Problem Set 4 - Conjugate Gradient

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Running serial CG solver for memory usage:

75x75 physical problem

Dense method memory usage: 241.61mb (took 50secs)

Sparse method memory usage: 0.21 mb (took 0.07 secs)

10000 x 10000 problem

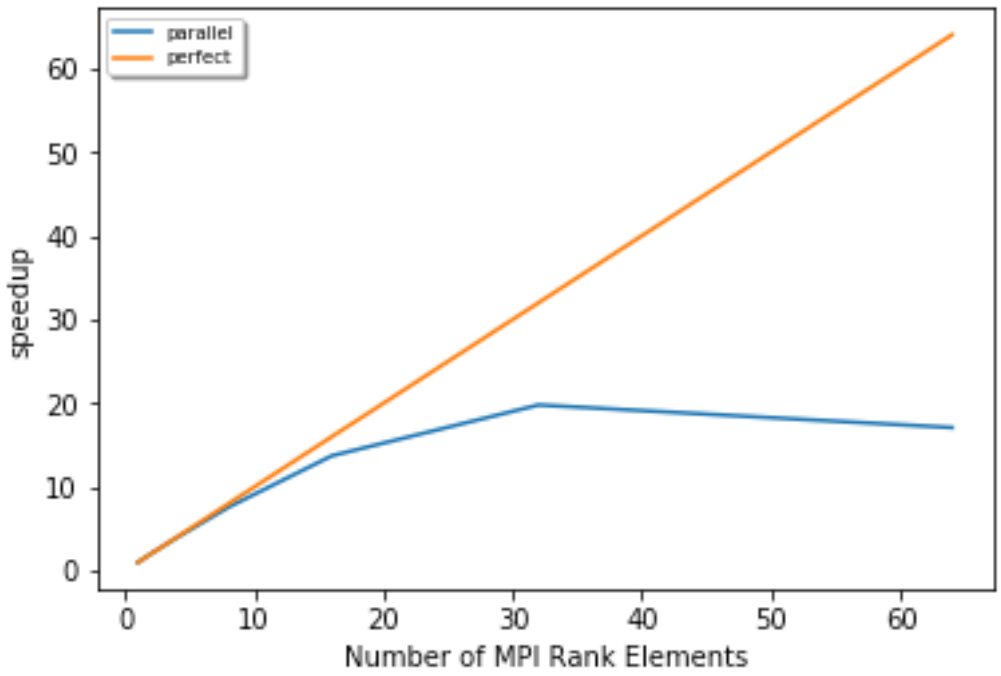
Dense = 17592186029767.2mb

Sparse = 3814.7mb

***Code located in zip file - see readme for exact file names

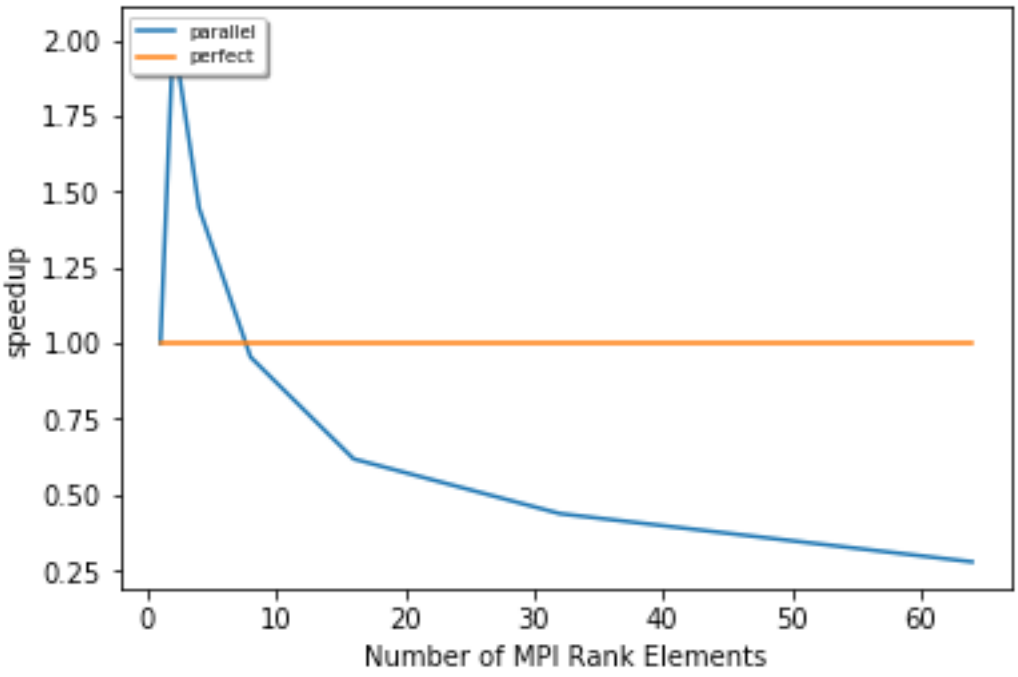
exact times and results in README file as well

Strong Scaling Study:



Summary: the strong scaling shows the problem scaled well up to 20 ranks and then started to bottom out after 30 ranks. This may be due to my implementation using barriers to ensure correctness but it seems the overhead for communicating starts becoming higher as you divide the problem too much. A better decomposition approach in 2D may improve this as i did a stacked 1d decomposition among ranks. The idea speedup received was slightly over 20x

Weak Scaling:



Summary: The weak scaling study shows the problem deteriorating at a near parabolic rate as the problem size scales. As was the case with strong scaling, the amount of overhead while maintaining n size buffers and partial arrays decomposed in a 1D stack may cause additional issues and a marked loss in speed up near 75% as we increase the problem by a power of 2. (note some numbers needed to be adjusted to take account my decomposition)