Computational experience with ASCALCG, ACGSYS, AHYBRIDM and ACGMSECM for solving some MINPACK2 applications with 10^6 variables

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ASCALCG

```
 Accelerated SCALCG Algorithm.    Neculai Andrei
 BFGS preconditioned conjugate gradient algorthm
 January 12, 2009                *** ASCALCG ***

   1  *** ASCALCG Algorithm ***. Function: Elastic-Plastic Torsion
      Powell criterion for restart.   Stoptest = 1  (theta spectral)

     n   iter    irs   fgcnt  lscnt   time(c)       fxnew                gnorm
-------------------------------------------------------------------------------------
1000000   1112      0    1144     30   91718  -.4393016851399E+00   .6317458181053E-04
-------------------------------------------------------------------------------------
TOTAL    1112      0    1144     30  917.18(seconds)     proc=   .00%
```

```
 Accelerated SCALCG Algorithm.    Neculai Andrei
 BFGS preconditioned conjugate gradient algorthm
 January 12, 2009                *** ASCALCG ***

   1  *** ASCALCG Algorithm ***. Function: Pressure Distribution
      Powell criterion for restart.   Stoptest = 1  (theta spectral)

     n   iter    irs   fgcnt  lscnt   time(c)       fxnew                gnorm
-------------------------------------------------------------------------------------
1000000   2836      0    2865     27  237140  -.2829101138880E+00   .8051295239719E-04
-------------------------------------------------------------------------------------
TOTAL    2836      0    2865     27 2371.40(seconds)     proc=   .00%
```

```
 Accelerated SCALCG Algorithm.    Neculai Andrei
 BFGS preconditioned conjugate gradient algorthm
 January 12, 2009                *** ASCALCG ***

   1  *** ASCALCG Algorithm ***. Function: Optimal Design with Composite Materials
      Powell criterion for restart.   Stoptest = 1  (theta spectral)

     n   iter    irs   fgcnt  lscnt   time(c)       fxnew                gnorm
-------------------------------------------------------------------------------------
1000000   4560      0    4691    129  602556  -.1138204823625E-01   .1338450679447E-03
-------------------------------------------------------------------------------------
TOTAL    4560      0    4691    129 6025.56(seconds)     proc=   .00%
```

```
 Accelerated SCALCG Algorithm.    Neculai Andrei
 BFGS preconditioned conjugate gradient algorthm
 January 12, 2009                 *** ASCALCG ***

   1  *** ASCALCG Algorithm ***. Function: Steady State Ccombustion Problem
      Powell criterion for restart.   Stoptest = 1  (theta spectral)

     n   iter    irs   fgcnt  lscnt   time(c)       fxnew                gnorm
-------------------------------------------------------------------------------------
1000000   1412      0    1451     37  248034  -.5611488187955E+01   .4244246165620E-04
-------------------------------------------------------------------------------------
TOTAL    1412      0    1451     37 2480.34(seconds)     proc=   .00%
```

```
 Accelerated SCALCG Algorithm.    Neculai Andrei
 BFGS preconditioned conjugate gradient algorthm
 January 12, 2009                 *** ASCALCG ***

   1  *** ASCALCG Algorithm ***. Function: Minimal Surface Area
      Powell criterion for restart.   Stoptest = 1  (theta spectral)

     n   iter    irs   fgcnt  lscnt   time(c)       fxnew                gnorm
-------------------------------------------------------------------------------------
1000000   1221      0    1240     17  144363   .1000000248044E+01   .1381966543091E-03
-------------------------------------------------------------------------------------
TOTAL    1221      0    1240     17 1443.63(seconds)     proc=   .00%
```

ACGSYS

```
  **** CGSYS ****                    Neculai Andrei *
   * Accelerated Conjugate Gradient with Guaranteed *
   * Descent and Conjugacy conditions               *
   ***************************************************

   CGSYS Algorithm.    Elastic-Plastic Torsion Problem

   Parameters: t=  .8750000000000E+00    u=  .1000000000000E+00
   CGSYS. Powell restart.           January 9, 2009
-------------------------------------------------------------------------------------
      n   iter   irs  fgcnt lscnt   time(c)        fxnew              gnorm
-------------------------------------------------------------------------------------
1000000   1113     0   2257    30     80862 -.4393016862076E+00  .6317277720337E-04
-------------------------------------------------------------------------------------
TOTAL   1113     0   2257    30    808.62 (seconds)    proc=    .00%

   **** CGSYS ****                    Neculai Andrei *
   * Accelerated Conjugate Gradient with Guaranteed *
   * Descent and Conjugacy conditions               *
   ***************************************************

   CGSYS Algorithm.    Elastic-Plastic Torsion Problem

   Parameters: t=  .8750000000000E+00    u=  .2000000000000E+00
   CGSYS. Powell restart.           January 9, 2009
-------------------------------------------------------------------------------------
      n   iter   irs  fgcnt lscnt   time(c)        fxnew              gnorm
-------------------------------------------------------------------------------------
1000000   1111     0   2253    30     80681 -.4393016840064E+00  .6698996475680E-04
-------------------------------------------------------------------------------------
TOTAL   1111     0   2253    30    806.81 (seconds)    proc=    .00%

   **** CGSYS ****                    Neculai Andrei *
   * Accelerated Conjugate Gradient with Guaranteed *
   * Descent and Conjugacy conditions               *
   ***************************************************

   CGSYS Algorithm.    Elastic-Plastic Torsion Problem

   Parameters: t=  .8750000000000E+00    u=  .3000000000000E+00
   CGSYS. Powell restart.           January 9, 2009
```

```
-------------------------------------------------------------------------------
      n   iter   irs  fgcnt lscnt   time(c)        fxnew              gnorm
-------------------------------------------------------------------------------
1000000   1111     0   2253    30     80784 -.4393016840068E+00  .6698884224078E-04
-------------------------------------------------------------------------------
TOTAL   1111     0   2253    30    807.84 (seconds)    proc=    .00%

   **** CGSYS ****                   Neculai Andrei *
   * Accelerated Conjugate Gradient with Guaranteed *
   * Descent and Conjugacy conditions               *
   ***************************************************

   CGSYS Algorithm.    Elastic-Plastic Torsion Problem

   Parameters: t=  .8750000000000E+00    u=  .4000000000000E+00
   CGSYS. Powell restart.           January 9, 2009
-------------------------------------------------------------------------------
      n   iter   irs  fgcnt lscnt   time(c)        fxnew              gnorm
-------------------------------------------------------------------------------
1000000   1113     0   2257    30     80828 -.4393016862066E+00  .6317606063908E-04
-------------------------------------------------------------------------------
TOTAL   1113     0   2257    30    808.28 (seconds)    proc=    .00%

   **** CGSYS ****                   Neculai Andrei *
   * Accelerated Conjugate Gradient with Guaranteed *
   * Descent and Conjugacy conditions               *
   ***************************************************

   CGSYS Algorithm.    Elastic-Plastic Torsion Problem

   Parameters: t=  .8750000000000E+00    u=  .5000000000000E+00
   CGSYS. Powell restart.           January 9, 2009
-------------------------------------------------------------------------------
      n   iter   irs  fgcnt lscnt   time(c)        fxnew              gnorm
-------------------------------------------------------------------------------
1000000   1113     0   2257    30     80931 -.4393016862075E+00  .6317277143774E-04
-------------------------------------------------------------------------------
TOTAL   1113     0   2257    30    809.31 (seconds)    proc=    .00%

   **** CGSYS ****                   Neculai Andrei *
   * Accelerated Conjugate Gradient with Guaranteed *
   * Descent and Conjugacy conditions               *
   ***************************************************

   CGSYS Algorithm.    Elastic-Plastic Torsion Problem

   Parameters: t=  .8750000000000E+00    u=  .6000000000000E+00
   CGSYS. Powell restart.           January 9, 2009
-------------------------------------------------------------------------------
      n   iter   irs  fgcnt lscnt   time(c)        fxnew              gnorm
-------------------------------------------------------------------------------
1000000   1111     0   2253    30     80781 -.4393016840072E+00  .6698935518511E-04
-------------------------------------------------------------------------------
TOTAL   1111     0   2253    30    807.81 (seconds)    proc=    .00%

   **** CGSYS ****                   Neculai Andrei *
   * Accelerated Conjugate Gradient with Guaranteed *
   * Descent and Conjugacy conditions               *
   ***************************************************

   CGSYS Algorithm.    Elastic-Plastic Torsion Problem

   Parameters: t=  .8750000000000E+00    u=  .7000000000000E+00
   CGSYS. Powell restart.           January 9, 2009
-------------------------------------------------------------------------------
      n   iter   irs  fgcnt lscnt   time(c)        fxnew              gnorm
-------------------------------------------------------------------------------
1000000   1111     0   2253    30     80679 -.4393016840076E+00  .6698977672280E-04
-------------------------------------------------------------------------------
TOTAL   1111     0   2253    30    806.79 (seconds)    proc=    .00%
```

```
   **** CGSYS ****                    Neculai Andrei *
   * Accelerated Conjugate Gradient with Guaranteed *
   * Descent and Conjugacy conditions               *
   ***************************************************

   CGSYS Algorithm.    Elastic-Plastic Torsion Problem

   Parameters: t=  .8750000000000E+00    u=  .8000000000000E+00
   CGSYS. Powell restart.           January 9, 2009
-------------------------------------------------------------------------------
      n   iter   irs  fgcnt lscnt   time(c)        fxnew              gnorm
-------------------------------------------------------------------------------
1000000   1113     0   2257    30     80829 -.4393016862074E+00  .6317326009196E-04
-------------------------------------------------------------------------------
TOTAL   1113     0   2257    30    808.29 (seconds)    proc=    .00%

   **** CGSYS ****                    Neculai Andrei *
   * Accelerated Conjugate Gradient with Guaranteed *
   * Descent and Conjugacy conditions               *
   ***************************************************

   CGSYS Algorithm.    Elastic-Plastic Torsion Problem

   Parameters: t=  .8750000000000E+00    u=  .9000000000000E+00
   CGSYS. Powell restart.           January 9, 2009
-------------------------------------------------------------------------------
      n   iter   irs  fgcnt lscnt   time(c)        fxnew              gnorm
-------------------------------------------------------------------------------
1000000   1113     0   2257    30     80828 -.4393016862090E+00  .6316640023422E-04
-------------------------------------------------------------------------------
TOTAL   1113     0   2257    30    808.28 (seconds)    proc=    .00%

   **** CGSYS ****                    Neculai Andrei *
   * Accelerated Conjugate Gradient with Guaranteed *
   * Descent and Conjugacy conditions               *
   ***************************************************

   CGSYS Algorithm.    Elastic-Plastic Torsion Problem

   Parameters: t=  .8750000000000E+00    u=  .1000000000000E+01
   CGSYS. Powell restart.           January 9, 2009
-------------------------------------------------------------------------------
      n   iter   irs  fgcnt lscnt   time(c)        fxnew              gnorm
-------------------------------------------------------------------------------
1000000   1111     0   2253    30     80789 -.4393016840053E+00  .6698837932997E-04
-------------------------------------------------------------------------------
TOTAL   1111     0   2253    30    807.89 (seconds)    proc=    .00%



   **** CGSYS ****                    Neculai Andrei *
   * Accelerated Conjugate Gradient with Guaranteed *
   * Descent and Conjugacy conditions               *
   ***************************************************

   CGSYS Algorithm.    Pressure Distribution Problem

   CGSYS. Parameters: t=  .8750000000000E+00    u=  .1000000000000E+00
   CGSYS. Powell restart.           January 9, 2009
-------------------------------------------------------------------------------
      n   iter   irs  fgcnt lscnt   time(c)        fxnew              gnorm
-------------------------------------------------------------------------------
1000000   2837     0   5702    27    218064 -.2829101145832E+00  .8050032686484E-04
-------------------------------------------------------------------------------
TOTAL   2837     0   5702    27   2180.64 (seconds)    proc=    .00%
```

```
   **** CGSYS ****                    Neculai Andrei *
   * Accelerated Conjugate Gradient with Guaranteed *
   * Descent and Conjugacy conditions               *
   ***************************************************

   CGSYS Algorithm.    Pressure Distribution Problem

   CGSYS. Parameters: t=  .8750000000000E+00    u=  .2000000000000E+00
   CGSYS. Powell restart.            January 9, 2009
-------------------------------------------------------------------------------
      n   iter   irs  fgcnt lscnt   time(c)        fxnew              gnorm
-------------------------------------------------------------------------------
1000000   2837     0   5702    27    217985 -.2829101145825E+00  .8050294427570E-04
-------------------------------------------------------------------------------
TOTAL   2837     0   5702    27   2179.85 (seconds)    proc=    .00%

   **** CGSYS ****                    Neculai Andrei *
   * Accelerated Conjugate Gradient with Guaranteed *
   * Descent and Conjugacy conditions               *
   ***************************************************

   CGSYS Algorithm.    Pressure Distribution Problem

   CGSYS. Parameters: t=  .8750000000000E+00    u=  .3000000000000E+00
   CGSYS. Powell restart.            January 9, 2009
-------------------------------------------------------------------------------
      n   iter   irs  fgcnt lscnt   time(c)        fxnew              gnorm
-------------------------------------------------------------------------------
1000000   2837     0   5702    27    217894 -.2829101145869E+00  .8050001171424E-04
-------------------------------------------------------------------------------
TOTAL   2837     0   5702    27   2178.94 (seconds)    proc=    .00%

   **** CGSYS ****                    Neculai Andrei *
   * Accelerated Conjugate Gradient with Guaranteed *
   * Descent and Conjugacy conditions               *
   ***************************************************

   CGSYS Algorithm.    Pressure Distribution Problem

   CGSYS. Parameters: t=  .8750000000000E+00    u=  .4000000000000E+00
   CGSYS. Powell restart.            January 9, 2009
-------------------------------------------------------------------------------
      n   iter   irs  fgcnt lscnt   time(c)        fxnew              gnorm
-------------------------------------------------------------------------------
1000000   2833     0   5694    27    217561 -.2829101117335E+00  .8163494083349E-04
-------------------------------------------------------------------------------
TOTAL   2833     0   5694    27   2175.61 (seconds)    proc=    .00%

   **** CGSYS ****                    Neculai Andrei *
   * Accelerated Conjugate Gradient with Guaranteed *
   * Descent and Conjugacy conditions               *
   ***************************************************
   CGSYS Algorithm.    Pressure Distribution Problem

   CGSYS. Parameters: t=  .8750000000000E+00    u=  .5000000000000E+00
   CGSYS. Powell restart.            January 9, 2009
-------------------------------------------------------------------------------
      n   iter   irs  fgcnt lscnt   time(c)        fxnew              gnorm
-------------------------------------------------------------------------------
1000000   2837     0   5702    27    217981 -.2829101145850E+00  .8050219036275E-04
-------------------------------------------------------------------------------
TOTAL   2837     0   5702    27   2179.81 (seconds)    proc=    .00%

   **** CGSYS ****                    Neculai Andrei *
   * Accelerated Conjugate Gradient with Guaranteed *
   * Descent and Conjugacy conditions               *
   ***************************************************
   CGSYS Algorithm.    Pressure Distribution Problem

   CGSYS. Parameters: t=  .8750000000000E+00    u=  .6000000000000E+00
   CGSYS. Powell restart.            January 9, 2009
-------------------------------------------------------------------------------
      n   iter   irs  fgcnt lscnt   time(c)        fxnew              gnorm
-------------------------------------------------------------------------------
1000000   2833     0   5694    27    217571 -.2829101117327E+00  .8163269794773E-04
-------------------------------------------------------------------------------
TOTAL   2833     0   5694    27   2175.71 (seconds)    proc=    .00%
```

```
   **** CGSYS ****                    Neculai Andrei *
   * Accelerated Conjugate Gradient with Guaranteed *
   * Descent and Conjugacy conditions               *
   ***************************************************

   CGSYS Algorithm.    Pressure Distribution Problem

   CGSYS. Parameters: t=  .8750000000000E+00    u=  .7000000000000E+00
   CGSYS. Powell restart.            January 9, 2009
-------------------------------------------------------------------------------
      n   iter   irs  fgcnt lscnt   time(c)        fxnew              gnorm
-------------------------------------------------------------------------------
1000000   2833     0   5694    27    217567 -.2829101117335E+00  .8163599077992E-04
-------------------------------------------------------------------------------
TOTAL   2833     0   5694    27   2175.67 (seconds)    proc=    .00%

   **** CGSYS ****                    Neculai Andrei *
   * Accelerated Conjugate Gradient with Guaranteed *
   * Descent and Conjugacy conditions               *
   ***************************************************

   CGSYS Algorithm.    Pressure Distribution Problem

   CGSYS. Parameters: t=  .8750000000000E+00    u=  .8000000000000E+00
   CGSYS. Powell restart.            January 9, 2009
-------------------------------------------------------------------------------
      n   iter   irs  fgcnt lscnt   time(c)        fxnew              gnorm
-------------------------------------------------------------------------------
1000000   2837     0   5702    27    217791 -.2829101145834E+00  .8050270587316E-04
-------------------------------------------------------------------------------
TOTAL   2837     0   5702    27   2177.91 (seconds)    proc=    .00%

   **** CGSYS ****                    Neculai Andrei *
   * Accelerated Conjugate Gradient with Guaranteed *
   * Descent and Conjugacy conditions               *
   ***************************************************

   CGSYS Algorithm.    Pressure Distribution Problem

   CGSYS. Parameters: t=  .8750000000000E+00    u=  .9000000000000E+00
   CGSYS. Powell restart.            January 9, 2009
-------------------------------------------------------------------------------
      n   iter   irs  fgcnt lscnt   time(c)        fxnew              gnorm
-------------------------------------------------------------------------------
1000000   2837     0   5702    27    217799 -.2829101145854E+00  .8050162280175E-04
-------------------------------------------------------------------------------
TOTAL   2837     0   5702    27   2177.99 (seconds)    proc=    .00%

   **** CGSYS ****                    Neculai Andrei *
   * Accelerated Conjugate Gradient with Guaranteed *
   * Descent and Conjugacy conditions               *
   ***************************************************

   CGSYS Algorithm.    Pressure Distribution Problem

   CGSYS. Parameters: t=  .8750000000000E+00    u=  .1000000000000E+01
   CGSYS. Powell restart.            January 9, 2009
-------------------------------------------------------------------------------
      n   iter   irs  fgcnt lscnt   time(c)        fxnew              gnorm
-------------------------------------------------------------------------------
1000000   2833     0   5694    27    217566 -.2829101117338E+00  .8163782554176E-04
-------------------------------------------------------------------------------
TOTAL   2833     0   5694    27   2175.66 (seconds)    proc=    .00%


   **** CGSYS ****                    Neculai Andrei *
   * Accelerated Conjugate Gradient with Guaranteed *
   * Descent and Conjugacy conditions               *
   ***************************************************

   CGSYS Algorithm.    Optimal Design with Composite Materials

   Parameters: t=  .8750000000000E+00    u=  .5000000000000E+00
   CGSYS. Powell restart.           January 9, 2009
-------------------------------------------------------------------------------
```

```
      n   iter   irs  fgcnt lscnt   time(c)        fxnew              gnorm
 ------------------------------------------------------------------------------
 1000000   4782     0   9605    40    572488 -.1138217429532E-01  .1369600004719E-03
 ------------------------------------------------------------------------------
 TOTAL   4782     0   9605    40   5724.88 (seconds)    proc=    .00%



    **** CGSYS ****                    Neculai Andrei *
    * Accelerated Conjugate Gradient with Guaranteed *
    * Descent and Conjugacy conditions               *
    ***************************************************

    CGSYS Algorithm.     Steady State Combustion Problem

    Parameters: t=  .8750000000000E+00    u=  .5000000000000E+00
    CGSYS. Powell restart.           January 12, 2009
 ------------------------------------------------------------------------------
      n   iter   irs  fgcnt lscnt   time(c)        fxnew              gnorm
 ------------------------------------------------------------------------------
 1000000   1413     0   2864    37    233297 -.5611488188409E+01  .4244605414590E-04
 ------------------------------------------------------------------------------
 TOTAL   1413     0   2864    37   2332.97 (seconds)    proc=    .00%



    **** CGSYS ****                    Neculai Andrei *
    * Accelerated Conjugate Gradient with Guaranteed *
    * Descent and Conjugacy conditions               *
    ***************************************************

    CGSYS Algorithm.    Minimal Surface Area Problem

    Parameters: t=  .8750000000000E+00    u=  .5000000000000E+00
    CGSYS. Powell restart.           January 12, 2009
 ------------------------------------------------------------------------------
      n   iter   irs  fgcnt lscnt   time(c)        fxnew              gnorm
 ------------------------------------------------------------------------------
 1000000   1402     0   2850    45    149815  .1000000165721E+01  .9386116073590E-04
 ------------------------------------------------------------------------------
 TOTAL   1402     0   2850    45   1498.15 (seconds)    proc=    .00%
```

AHYBRIDM

```
    *** Conjugate Gradient Algorithms Project ***
    *** Dr. Neculai Andrei

    AHYBRIDM Conjugate Gradient Algorithm
    Accelerated convex combination of HS,DY:
    from Newton direction with modified  secant condition
    Powell restart.  January 14, 2009

      1    AHYBRIDM Algorithm. Function Elastic-Plastic Torsion Problem
           stoptest= 1

     n   iter   irs  fgcnt lscnt   time(c)        fxnew              gnorm           DY
HS   CC
 ------------------------------------------------------------------------------------------
--------
 1000000   1113     0   1144    30     80611 -.4393016862045E+00  .6318719828239E-04  501
612    0
 ------------------------------------------------------------------------------------------
--------
 TOTAL   1113     0   1144    30    806.11 (seconds)    proc=    .00%

 Total # iter for DY=   501   i.e.   45.01%
 Total # iter for HS=   612   i.e.   54.99%
 Total # iter for CC=     0   i.e.     .00%
```

```
    *** Conjugate Gradient Algorithms Project ***
    *** Dr. Neculai Andrei

    AHYBRIDM Conjugate Gradient Algorithm
    Accelerated convex combination of HS,DY:
    from Newton direction with modified  secant condition
    Powell restart.  January 14, 2009

      1    AHYBRIDM Algorithm. Function Pressure Distribution Problem
           stoptest= 1

     n   iter   irs  fgcnt lscnt   time(c)        fxnew              gnorm           DY
HS   CC
 ---------------------------------------------------------------------------------------
--------
 1000000   2833     0   2861    27    216430 -.2829101117287E+00  .8163367284139E-04 1232
1601    0
 ---------------------------------------------------------------------------------------
--------
 TOTAL   2833     0   2861    27   2164.30 (seconds)    proc=    .00%

 Total # iter for DY=  1232   i.e.   43.49
 Total # iter for HS=  1601   i.e.   56.51
 Total # iter for CC=     0   i.e.     .00


    *** Conjugate Gradient Algorithms Project ***
    *** Dr. Neculai Andrei

    AHYBRIDM Conjugate Gradient Algorithm
    Accelerated convex combination of HS,DY:
    from Newton direction with modified  secant condition
    Powell restart.  January 14, 2009

      1    AHYBRIDM Algorithm. Function Optimal Design with Composite Materials
           stoptest= 1

     n   iter   irs  fgcnt lscnt   time(c)        fxnew              gnorm           DY
HS   CC
 ---------------------------------------------------------------------------------------
--------
 1000000   4643     0   4683    39    554872 -.1138213335869E-01  .1426541466858E-03  253
3288 1102
 ---------------------------------------------------------------------------------------
--------
 TOTAL   4643     0   4683    39   5548.72 (seconds)    proc=    .00%

 Total # iter for DY=   253   i.e.    5.45
 Total # iter for HS=  3288   i.e.   70.82
 Total # iter for CC=  1102   i.e.   23.73


    *** Conjugate Gradient Algorithms Project ***
    *** Dr. Neculai Andrei

    AHYBRIDM Conjugate Gradient Algorithm
    Accelerated convex combination of HS,DY:
    from Newton direction with modified  secant condition
    Powell restart.  January 14, 2009

      1    AHYBRIDM Algorithm. Function Steady State Combustion
           stoptest= 1

     n   iter   irs  fgcnt lscnt   time(c)        fxnew              gnorm           DY
HS   CC
 ---------------------------------------------------------------------------------------
--------
 1000000   1413     0   1451    37    232477 -.5611488188407E+01  .4244605838999E-04  331
1002   80
 ---------------------------------------------------------------------------------------
--------
 TOTAL   1413     0   1451    37   2324.77 (seconds)    proc=    .00%

 Total # iter for DY=   331   i.e.   23.43
 Total # iter for HS=  1002   i.e.   70.91
 Total # iter for CC=    80   i.e.    5.66
```

```
    *** Conjugate Gradient Algorithms Project ***
    *** Dr. Neculai Andrei

    AHYBRIDM Conjugate Gradient Algorithm
    Accelerated convex combination of HS,DY:
    from Newton direction with modified  secant condition
    Powell restart.  January 14, 2009

      1    AHYBRIDM Algorithm. Function Minimal Surface Area
           stoptest= 1

     n   iter   irs  fgcnt lscnt   time(c)        fxnew              gnorm           DY
HS   CC
 ---------------------------------------------------------------------------------------
--------
 1000000   1307     5   1348    40    139763  .1000000134025E+01  .9359702982166E-04  168
1029  110
 ---------------------------------------------------------------------------------------
--------
 TOTAL   1307     5   1348    40   1397.63 (seconds)    proc=    .38%

 Total # iter for DY=   168   i.e.   12.85
 Total # iter for HS=  1029   i.e.   78.73
 Total # iter for CC=   110   i.e.    8.42
```

ACGMSEC

```
    **** ACGMESC ****              Neculai Andrei
    Accelerated CG with Modified Secant Condition
    Powell restart.              January 14, 2009
    Accelerated CG with Modified Secant Condition

      1    ACGMSEC Algorithm. Function: Elastic - Plastic Torsion Problem
           stoptest= 1     tau=  .0000000000000E+00

     n   iter   irs  fgcnt lscnt   time(c)        fxnew              gnorm         delta
 ---------------------------------------------------------------------------------------
 1000000   1113     0   1144    30     82378 -.4393016862058E+00  .6318111108700E-04
0
 ---------------------------------------------------------------------------------------
 TOTAL   1113     0   1144    30    823.78 (seconds)    proc=    .00%


    **** ACGMESC ****              Neculai Andrei
    Accelerated CG with Modified Secant Condition
    Powell restart.              January 14, 2009
    Accelerated CG with Modified Secant Condition

      1    ACGMSEC Algorithm. Function: Pressure Distribution Problem
           stoptest= 1     tau=  .0000000000000E+00

     n   iter   irs  fgcnt lscnt   time(c)        fxnew              gnorm         delta
 ---------------------------------------------------------------------------------------
 1000000   2837     0   2865    27    226846 -.2829101145955E+00  .8050511996638E-04
0
 ---------------------------------------------------------------------------------------
 TOTAL   2837     0   2865    27   2268.46 (seconds)    proc=    .00%


    **** ACGMESC ****              Neculai Andrei
    Accelerated CG with Modified Secant Condition
    Powell restart.              January 14, 2009
    Accelerated CG with Modified Secant Condition

      1    ACGMSEC Algorithm. Function: Optimal Design with Composite Materials
           stoptest= 1     tau=  .0000000000000E+00

     n   iter   irs  fgcnt lscnt   time(c)        fxnew              gnorm         delta
 ---------------------------------------------------------------------------------------
 1000000   4644     0   4692    47    556153 -.1138215541786E-01  .1357602064712E-03
0
 ---------------------------------------------------------------------------------------
 TOTAL   4644     0   4692    47   5561.53 (seconds)    proc=    .00%
```

```
   **** ACGMESC ****              Neculai Andrei
   Accelerated CG with Modified Secant Condition
   Powell restart.              January 14, 2009
   Accelerated CG with Modified Secant Condition

     1    ACGMSEC Algorithm. Function: Steady State Combustion Problem
          stoptest= 1     tau=  .0000000000000E+00

    n   iter   irs  fgcnt lscnt   time(c)        fxnew              gnorm         delta
 -----------------------------------------------------------------------------------------
 1000000   1413     0   1451    37    231191 -.5611488188408E+01  .4244605281665E-04
0
 -----------------------------------------------------------------------------------------
 TOTAL   1413     0   1451    37   2311.91 (seconds)    proc=    .00%


   **** ACGMESC ****              Neculai Andrei
   Accelerated CG with Modified Secant Condition
   Powell restart.              January 14, 2009
   Accelerated CG with Modified Secant Condition

     1    ACGMSEC Algorithm. Function: Minimal Surface Area Problem
          stoptest= 1     tau=  .0000000000000E+00

    n   iter   irs  fgcnt lscnt   time(c)        fxnew              gnorm         delta
 -----------------------------------------------------------------------------------------
 1000000   1380     0   1430    49    148254  .1000000084999E+01  .7061944815759E-04
0
 -----------------------------------------------------------------------------------------
 TOTAL   1380     0   1430    49   1482.54 (seconds)    proc=    .00%
```

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