

LAWA

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This document describes the usage of software package LAWA (**L**ibrary for **A**ddaptive **W**avelet **A**pplications) for the PhD thesis *On the adaptive tensor product wavelet Galerkin method with applications in finance*.

Contributors: It is important to note that the library itself is a group project with the following contributors (listed in lexicographical order): Sebastian Kestler, Michael Lehn, Mario Rometsch, Andreas Rupp, Kristina Steih, Alexander Stippler

1 Documentation

1.1 Required packages

- BOOST, GSL
- On Unix systems: BLAS, LAPACK,
- On Mac OS X: Accelerate Framework

1.2 Environment variables

Before starting, you need to set several environment variables:

- FLENS_HOME: path to the FLENS-lite folder
- LAWA_HOME: path to the LAWA-lite folder
- BOOST_HOME: path to the BOOST folder (headers)
- GSL_INC_HOME: path to the GSL folder (headers)
- GSL_LIB_HOME: path to the GSL folder (lib)

This can also be found in the file `.Lawa-liteProfile` in the source folder. Please note that environment variables for *multiprecision* do not need to be set – they are only for experimental purposes.

1.3 Configuration

All required configuration can be found in the config file in the source folder.

1.3.1 Mac OS X

LAWA has been successfully used on all recent Mac OS X systems with the compilers gcc (Versions 4.2.1 and 4.4) and clang.

1.3.2 Unix

I used the provided library on UBUNTU 10.04 in conjunction with gcc (Version 4.4). Here, I installed the following packages:

- libblas-test, libblas-dev, libblas3gf
- liblapack3gf
- liblapack3gf-base

1.3.3 Windows

Has not been tested.

1.4 html documentation

In the folder `LAWA-lite/doc/sites` you find the html file `index.html`. Here, you find all currently available documentation for explanatory examples as well as for the programs used for the PhD thesis. The latter one can be found under *projects based on LAWA*.

2 Notes

2.1 Checks

- The variable `JMINOFFSET` in `lawa/methods/adaptive/datastructures/index.h` needs to be larger or equal to zero when using wavelet algorithms on bounded domains. For unbounded domains, this variable should be chosen such that $JMINOFFSET + j_0$ (minimal level of univariate basis/bases) is nonnegative. Otherwise, one may encounter undefined behavior.
- As a standard, `long int` is used for storing translation indices in an `Index1D` object. However, also `int` can be used. This is of advantage when lack of working memory becomes an issue.

- The comments (“//”) in front of the calls of `F.initializePropagation` in `lawa/methods/adaptive/solvers/multitreeawgm.tcc` have to be removed in order to use the AWGM within option pricing problems (or, more general, the AWGM in conjunction with a θ -scheme for time discretization). This should be fixed in a later version.

3 Setting for Eclipse

I used ECLIPSE (GALILEO) for programming. For this purpose I set up a *make-file project* and used the following settings for the project properties:

- *C/C++ Build*: Build directory is the path to LAWA-lite.
- *C/C++ Build – Environment*: Set variables `LAWA_HOME`, `BOOST_HOME`, `FLENS_HOME`, `GSL_INC_HOME`, `GSL_LIB_HOME` and `PWD`
- *C/C++ Build – Settings*: Activate Mach-O-Parser
- *C/C++ General – File types*: Added `*.tcc`.