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addpath for PQN working

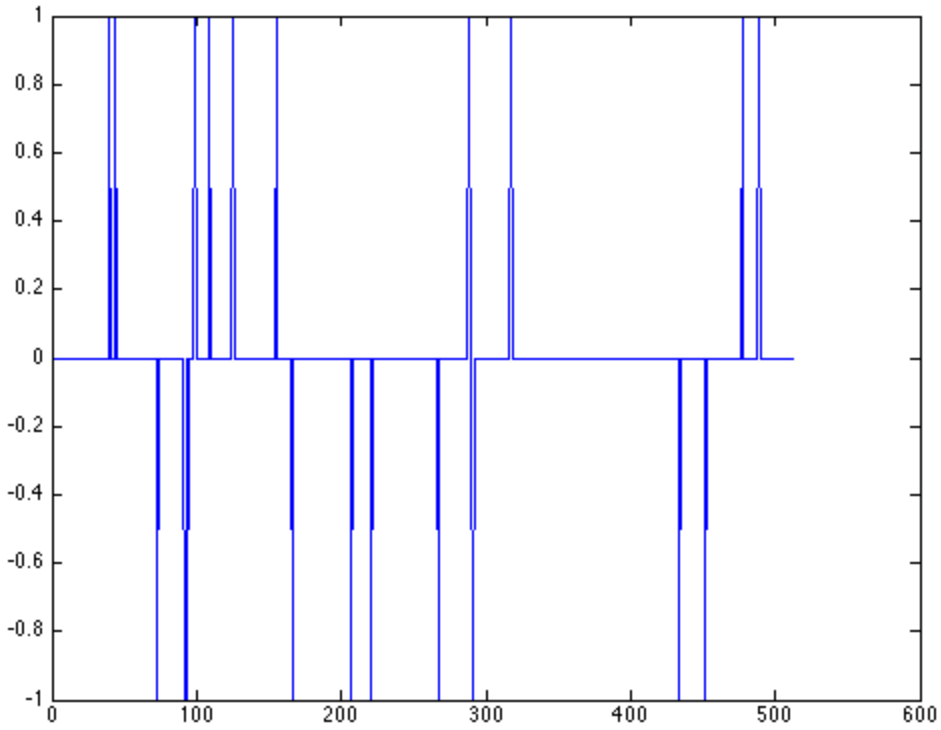
```
%addpath(genpath('/Volumes/Users/linamiao/Dropbox/PQN/'))
cd ../../../../pqnl1;
addpath(genpath(pwd))
cd ../experiments/help_spgl1/modifying/task11lasso

%stream = RandStream.getGlobalStream;
%reset(stream);
```

sample matrix and options

```
m = 120; n = 512; k = 20; % m rows, n cols, k nonzeros.
A  = randn(m,n); [Q,R] = qr(A',0);  A = Q';

opts.iterations = 100;

% save temp A m n k opts
% clear;
% load temp
```

problem setting

```
p = randperm(n); x0 = zeros(n,1); x0(p(1:k)) = sign(randn(k,1));
figure;plot(x0)
b  = A*x0;

tau = norm(x0,1);
```



reconstruct

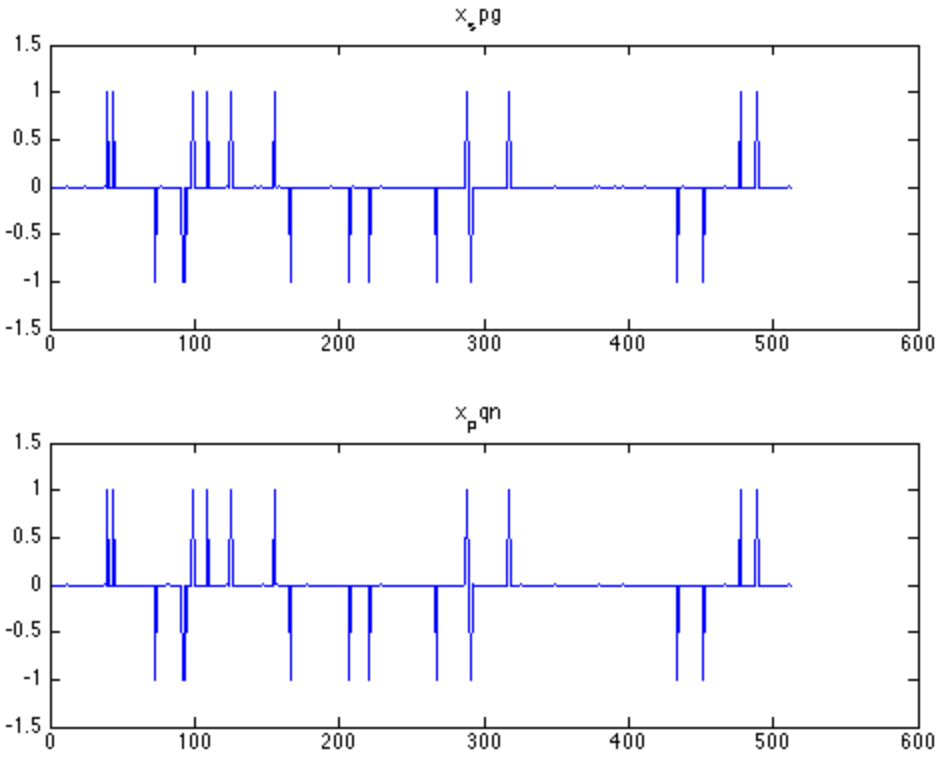
```
[x_spg,r_spg,g_spg,info_spg] = spgl1(A, b, tau, [], zeros(size(x0)), opts);
[x_pqn,r_pqn,g_pqn,info_pqn] = pqnl1_2(A, b, tau, [], zeros(size(x0)), opts);

figure;
subplot(2,1,1); plot(x_spg);title('x_spg')
subplot(2,1,2); plot(x_pqn);title('x_pqn')

which spgl1
which pqnl1_2
which minConf_PQN_pqnl1
```

```
================================================================================
SPGL1_SLIM v. 46  (Tue, 14 Jun 2011) based on v.1017
================================================================================
No. rows              :      120      No. columns           :      512
Initial tau           : 2.00e+01      Two-norm of b         : 2.43e+00
Optimality tol        : 1.00e-04      Target one-norm of x  : 2.00e+01
Basis pursuit tol     : 1.00e-06      Maximum iterations    :      100

 Iter      Objective   Relative Gap      gNorm   stepG    nnzX    nnzG
    0  2.4275619e+00  3.1771670e+00   4.68e-01     0.0       0       0
    1  6.6589533e-01  2.0492787e+00   1.24e-01     0.0     124       0
    2  5.1732211e-01  5.2787227e-01   6.74e-02     0.0     188       0
```

3	4.6451687e-01	4.9809285e-01	6.17e-02	0.0	158	0
4	3.4031542e-01	4.0538460e-01	4.91e-02	0.0	117	0
5	4.2713049e-01	1.4008146e+00	7.80e-02	0.0	84	0
6	4.6415507e-01	1.4839141e+00	1.03e-01	0.0	162	0
7	2.3671842e-01	2.5249779e-01	3.21e-02	0.0	156	0
8	2.1347059e-01	1.6842554e-01	2.75e-02	0.0	135	0
9	1.9959872e-01	1.7139034e-01	2.65e-02	0.0	113	0
10	1.4734540e-01	1.4883742e-01	2.04e-02	0.0	87	0
11	1.6129669e-01	3.4729542e-01	2.65e-02	-0.3	82	0
12	1.2676653e-01	2.4931976e-01	2.43e-02	-0.3	131	0
13	1.0470204e-01	1.0257547e-01	1.46e-02	0.0	118	0
14	9.9185769e-02	7.5461435e-02	1.31e-02	0.0	104	0
15	9.1594466e-02	6.9905601e-02	1.20e-02	0.0	92	0
16	6.3231234e-02	1.5753286e-01	1.34e-02	0.0	73	0
17	5.7310992e-02	8.9734444e-02	9.81e-03	-0.3	76	0
18	5.2301742e-02	4.2752545e-02	7.09e-03	0.0	82	0
19	4.9406847e-02	2.8628267e-02	6.10e-03	0.0	80	0
20	4.6101138e-02	4.6341326e-02	6.67e-03	0.0	79	0
21	4.5125705e-02	7.6020051e-02	7.59e-03	0.0	78	0
22	4.4973107e-02	1.2525900e-01	1.00e-02	0.0	82	0
23	3.7194381e-02	1.8602224e-02	4.48e-03	0.0	84	0
24	3.5856220e-02	2.2224249e-02	4.54e-03	0.0	81	0
25	3.2841915e-02	2.1208254e-02	4.19e-03	0.0	79	0
26	2.0499830e-02	8.9780776e-02	5.42e-03	0.0	52	0
27	1.7414504e-02	5.8941432e-02	4.30e-03	-0.3	63	0
28	1.1902382e-02	1.7849318e-02	2.03e-03	0.0	68	0
29	1.0078851e-02	1.0746008e-02	1.54e-03	0.0	66	0
30	9.4081105e-03	3.5880438e-03	1.12e-03	0.0	64	0
31	8.4617511e-03	4.9585655e-03	1.08e-03	0.0	63	0
32	7.5058770e-03	1.9138838e-02	1.55e-03	0.0	58	0
33	6.2605086e-03	5.6384091e-03	9.01e-04	-0.3	62	0
34	5.9424299e-03	2.2827356e-03	6.92e-04	0.0	60	0
35	5.5056090e-03	2.6652320e-03	6.66e-04	0.0	62	0
36	4.4142293e-03	9.1392887e-03	8.12e-04	0.0	52	0
37	3.7846502e-03	6.0667695e-03	6.79e-04	-0.3	52	0
38	3.4728900e-03	1.2380037e-03	4.05e-04	0.0	52	0
39	3.2744836e-03	1.6248497e-03	4.01e-04	0.0	51	0
40	2.7003955e-03	3.3265517e-03	4.12e-04	0.0	43	0
41	2.5281770e-03	3.0908332e-03	4.02e-04	-0.3	43	0
42	2.3744038e-03	1.8362854e-03	3.18e-04	0.0	41	0
43	2.2546453e-03	1.2284025e-03	2.80e-04	0.0	41	0
44	2.1163460e-03	1.7117723e-03	2.87e-04	0.0	40	0
45	2.0423390e-03	2.9385413e-03	3.32e-04	0.0	36	0
46	2.0702674e-03	4.9861929e-03	4.16e-04	0.0	36	0
47	1.7168925e-03	8.8276894e-04	2.11e-04	0.0	33	0
48	1.6520704e-03	8.6324126e-04	2.03e-04	0.0	33	0
49	1.5347665e-03	7.7638325e-04	1.87e-04	0.0	30	0
50	8.7059174e-04	3.7830151e-03	2.26e-04	0.0	20	0
51	8.6796853e-04	3.2643111e-03	2.25e-04	-0.3	20	0
52	5.8287180e-04	1.0276525e-03	1.06e-04	0.0	20	0
53	4.6790008e-04	6.3218331e-04	7.92e-05	0.0	20	0
54	4.3671855e-04	2.4639568e-04	5.65e-05	0.0	20	0
55	3.9434344e-04	1.8910712e-04	4.86e-05	0.0	20	0
56	3.1559256e-04	4.2450852e-04	5.05e-05	0.0	20	0

```
   57  2.9112774e-04  3.4723161e-04   4.62e-05    -0.3      20       0
   58  2.7214570e-04  2.2752529e-04   3.76e-05     0.0      20       0
   59  2.5757983e-04  1.8256200e-04   3.43e-05     0.0      20       0
   60  2.4135197e-04  2.6620086e-04   3.62e-05     0.0      20       0

 EXIT -- Optimal solution found

 Products with A     :      77        Total time   (secs) :     0.2
 Products with A'    :      61        Project time (secs) :     0.0
 Newton iterations   :       0        Mat-vec time (secs) :     0.0
 Line search its     :      20        Subspace iterations :       0


 ================================================================================
 PQNL1_SLIM v. 46  (Tue, 14 Jun 2011) based on v.1017
 ================================================================================
 No. rows              :      120      No. columns           :      512
 Initial tau           : 2.00e+01      Two-norm of b         : 2.43e+00
 Optimality tol        : 1.00e-04      Target one-norm of x  : 2.00e+01
 Basis pursuit tol     : 1.00e-06      Maximum iterations    :      100

  Iter      Objective   Relative Gap      gNorm   stepG    nnzX    nnzG
     0  2.4275619e+00  3.1771670e+00   4.68e-01     0.0       0       0
Inside of minConf_PQN
 Iteration   FunEvals Projections     Step Length          rNorm2        O
         1          1           4     1.00000e+00     8.75583e-01     3.959
         2          1          17     1.00000e+00     7.10861e-01     2.166
         3          1          36     1.00000e+00     5.66067e-01     1.261
         4          1          55     1.00000e+00     4.74618e-01     1.047
         5          1          82     1.00000e+00     3.90008e-01     8.512
         6          1         111     1.00000e+00     3.31626e-01     6.939
         7          1         142     1.00000e+00     2.82788e-01     5.518
         8          1         169     1.00000e+00     2.46553e-01     4.157
         9          1         200     1.00000e+00     2.10061e-01     3.795
        10          1         229     1.00000e+00     1.82818e-01     3.295
        11          1         258     1.00000e+00     1.51246e-01     2.954
        12          1         291     1.00000e+00     1.19084e-01     2.791
        13          1         320     1.00000e+00     9.53063e-02     2.398
        14          1         359     1.00000e+00     7.42372e-02     1.852
        15          1         392     1.00000e+00     5.57729e-02     1.394
        16          1         421     1.00000e+00     4.31114e-02     1.090
        17          1         451     1.00000e+00     3.20502e-02     9.593
        18          1         480     1.00000e+00     2.43964e-02     6.390
        19          1         491     1.00000e+00     2.05779e-02     5.141
        20          1         510     1.00000e+00     1.71057e-02     4.125
        21          1         527     1.00000e+00     1.40938e-02     2.973
        22          1         544     1.00000e+00     1.15051e-02     1.905
        23          1         558     1.00000e+00     9.54301e-03     1.398
        24          1         574     1.00000e+00     7.78685e-03     1.187
        25          1         586     1.00000e+00     6.75129e-03     1.150
        26          1         602     1.00000e+00     5.62047e-03     1.041
        27          1         614     1.00000e+00     4.77639e-03     1.003
        28          1         630     1.00000e+00     3.71786e-03     7.768
        29          1         648     1.00000e+00     2.82950e-03     4.919
```

```
        30          1         665     1.00000e+00     2.26318e-03     3.745
        31          1         677     1.00000e+00     1.85409e-03     3.984
        32          1         693     1.00000e+00     1.47333e-03     3.384
        33          1         711     1.00000e+00     1.04067e-03     1.758
        34          1         725     1.00000e+00     7.97931e-04     1.101
        35          1         737     1.00000e+00     6.37415e-04     1.358
        36          1         755     1.00000e+00     4.99267e-04     1.114
        37          1         769     1.00000e+00     4.01672e-04     6.872
        38          1         783     1.00000e+00     3.18049e-04     5.253
        39          1         797     1.00000e+00     2.48489e-04     4.403
        40          1         813     1.00000e+00     1.98153e-04     3.595
        41          1         825     1.00000e+00     1.59106e-04     3.266
        42          1         843     1.00000e+00     1.18553e-04     2.308
        43          1         855     1.00000e+00     9.44814e-05     1.967
        44          1         869     1.00000e+00     7.21144e-05     1.250
        45          1         883     1.00000e+00     5.47606e-05     9.026
        46          1         897     1.00000e+00     4.21298e-05     7.099
        47          1         913     1.00000e+00     2.99824e-05     5.335
        48          1         931     1.00000e+00     2.19988e-05     4.285
        49          1         945     1.00000e+00     1.87274e-05     4.913
        50          1         956     1.00000e+00     1.71014e-05     3.436
        51          1         963     1.00000e+00     1.61980e-05     2.936
        52          1         974     1.00000e+00     1.50688e-05     2.490
        53          1         983     1.00000e+00     1.40369e-05     1.868
        54          1         997     1.00000e+00     1.21922e-05     1.812
        55          1        1009     1.00000e+00     1.09880e-05     1.703
        56          1        1016     1.00000e+00     1.04225e-05     1.425
        57          1        1028     1.00000e+00     9.50493e-06     1.323
        58          1        1035     1.00000e+00     9.05112e-06     1.168
        59          1        1047     1.00000e+00     8.24099e-06     1.137
        60          1        1054     1.00000e+00     7.85913e-06     1.012
        61          1        1061     1.00000e+00     7.51238e-06     9.241
        62          1        1073     1.00000e+00     6.90004e-06     9.026
        63          1        1080     1.00000e+00     6.59807e-06     7.993
        64          1        1087     1.00000e+00     6.31791e-06     7.332
        65          1        1099     1.00000e+00     5.78588e-06     7.541
        66          1        1106     1.00000e+00     5.54228e-06     6.628
        67          1        1113     1.00000e+00     5.31812e-06     6.116
        68          1        1120     1.00000e+00     5.10768e-06     5.721
        69          1        1127     1.00000e+00     4.91000e-06     5.448
Function value changing by less than optTol
    69  4.9100005e-06  4.1933049e-06   6.69e-07     0.0      20       0
 EXIT -- Optimal solution found

 Products with A     :      71        Total time   (secs) :     1.3
 Products with A'    :      71        Project time (secs) :     1.6
 Newton iterations   :       0        Mat-vec time (secs) :     0.0

/Tools/mat_toolbox/spgl1-slim/spgl1.m
/Volumes/Users/linamiao/Dropbox/PQN/experiments/help_spgl1/modifying/task1
/Volumes/Users/linamiao/Dropbox/PQN/experiments/help_spgl1/modifying/task1
```



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