Optimal Design with Composite Materials solved by SCALCG

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In this work I present the results of SCALCG package for solving the Optimal Design with Composite Materials problem from MINPACK-2 Collection. In this experiments I considered:

$nx = 200$, $\lambda = 0.008$,

$ny = 200$, $\theta^s = .true.$ (spectral)

I considered the following stopping criteria:

Stopping criterion	Algebraic expression
1	$\|\nabla f(x_k)\|_\infty \le \varepsilon_g$ or $\|\alpha_k \nabla f(x_k)^T d_k\| \le \varepsilon_f \|f(x_{k+1})\|$
2	$\|\nabla f(x_k)\|_\infty \le \max\{\varepsilon_g, \varepsilon_f \|\nabla f(x_0)\|_\infty\}$
3	$\|\nabla f(x_k)\|_2 \le \varepsilon_g$
4	$\|\nabla f(x_k)\|_2 \le \varepsilon_g \max\{1, \|f(x_{k+1})\|\}$

where

$$\varepsilon_f = 10^{-20} \text{ and } \varepsilon_g = 10^{-6}.$$

The results are as follows:

```
  Optimal Design with Composite Materials Problem   December 5, 2006, *** SCALCG
Package ***
 Powell criterion for restart.   Stoptest = 1
      n   iter    irs   fgcnt  lscnt   time(c)       fxnew                gnorm
 ---------------------------------------------------------------------------------
 theta spectral
  40000   1413    657    1753    338   39019  -.1138128679029E-01   .1084573717178E-04
 ---------------------------------------------------------------------------------
 TOTAL    1413    657    1753    338  390.19(seconds)     proc= 46.50%


 SCALCG: istop (f)  total =      0    istop (g)  total =      1
         istop (fg) total =      0    istop (fr) total =      0


  Optimal Design with Composite Materials Problem   December 5, 2006, *** SCALCG
Package ***
 Powell criterion for restart.   Stoptest = 2
      n   iter    irs   fgcnt  lscnt   time(c)       fxnew                gnorm
 ---------------------------------------------------------------------------------
 theta spectral
  40000   1413    657    1753    338   39019  -.1138128679029E-01   .1084573717178E-04
 ---------------------------------------------------------------------------------
 TOTAL    1413    657    1753    338  390.19(seconds)     proc= 46.50%


  Optimal Design with Composite Materials Problem   December 5, 2006, *** SCALCG
Package ***
 Powell criterion for restart.   Stoptest = 3
```

```
     n   iter    irs   fgcnt  lscnt   time(c)       fxnew                gnorm
 ---------------------------------------------------------------------------------
 theta spectral
  40000   1952    913    2455    501   54618  -.1138129897799E-01   .7308369881005E-06
 ---------------------------------------------------------------------------------
 TOTAL    1952    913    2455    501  546.18(seconds)     proc= 46.77%
```

```
  Optimal Design with Composite Materials Problem   December 5, 2006, *** SCALCG
Package ***
 Powell criterion for restart.   Stoptest = 4
     n   iter    irs   fgcnt  lscnt   time(c)       fxnew                gnorm
 ---------------------------------------------------------------------------------
 theta spectral
  40000   1952    913    2455    501   54580  -.1138129897799E-01   .7308369881005E-06
 ---------------------------------------------------------------------------------
 TOTAL    1952    913    2455    501  545.80(seconds)     proc= 46.77%
```

December 5, 2006