Proposition for some short presentations

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Automatic Parallel Linear Solver : Domain decomposition.

- *Goal* : The challenge of that research is to build a software suite such that solves linear linear systems on a parallel architecture: given a large sparse matrix, an algebraic partitionner provides a matrix allocation on a network of processors; then a parallel code implements the GMRES method preconditionned by Multiplicative Schwarz iterations. The contradiction of the search for parallelism and the consideration of the inherently sequential preconditionner is counterbalanced by the efficiency of that preconditionner.
- *Main results* : Explicit expression of the Multiplicative Schwarz iteration ; automatic algebraic partitionner (1D) ; parallel code expressed into the PETSc format.
- *References* : [3, 2]

Eigenvalue solvers : Correction of approximate invariant subspaces.

- *Goal* : Approximate invariant subspace associated with the smallest eigenvalues of a sparse symmetric (real) matrix. The approach taken is that of the so-called "correction equation" which leads to such standard schemes as the Jacobi-Davidson method or Olsen's method. We consider the situation of block corrections and discuss two algorithms. The application of the viewpoint that is developed is then explored for Domain Decomposition methods (Component Mode Synthesis method) .
- *Main results* : General frame for an already existing algorithm. Improvement of it.

Geodesy : Inverse problem.

- *Goal* : A distribution of ponctual masses (caracterized by its intensities and depths) is determinated, in such a way that the associated equivalent potential approximates the best a given potential field. For this purpose, a geodetic inverse problem is solved. On the whole unit sphere a potential function is usually expressed in spherical harmonics, basis functions with global support. The identification of the two potentials is done by solving a least-squares problem. When a limited area is studied, the estimation of the point-mass parameters by means of spherical harmonics is prone to error, since they are no longer orthogonal over a partial domain of the cut sphere. The construction of a local spherical harmonic bases that is orthogonal on the specified limited domain of the sphere, allows us to treat the local point-mass determination problem.
- *Main results* : Not yet.
- *Reference* : [1]

References

[1] A. Abdelmoula, M. Moakher, and B. Philippe, *Localized spectral analysis for an inverse problem in geodesy*, in CARI'08, submitted.

[2] G.-A. Atenekeng-Kahou, L. Grigori, and M. Sosonkina., *A partitioning algorithm for block-diagonal matrices with overlap*, Parallel Computing, (2008).

[3] B. Philippe and Y. Saad, *On correction equations and domain decomposition for computing invariant subspaces*, Comput. Methods Appl. Mech. Eng., 196 (2007), pp. 1471–1483.