

# Multigrid Report

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## 1 Introduction

Multigrid method for solving 2D poisson problem with time invariant right hand side on a square domain with Dirichlet boundary condition is implemented. More details on the implementation can be found in [1]. Simple C++ constructs with dynamic memory allocation is used for implementing the main program [2]. Three small scripts are used to semi automate the build, run, and post process the test cases.

## 2 auto.sh

`$bash auto.sh`

will build the executable using `make main` and run different settings that were requested within the project description. It will change the data file names and give them to a small python script for plotting.

If a file name is "n4nu12nu21" it corresponds to:

$n = 4, \nu_1 = 2, \nu_2 = 1$ .

The maximum number of iteration is chosen 30 so that we also get the "flat-tened" part of the plots.

To get individual tests one can use:

`$/main 6 40 2 1`

which corresponds to:

$n = 6, \nu_1 = 2, \nu_2 = 1$  and one additional number  $M = 40$  which is the maximum number of multigrid iteration. The data file is now called data and for plotting one should use:

`$echo data | python plot.py`

All the plots can be found in the "PLOTS" folder.

## References

- [1] U. Trottenberg. *Multigrid*. Academic Press, 2001.
- [2] Joe Pitt-Francis, Jonathan Whiteley. *Guide to Scientific Computing in C++*. Springer, 2017.