

TP2 – First part : Solving the Laplacian equation with Boundary conditions through the pseudospectral method using the BiCGStab algorithm and the BLAS library

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Abstract

The purpose is here to evaluate the use of the BLAS library comparing to self-written routines when using them in the Stabilized Bi-Conjugate Gradient (BiCGStab) algorithm. The Laplacian equation with Boundary Condition (B.C.) discretized with the pseudospectral method will be used to apply this algorithm.

1 The pseudospectral method

Please refer to the document of the lesson treating of the pseudospectral method and its usage.

2 Using the BLAS libraries in the BiCGStab algorithm

Iterative algorithms used to solve linear systems (i.e. $AX = B$) such as the BiCGStab are based on simple matrix operations:

- matrix-vector product
- scalar-vector product, vectors addition/substraction
- dot product of two vectors

You can realize these operations by coding them yourself or you can use optimized routines that you can find in scientific libraries (i.e. **SCSL** which is present on ouessant) such as **BLAS** or **LAPACK**.

When you have downloaded the archive file `part1.tgz` and extracted its content, describe the BLAS routines that can be used in the BiCGStab algorithm, and how the arguments have to be supplied.

Create a new routine corresponding to the BiCGStab using the BLAS routines.

Use the routines of the example module to compare the performances of the algorithm with and without the blas routines for different linear system sizes.