**README for nature2ndRev\_gridRunner\_cplex.**

**Code Folder:** nature2ndRev\_gridRunner\_cplex

**Github URL:** https://github.com/ravi9/mca\_vision\_angle\_nature\_cplex\_comparision

**Input Data Folder:** Data

The time comparison of magnetic computing versus IBM ILOG CPLEX is performed on the USF CIRCE GRID.

**Prerequisites:**

1. IBM ILOG CLPEX must be installed. Students can receive a free version.
   1. Instructions on how to install IBM ILOG CPLEX on Linux machine can be found here: <http://www-01.ibm.com/support/docview.wss?uid=swg21444285>
2. Access to CIRCE grid. To request account on CIRCE, see here: <http://www.rc.usf.edu/>
3. Knowledge of submitting jobs to CIRCE computing grid. Beginner guide to submit jobs on CIRCE computing grid are available here: <https://cwa.rc.usf.edu/projects/research-computing/wiki/Guide_to_Slurm>

**Assumptions:**

Existing code assumes CPLEX is installed at: /work/r/ravi1/EMT/ibm/ILOG/CPLEX\_Studio1261/cplex/matlab/x86-64\_linux/

If you installed CPLEX at a different location, update the path at line #7 in the file: rp\_bashRun2Images.sh

**Steps to run the comparison:**

1. To launch experiments with sparsity 96%, run rp\_qsubCmds\_spars\_96.sh

2. To launch experiments with sparsity 98%, run rp\_qsubCmds\_spars\_98.sh

**Execution Workflow:**

The dataset (Data) contains 101 images as attribute files (.atts). The submission script (rp\_qsubCmds\_spars\_96.sh) launches 51 jobs. Each job has 2 images as input along with the sparsity value. Each job invokes script rp\_bashRun2Images.sh.

The rp\_bashRun2Images.sh script is used to submit the job for SLURM(CIRCE grid).

The rp\_bashRun2Images.sh script loads Matlab, sets the path to CPLEX and launches the MATLAB script rp\_gridMain\_Run2Img.m

The Matlab script rp\_gridMain\_Run2Img.m launches the script: cplexQuadprog\_grid2.m, which invokes CPLEX. The Matlab script cplexQuadprog\_grid2.m prepares the affinity matrix and invokes the CPLEX optimization “cplexmiqp”

To summarize, the order of execution workflow:

1. rp\_qsubCmds\_spars\_98.sh
2. rp\_bashRun2Images.sh
3. rp\_gridMain\_Run2Img.m
4. cplexQuadprog\_grid2.m

**Description of files:**

1. Intermediate result Folders: grid1-sparse-run1, grid1-run2, grid1\_results, grid2\_results, cplexgrid2-run2, cplexgrid2-run3, cplexgrid2-run4, cplexgrid2-run5, cplexgrid2-run6, cplexgrid2-run7, cplexgrid2-run8
2. Data: Contains the dataset. 101 Images in .atts format
3. rp\_qsubCmds\_spars\_90.sh: Shell script to launch with sparsity 90%
4. rp\_qsubCmds\_spars\_95.sh: Shell script to launch with sparsity 95%
5. rp\_qsubCmds\_spars\_96.sh: Shell script to launch with sparsity 96%
6. rp\_qsubCmds\_spars\_98.sh: Shell script to launch with sparsity 98%
7. rp\_qsubCmds\_spars\_90\_missing.sh: Shell script to rerun missing outputs with sparsity 90%
8. rp\_bashRun2Images.sh: Shell script to submit job to CIRCE grid (SLRUM)
9. cplexQuadprog\_grid1.m: Matlab script version1 which runs CPLEX optimization
10. cplexQuadprog\_grid2.m: Matlab script version2 which runs CPLEX optimization
11. rp\_gridLauncher\_100ImgOn50Proc.m: Shell script to generate qsub Commands present in rp\_qsubCmds\_spars\_98.sh
12. resultAnalyze\_cplexgrid.m: Matlab script to analyze the results produced my CPLEX optimization.
13. resultAnalyze.m: Old Matlab script to analyze results produced from traditional vision.
14. rp\_gridMain\_Run2Img.m: Matlab script which calls the cplexQuadprog\_grid2.m script
15. matlabQuadprog.m
16. cplexQuadprog.m: Matlab script used for testing purposes.
17. TraditionalVision.m: Matlab scripts which runs traditional vision optimization using Simulated Annealing.
18. cpuinfo.m: Matlab script which reads the CPU info
19. plotter.m: Matlab script to plot graphs of the metrics.
20. Main\_driver.m
21. TraditionalVisionReviewer.m: Matlab scripts which runs traditional vision optimization using Simulated Annealing with slight modification for intial k parameter.
22. resultAnalyze\_tradvizReviewer.m: Matlab script which extracts the time taken, true +ve rate, false +ve rate for running Traditional vision algorithm.
23. sparsifyWithStrongEdges.m: Matlab script which computes the sparsity of a given Affinity Matrix.
24. ComputeGroupingAffinities.m: Matlab script which computes the grouping affinities of an image.
25. AffMatrices: This folder contains all the Affinity Matrices of all images pre-calculated, and used by cplexQuadprog\_grid2.m
26. gridlogs: This folder contains the logs generated while running the jobs.
27. oldresults: This folder contains the old results
28. linescount.csv: This excel sheet contains the precomputed information of number of line segments for each image. This information is used in analyzing the results.
29. FinalCPLEX\_graph\_avg+std-cplex-96-98.xlsx: Final graph statistics info for CPLEX comparision published in Nature Nano paper
30. excel\_meta: excel sheets which are used to during development of this comparison.