Lecture 0: Introduction

B0B17MTB, BE0B17MTB – MATLAB

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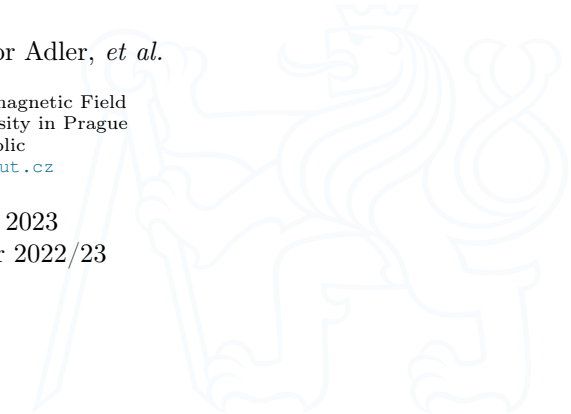
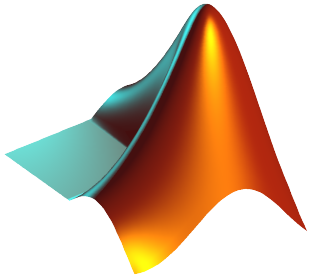


Outline

1. What is MATLAB?
2. Why to Learn MATLAB?
3. Launching and Termination



MATLAB is...

- High-level programming language (*4th generation language*).
- Interpreted language (not compiled, but... JIT).
  - Intended mainly for numerical computing (nevertheless includes MuPAD symbolic kernel).
- Philosophy: kernel & tool boxes & user-defined functions → wide application.
  - Wide possibilities of linking with other tools (Java, C++, Fortran, Python, .NET, Excel, physical- / multi-physical softwares).
- Speed (of well written) algorithm comes near to that of C++.
- Excellent "for fast prototyping."
  - MATLAB does not require variables declaration (not always the advantage).
- Multi-licensed for CTU.
  - Available for students as well!
    - CTU students: download.cvut.cz
    - FEE students: svti.fel.cvut.cz/cz/services/software/matlab.html

MATLAB's Potential

Why to learn MATLAB?

- MATLAB is a worldwide standard.
- It is used by more than 5000 universities worldwide.
- Licenses used by thousands of corporations in aviation, biotechnology, electronics, cybernetics, mechanical engineering, finance, ...
- Knowledge of MATLAB can be used in other courses at the University as well as in professional life.

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Where to make use of MATLAB?

- Data processing and visualization during laboratory exercises.
- When elaborating diploma works.
- Seminar exercises (signals, algorithm development, ...).
- Theory verification (mathematics and physics classes, electromagnetic field, electronic circuits, ...).
- Studying aboard (Erasmus, Sokrates).
- "everywhere" :)

Historical Development of MATLAB

- the 1970's
  - Cleve Moler[1], MATLAB used instead of Fortran.
  - MATrix LABoratory → matrix is the basic data structure.
  - Fortran-based syntax.
- 1983
  - Jack Little rewrote Matlab in C.
  - New functionality and new mathematical libraries added.
- 1984 (MATLAB is so far for free!)
  - MathWorks founded in 1984
- 2004
  - Matlab used by more than 1 million of active users.
- now...
  - R2022a is the newest version of Matlab.
  - local distribution: Humusoft s.r.o.

[1] see: http://www.mathworks.com/company/aboutus/founders/clevemoler.html

Alternatives to MATLAB

Fortran: most of the libraries still in Fortran, used mostly by physicists

Python: for free, fast and intuitive; Spyder provides MATLAB-like features

Mathematica: symbolic and numerical calculations, excellent symbolic kernel, extensive applicability, mostly for mathematicians and physicists

Maple: symbolic and numerical calculations

MathCad: used for symbolic and numerical calculations, slightly out-of-date

Octave: for free, syntax and functionality similar to Matlab, not so extensive, smartphone executable

R: for free, designed particularly for statistical applications

Scilab: MATLAB-like, open documentation

Derive: small, fast, Casio calculator executable

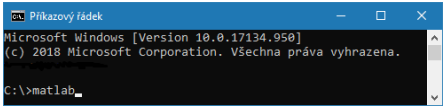
Alternatives to MATLAB

- MATLAB vs. C/C++
  - Choice between the two strongly depends on application.
  - C/C++ faster in general, MATLAB, on the other hand, provides implicit parallelism.
  - General principle: MATLAB is more than suitable for everything except commercial compiled code (especially MATLAB 6.5 and above: JIT + Real-Time Type Analysis).
- MATLAB vs. Fortran
  - MATLAB has wider support, more intuitive syntax.
  - Speed of a well written code is (usually, at least) comparable.
  - Utilization of Fortran is on the decline.
- MATLAB vs. Python
  - MATLAB offers significant support thanks to MathWorks, Matlab File Exchange.
  - Python entirely for free, it's becoming more and more popular.
- MATLAB vs. Julia
  - Comparable speed and syntax for both.
  - MATLAB has broader community and coverage in industry.

Launching MATLAB

- Desktop icon

- Command line:
  - `matlab`



- MATLAB can be launched with a set of optional parameters.
  - `matlab -r "test(10)"`

- System requirements[2] for MATLAB R2022a+:
  - Windows 10+
  - 4 GB RAM
  - 3.1 GB of HDD (MATLAB only), 5-8 GB for a typical installation
  - Any Intel or AMD x86-64 processor
- Available also for Mac and Linux!

[2] https://www.mathworks.com/support/requirements/matlab-system-requirements.html

MATLAB Termination

- Close button in top right of MATLAB window.

- Possibility to terminate MATLAB in the command window.

```
>> quit % terminates Matlab (and all windows)
>> exit %    -//-
```

- More advanced options (see documentation).

```
>> quit cancel
>> exit force
```

Questions?

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