

Matlab Tweaks - Part 1

Startup Files and Debugging

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Motivation

Matlab is one of the most common software packages in the field of numerical mathematics.

There are a lot of less known utilities that make life with Matlab more convenient. In the series “Matlab Tweaks” we want to discuss some of these utilities. Today is Part 1.

Startup File

- The startup file is automatically executed every time you start Matlab. Use it for commands you frequently use, e.g. figure properties.
- Name: startup.m
- Save in:

```
>> userpath
```

```
ans =
```

```
/homes/extern/stolwijk/Documents/MATLAB:
```

My Startup File

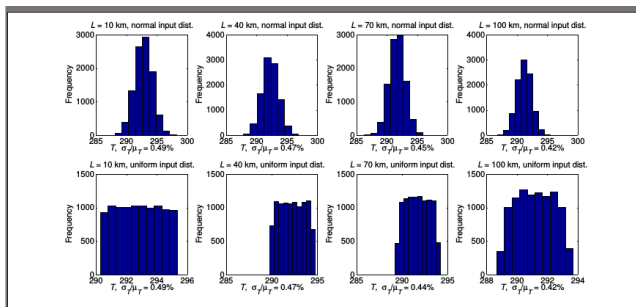
```
addpath /homes/extern/stolwijk/Documents/MATLAB/eigtoolib

% Change default axes fonts.
set(0,'DefaultAxesFontName', 'Arial')
set(0,'DefaultAxesFontSize', 14)

% Change default text fonts.
set(0,'DefaultTextFontname', 'Arial')
set(0,'DefaultTextFontSize', 14)
```

Whitespace Subplot

Subplot creates much whitespace around the subplots, e.g.,



which is tedious to remove in Matlab itself.

Whitespace Subplot

However, it is easy to crop images in \LaTeX :

```
\includegraphics[trim=3.5cm 0.5cm 3.0cm 0cm, clip=true,  
width=1.0\textwidth]{Figs/MCS_T.eps}
```

Here, 'trim' crops in the following order: left, bottom, right and top. The 'clip=true' should also be included.

Debugging Matlab Files

Debugging in general

- procedure to find and eliminate bugs in a computer program
- comprises: control of program run, examination of data, modification of buggy code

Debugging in Matlab

- in the GUI of the editor or from the command line
- main tool: breakpoints
- three different kinds of breakpoints:
 - standard breakpoints
 - conditional breakpoints
 - error breakpoints

Useful Debugging Commands

Breakpoints

dbstop set breakpoints
dbclear clear breakpoints
dbstatus list all breakpoints

Program Run Control

dbcont continue execution
dbstep execute one or more lines from the current breakpoint
dbquit quit debug mode

Workspace Management

dbup shift current workspace to workspace of caller
dbdown reverse operation to dbup
dbstack displays function call stack

Hands-on Session: Example - Collatz Sequence

Definition of Collatz Sequence

$$a_n = \begin{cases} a_{n-1}/2 & , \text{ if } a_{n-1} \text{ is even} \\ 3a_{n-1} + 1 & , \text{ if } a_{n-1} \text{ is odd} \end{cases}$$

... until $a_n = 1$

Collatz Conjecture:

The Collatz sequence terminates within a finite number of steps.

Consider 2 Matlab Functions:

- *collatz.m*: generates Collatz sequence of integers for any given starting value $a_1 > 0$
- *collatzplot.m*: plots length of sequence over the starting value for all starting values from 1 to a given value m

Summary and Outlook

Summary

- startup files: helpful for automatisisation
- whitespace around subplots easily removed in LaTeX
- easy-to-use and comprehensive debugging framework

Outlook

- suggestions for future talks about "Matlab Tweaks":
 - profiling
 - object-oriented programming
 - calling external functions
 - ...

Thank you for your attention