Computational experience with ACGSD for solving some MINPACK2 applications with 10^6 variables

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1. Elastic-Plastic Torsion Problem

```
   CG with angle restart.  January 19, 2009

    22    New CG-ACGSD Algorithm:Elastic-Plastic Torsion Problem         Function
          Andrei New Sufficient Descent from DY. stoptest= 1
          ACGSD: beta=ytg/yts-ytg*stg/(yts**2)

    n   iter   irs  fgcnt lscnt   time(c)        fxnew              gnorm
-------------------------------------------------------------------------------
1000000   1567     0   1592    24     64907 -.4393000523419E+00  .1958864597454E-03
-------------------------------------------------------------------------------
TOTAL   1567     0   1592    24    649.07 (seconds)    proc=    .00%
```

2. Pressure Distribution Problem

```
   CG with angle restart.  January 19, 2009

    22    New CG-ACGSD Algorithm:Pressure Distribution Problem           Function
          Andrei New Sufficient Descent from DY. stoptest= 1
          ACGSD: beta=ytg/yts-ytg*stg/(yts**2)

    n   iter   irs  fgcnt lscnt   time(c)        fxnew              gnorm
-------------------------------------------------------------------------------
1000000   4494     0   4601   106    204854 -.2829095217831E+00  .8387182118758E-04
-------------------------------------------------------------------------------
TOTAL   4494     0   4601   106   2048.54 (seconds)    proc=    .00%
```

3. Optimal Design with Composite Materials

```
   CG with angle restart.  January 19, 2009

    22    New CG-ACGSD Algorithm:Optimal Design with Composite Materials Function
          Andrei New Sufficient Descent from DY. stoptest= 1
          ACGSD: beta=ytg/yts-ytg*stg/(yts**2)

    n   iter   irs  fgcnt lscnt   time(c)        fxnew              gnorm
-------------------------------------------------------------------------------
1000000   5071     0   5161    89    338439 -.1138175464469E-01  .8083387347722E-04
-------------------------------------------------------------------------------
TOTAL   5071     0   5161    89   3384.39 (seconds)    proc=    .00%
```

5. Steady State Combustion

```
   CG with angle restart.  January 19, 2009

    22    New CG-ACGSD Algorithm:Steady State Combustion                Function
          Andrei New Sufficient Descent from DY. stoptest= 1
          ACGSD: beta=ytg/yts-ytg*stg/(yts**2)

    n   iter   irs  fgcnt lscnt   time(c)        fxnew              gnorm
--------------------------------------------------------------------------------
1000000   2516     0   2556    39    221930 -.5611485907046E+01  .1390374229646E-03
--------------------------------------------------------------------------------
TOTAL   2516     0   2556    39   2219.30 (seconds)    proc=    .00%
```

7. Minimal Surface Area

```
   CG with angle restart.  January 19, 2009

    22    New CG-ACGSD Algorithm:Minimal Surface Area                   Function
          Andrei New Sufficient Descent from DY. stoptest= 1
          ACGSD: beta=ytg/yts-ytg*stg/(yts**2)

    n   iter   irs  fgcnt lscnt   time(c)        fxnew              gnorm
--------------------------------------------------------------------------------
1000000   2131     0   2184    52    128188  .1421361778710E+01  .1037469108564E-03
--------------------------------------------------------------------------------
TOTAL   2131     0   2184    52   1281.88 (seconds)    proc=    .00%
```

Remark:

$$\beta_k^{ACGSD} = \frac{y_k^T g_{k+1}}{y_k^T s_k} - \frac{(y_k^T g_{k+1})(s_k^T g_{k+1})}{(y_k^T s_k)^2}$$

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