestone 200, Page 33
COMMENT: Trying to compute 1/0 gives 1.33414360000000000e+00
COMMENT: Trying to compute 0/0 gives 1.33414360000000000e+00

-------> Diagnosis resuming after Milestone 210, Page 34
COMMENT: ========================================
COMMENT:     Embedded System Paranoia SUMMARY
COMMENT:
COMMENT: Number of FAILUREs  encountered = 6
COMMENT: Number of SERIOUS DEFECTs  discovered = 7
COMMENT: Number of DEFECTs  discovered = 12
COMMENT: Number of FLAWs  discovered = 1
COMMENT:
FAILED : The arithmetic diagnosed has unacceptable
COMMENT: Serious DEFECT.
FAILED : Potentially fatal FAILURE has occurred
COMMENT: Rating ...
               Excellent
               Very good
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               Good
               Acceptable
               Unacceptable
         =====> Broken
COMMENT: END OF TEST.
COMMENT: ========================================
```