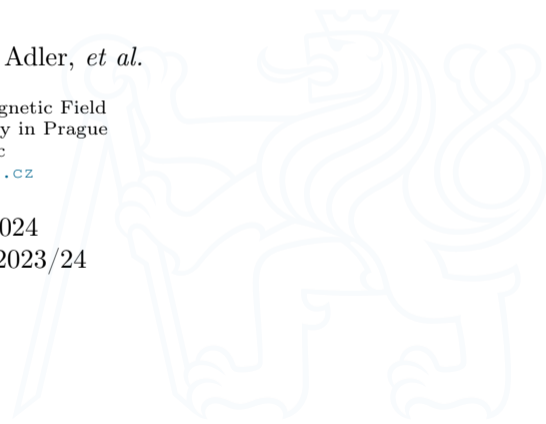# Lecture 0: Introduction

B0B17MTB, BE0B17MTB – MATLAB

Miloslav Čapek, Viktor Adler, *et al.*
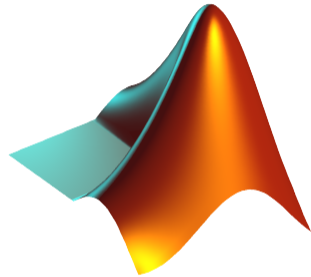
Department of Electromagnetic Field
Czech Technical University in Prague
Czech Republic
matlab@fel.cvut.cz

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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

Introduction

MATLAB's Potential

Why to learn MATLAB?

▶ MATLAB is a worldwide standard.

▶ It is used by more than 6500+ 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" :)

Introduction

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...
    - R2023b is the newest version of Matlab.
    - local distribution: Humusoft s.r.o.

Introduction

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

Julia: very fast, still limited community

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

Introduction

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.

Introduction

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!

Introduction

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[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
```

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Questions?

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