Guide for optimization

Marathon is a matlab-file that contains all runs. Use this for an overview of the optimization process.

The following programs/add-ons are needed to perform the optimization/temperature transformation.

# Optimization

* Matlab (R2017a)
* Matlab add-on: MinGW64 (GGC version 4.9.2 by MathWorks Supported Compilers Team)
* Matlab add-on: Myslicer (version 1.1 by Anders Brun)
* Iso2mesh (Iso2mesh 2017 (v1.8), codenamed Deviled Egg)

<http://iso2mesh.sourceforge.net/cgi-bin/index.cgi/?Download>

# Temperature

## Windows

* Virtualbox (VirtualBox 5.1.20 platform packages, windows hosts)  
  <https://www.virtualbox.org/wiki/Downloads>
* Virtualbox: Ubuntu (give at least 15 MB space)  
  <https://www.youtube.com/watch?v=QkJmahizwO4>
* Ubuntu: FEniCS

Type following commands in Ubuntu terminal to install

sudo add-apt-repository ppa:fenics-packages/fenics  
 sudo apt-get update  
 sudo apt-get install --no-install-recommends fenics  
 sudo apt-get dist-upgrade

## Mac

* Anaconda (Anaconda 1.6.2)
  + Dolfin (Dolfin 2017.1.0) should come with Anaconda
* Python (Python 2.7.13)
* Anaconda Navigator: FEniCS  
  To activate FEniCS type following commands in normal mac terminal  
   conda create -n fenicsproject -c conda-forge fenics  
   source activate fenicsproject
* Install h5py  
  Type following command in terminal found in Anaconda Navigator > Environments > fenicsproject > Open Terminal:  
   pip install h5py

## Linux

We have not used Linux, but doing so should be easier since FEniCS is more compatible with them.

# Good to know

The program CST microwave studios (2014) is used to simulate the E-fields, that are then exported to matlab using the function ExportEfieldsFFT that can be found on NewHopa. These Efields are then converted to Octrees (to save space) in run\_1. When they have been converted to Octrees, the original Efields are no longer needed for the optimization. Run\_1 is where the actual optimization takes place. Run\_2 is where data needed for the temperature conversion in FEniCS is created. Run\_2 only needs to be run once for every model since it is only the mesh that changes between models. Run\_3 is run in FEniCS, see more information about that below. Run\_4 converts the temperature files from run\_3 into a temperature matrix. Use the file marathon to run the optimization.

See “Guide of the folder system” for information about what files go where to be able to run the files.

# Run\_3 – temperature conversion

Run\_3 is run in FEniCS. This can be done in different ways depending on what system you are using.

## Windows (using Ubuntu)

Först behöver Ubuntu och FEniCS vara installerat, se ovan. Därefter kan det vara mycket hjälpsamt att installera google drive på Ubuntu, vilket underlättar kopierandet av data mellan Ubuntu/Windows. För att göra detta, se <https://www.howtogeek.com/196635/an-official-google-drive-for-linux-is-here-sort-of-maybe-this-is-all-well-ever-get/>.

Vi hade mapparna: 2\_Prep\_FEniCS\_results, 3\_FEniCS\_example och 3\_FEniCS\_results i Downloads i Ubuntu. Första gången en PLD (P-matris) ska omvandlas till temperatur gjorde vi:

1. Windows: kopiera över de tre mapparna (3\_FEniCS\_results är tom) från Windows till delad mapp i drive
2. Ubuntu: kopiera över mappar till Downloads
3. Ubuntu: byt namn på P-matris till endast P.mat
4. Ubuntu: öppna terminalen och skriv in ”ls” för att se i vilken mapp du står, stega sedan med hjälp av ”cd” till Downloads>3\_FEniCS\_example
5. Ubutnu: skriv ”python pennes.py” för att starta omvandlingen
6. Ubutnu: kopiera över nyskapade filer i Downloads>3\_FEniCS\_results till delad mapp i drive

Nu är det bara att flytta filerna till rätt ställe i Windows och köra run\_4 eller paraview (visningsprogram).

Efter att processen utförts en gång och du ska använda samma modell men en annan frekvens behöver du endast byta ut P-matrisen, då alla andra filer är samma för samma modell. Alltså behöver du inte heller köra run\_2 mer än en gång för varje modell.

## Other systems

Open the terminal used to run fenics and initiate the fenics project. Find the correct folder and make sure all the files you need to run run\_3 are there. The PLD-matrix should only be named P.mat. To run the script, enter “ python pennes.py “.