

Instruction for ADEF1 Solver Software

A.H. Sheikh

1 Introduction

ADEF1 solver software is divided into two parts. Multilevel implementation requires matrices at all levels from finest to coarsest. The data files are constructed in Matlab and subsequently are written into `.DAT` files. Important part of ADEF1 solver software is part which implements multilevel preconditioner. This is implemented in PETSc, which calls the `.DAT` files on run time.

Structure Main directory `Adef1_Software` contains two sub-directories; `ConstructDatFiles` and `PetscSolver`.

The directory `ConstructDatFiles` constructs data files.

2 Constructing DATA files

Add the directory `ConstructDatFiles` to Matlab path also `AddPath` of your PETSC `matlab-bin` directory in matlab session or adapt path in program `MainMarmousi.m`.

Run the program `MainMarmousi.m` It will ask for options in an input dialogue box. Those options are as following;

That program constructs discrete matrices according to provided options.

- | | |
|---------------------------------|--|
| Frequency f | Give values $f = 1, 10, 20$ or 40 |
| Meshsize | In terms of grid points per wavelength. Choose 10 or 20 . |
| Real shift | Real shift in complex shifted Laplace preconditioner CSLP, choose whatever you want to use as CSLP. |
| Imag. shift | Imaginary shift in complex shifted Laplace preconditioner CSLP, choose whatever you want to use as CSLP. |
| Damping | Damping parameter in equation. |

An example is shown in Figure 1.

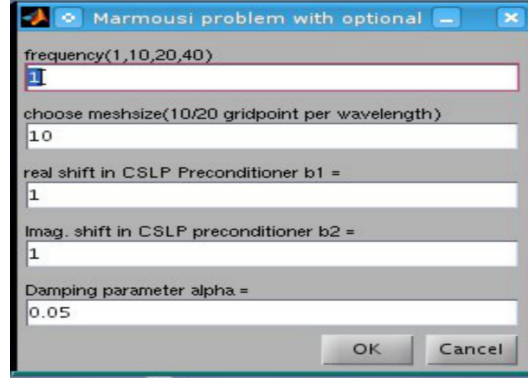


Figure 1: Menu to choose options while constructing .DAT files.

Recommended: First test run with defaults option in order to check if it runs smoothly. Subsequently customize with options.

Output file will be a .DAT file and will be saved in directory ../DataFiles/ with customized name `fN1gpWLN2aN3.dat` where `f`, `gpWL`, and `a` are constant where `N1`, `N2` and `N3` will customized according to options. For example `f1gpWL10a0.05.dat`, is data set with frequency $f = 1$, number of $gp/wl = 10$ and damping parameter $a = 0.05$.

2.1 How to adapt

PLEASE NOTE WHEN ADAPTING,
Reading `FILENAME.dat` file in Petsc is sensible of orders of things(matrices and vectors) written in .dat file. If you wish to adapt, adapt it carefully. Take care of the order, persist with same order while writing into .dat file and reading same .dat file.

The directory `PetscSolver` implements the `ADEF1` solver.

3 Solving part of software

In the terminal, go to the target directory; Compile the program as follows

```
> make GMGcycle.o; make MLadef.o; make MainSolver
```

subsequently execute the executable program and provide with data file with “-f” as follows:

```
> ./MainSolver -f /your/path/to/datafile.dat.
```

This execution accept all the possible runtime PETSc options. These all options can be listen by executing program with “-help”.