COURSE SYLLABUS

Matlab for Experiments and Data Analysis

Instructors: Günther Knoblich and Cordula Vesper
Department of Cognitive Science
Central European University
Winter term, 2016
PhD level
2.0 ECTS Credits
Course e-learning site: http://ceulearning.ceu.hu
Office hours by appointment (email: vesperc@ceu.edu)

Course Description
This course will provide a hands-on introduction to programming in Matlab with a special focus on applying it to create psychological experiments and to analyze human behavioral data. After a general introduction to the basic ingredients of programming (variables, loops, good programming styles etc.), we will use Matlab to write little experiments and to collect, analyze and plot real data. This will involve simple reaction time experiments but the course will also offer an introduction to collecting and analyzing 3D human movement data with the Polhemus motion tracking system. Course participants will be required to do programming assignments.

Suggested handbook: David A. Rosenbaum, Matlab for Behavioral Scientists (copies available in the CogSci library)

Learning Outcomes

By the end of this course, students will be able to:

✓ Read, understand and edit existing Matlab code
✓ Write own Matlab programs for running and controlling psychological experiments
✓ Collect behavioral data with Matlab using different input devices such as mouse, keyboard and a 3D motion tracker
✓ Use Matlab to analyze behavioral data such as reaction times and movement trajectories
Course Requirements

(1) Weekly assignments (60% of the final grade). There will be weekly assignments involving writing pieces of code or thinking about programming problems.

(2) Course participation (40% of the final grade). Students are expected to actively take part during the classes, e.g. by answering questions, solving small exercises, helping others etc.

COURSE SCHEDULE

1) Introduction (Jan 14th, 2016, 11:00-12:40)
   This session gives a basic introduction to programming and how to use the Matlab editor.

2) Variables (Jan 21th, 2016, 11:00-12:40)
   In this session, we will look at the different variable types used in Matlab (e.g. integers, strings, arrays, structures) and their associated functions.

3) Contingencies (Jan 28th, 2016, 11:00-12:40)
   This session covers loops and logical statements to control the program flow.

4) Functions and Files (Feb 4th, 2016, 11:00-12:40)
   In this session, the use of built-in Matlab functions will be discussed as well as how to save, edit and use different file types (Matlab files, images etc.).

5) Plotting (Feb 11th, 2016, 11:00-12:40)
   This session is about using Matlab to create simple graphs, both from the command line and with the plot editor.

6) Programming Style (Feb 18th, 2016, 11:00-12:40)
   In this session, we will discuss what a “good programming style” is, i.e. what simple rules should be followed to make code useful, efficient, readable and easy to debug.

7) Psychophysics Toolbox (Feb 25th, 2016, 11:00-12:40)
   This session provides an introduction to the main functions (e.g. Screen, PsychPortAudio) of the Psychophysics toolbox which is specifically useful for psychological experiments.
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8) Experimental Procedures (Mar 3rd, 2016, 11:00-12:40)
   In this session, we will discuss how to transform a given experimental procedure into Matlab code. This includes e.g. ways of randomizing conditions, storing data etc.

9) RT Data Analysis (Mar 10th, 2016, 11:00-12:40)
   For this session, we will collect a few reaction times ourselves and do basic descriptive and statistical analyses on them.

10) Polhemus (Mar 17th, 2016, 11:00-12:40)
    This session introduces the functioning and use of the Polhemus motion tracker which can collect 3D movement trajectories. In a hands-on part, we will collect some motion data together.

11) Movement Analysis (Mar 24th, 2016, 11:00-12:40)
    In this session, we will perform basic analyses of the movement trajectories recorded before, such as filtering, calculation of velocity etc.

12) Extensions (Mar 31st, 2016, 11:00-12:40)
    This session will provide a brief outlook on further applications of Matlab, e.g. toolboxes for EEG analysis. It could also be used to discuss course participants’ own projects that involve programming in Matlab.