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 Matlab Codes package of difference map ECME (DM-ECME)
 algorithm for nonnegative signal reconstruction
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Authors: K. Qiu and A. Dogandzic
The Matlab codes are written and debugged by Kun Qiu.
Tested Configurations: Matlab 7.2.0.232(R2006a) on PC

The codes in this package are free program. You are welcome to use them for academic purposes. If you use this code in your research and publications, please put a reference to our paper. If you find any bug or have any suggestion, please contact the authors through email: kqiu@iastate.edu and/or ald@iastate.edu

%%%%%%%%%%%%%% File list %%%%%%%%%%%%%%%
--root folder
"PhantomExample.m":   This is the test file of the phantom image
                        reconstruction example.

"WristExample.m":   This is the test file of the wrist image
                        reconstruction example.

--folder "Algorithms"
"DMECME.m":   Our core DM-ECME reconstruction function.

"SPIRALTAP_mod.m":   The sparse poisson-intensity reconstruction
                        with gaussian noise (SPIRAL_G) method by Z. T.
                        Harmany, R. F. Marcia, and R. M. Willett, the
                        original file " SPIRALTAP.m" can be downloaded
                        at: http://people.ee.duke.edu/~zth/software/
                        Kun Qiu has modified the original file to
                        incorporate a common convergence criterion.

"constrainedl2l1denoise.m":   The file is needed in SPIRAL_G
                        reconstruction.

"hard_l0_Mterm_mod.m": The (normalized) iterative hard thresholding
                        algorithms by T. Blumensath and M. E. Davies;
                        the original file "hard_l0_Mterm.m" can be
                        downloaded at:
                        http://www.personal.soton.ac.uk/tb1m08/sparsify
                        /sparsify.html
                        Kun Qiu has modified the original file to
                        incorporate a common convergence criterion.

"GPSR_BB.m":   The Gradient Projection for Sparse
                        Reconstruction method by Mário Figueiredo,
                        Robert D. Nowak, and Stephen J. Wright,
                        downloaded at: http://www.lx.it.pt/~mtf/GPSR/

"FPC_AS":   This folder contains the files for the fixed
                        point continuation active set (FPC_AS) method
                        by Z. Wen, W. Yin, D. Goldfarb, and Y. Zhang,

downloaded at:
http://www.caam.rice.edu/~optimization/L1/FPC_A
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--folder "subfunctions"
The files in this folder are useful in implementing the sampling and
sparsifying operators in the function handle form. Most of them are
from Rice wavelet toolbox and can be downloaded from
http://www-dsp.rice.edu/software/rice-wavelet-toolbox.
Files "A_fhp.m", "At_fhp", and "LineMask" are from l1-magic suite:
http://www.acm.caltech.edu/l1magic/.
Files "H_idwt1d.m", "Ht_dwt1d.m" and "psnr.m" are created or added by
Kun Qiu.

--folder "Images"
The folder contains the wrist test image.

%%%%%%%%%%%%%% Quick Start %%%%%%%%%%%%%%%%%%%
As a quick demo, open "PhantomExample.m" or "WristExample.m" file and
run.

%%%%%%%%%%%%%%%% To reproduce the figures %%%%%%%%%%%%%%%%%
To reproduce the image recoveries in the paper, just open the
"PhantomExample.m" and "WristExample.m" files and run.

To reproduce the PSNR curves (for noiseless phantom reconstruction),
fix the noise variance "sigma2" at 0 and the number of trials
"TrialNum" at 1 and vary the parameter "RadialNum" from 32 to 50 with
increment by 1. Collect the data under different number of radial lines
(thereby different measurement ratio N/m) and plot the curves of PSNR
vs N/m.

To reproduce the MSE curves (for phantom reconstruction under noise),
fix the number of radial lines "RadialNum" at 38, set the number of
trials "TrialNum" to 20 and vary the noise variance parameter "sigma2"
from the set {10^-2, 10^-3, 10^-4, 10^-5, 10^-6, 10^-7, 10^-8}. Collect
the data under different noise variances sigma2 and plot the curves of
MSE vs sigma2.