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Split Grid and Block Lanczos algorithm for efficient eigenpair generation

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The increasing unbalance between computing capabilities of individual
nodes and internode communication makes it highly desirable for any
Lattice QCD algorithm to minimize the amount of off-node communication.
One of the relatively new methods for this is the 'split-grid' or
'split-domain', where data is rearranged within the running of a single binary,
so that the routines which requires significant off-node communications such
as Dirac operators are run on multiple smaller partitions in parallel
with a better surface to volume ratio,
while other routines are run in one large partition.

While it is relatively straightforward to utilize split-grid for
inverters, the typical
Lanczos algorithm which has one starting vector does not render itself
naturally to split-grid approach. Here we report on our investigation of Block
Lanczos algorithm which allows multiple starting vectors to be concurrently.
It is shown that for a moderate number of starting vectors, Block
Lanczos algorithm has been implemented in Grid Data parallel C++ mathematical object library, and shown
to achieve convergence comparable to normal Lanczos algorithm on
DWF/Mobius ensemble with physical quark masses.

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