Lecture 01
Bits, Bytes, Codes, Variables

Erdal Yılmaz

Cornell University

June 25, 2012
Syllabus

- Staff
- Course Information
- Software
- Course Websites
- Lectures and Labs
- Office Hours
- Textbook
- Homeworks
- Quizes
- Final Exam
- Grading
- Academic Integrity
- Student with Disabilities

**Instructor**

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**Teaching Assistant**

Yue Gao
334 Upson Hall
yg255@cornell.edu
Syllabus

- Staff
- Course Information
  - Introduction to programming
  - Learn a high-level programming language
  - Programming concepts
  - Problem solving
- Software
- Course Websites
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**MATLAB from MathWorks**
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- Software
- Course Websites
- Lectures and Labs: web http://www.cs.cornell.edu/courses/cs1109/2012su
  shortcut http://www.cs1109.info
- Office Hours
- Textbook
- Homeworks: for homeworks http://cms.csuglab.cornell.edu
  shortcut http://hw.cs1109.info
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Class Number: 1074 001
Time: 10:00 AM - 11:05 AM
Lecture: 211 Upson Hall on MW
Lab: Upson B7 on TR

Class Number: 1075 002
Time: 11:30 AM - 12:35 PM
Lecture: 215 Upson Hall on MW
Lab: Upson B7 on TR
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Where

- Upson B7

Erdal

- Thursdays 1pm-3pm
- Sundays 1pm-2pm
- Fridays 10am-noon

Yue

- Wednesdays 2pm-3pm
- Sundays 2pm-4pm
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**Title**  
*Insight Through Computing*  
*A MATLAB Introduction to Computational Science and Engineering*

**Authors**  
Charles F. Van Loan, K.-Y. Daisy Fan
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- Course Websites
- Lectures and Labs
- Office Hours
- Textbook
- **Homeworks**
  - Assigned on Wednesdays at 1pm
  - Due on next Monday by 10am
  - One or two multi-part questions
  - Upload to CMS website
- Quizzes
- Final Exam
- Grading
- Academic Integrity
- Student with Disabilities
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- In-class quizzes:
  - Short answers
  - Anytime, lecture or lab
- Online quizzes:
  - Easy
  - Multiple choice
  - Assigned on Mondays at 1pm
  - Due on Wednesdays by 10am

Lecture 01

Bits, Bytes, Codes, Variables
either one prelim and a group project
or just final exam
vote on CMS survey today
check your email after class!
HW = Normalize homeworks to 100 ... and take average
QZ = Normalize quizzes to 100 ... and take average
FL = Normalize prelim and project to 100 ... and take average
or Normalize Final Exam result to 100
Grade = (FL × 0.3) + (HW × 0.5) + (QZ × 0.2)
S/U Grade ≥ 75
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Read Code of Academic Integrity
Submit your own work
Acknowledge any help received
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- Contact Student Disability Services: at 420 CCC, (607) 254 4545
- Send an email and talk to me
Bits, Bytes

- Bit (Binary Digit) $\in \{0, 1\}$
- Byte $\equiv$ 8 bits (e.g. 01000001)
- $KB = 2^{10}(\approx 10^3)$ bytes
- $MB = 2^{20}(\approx 10^6)$ bytes
- $GB = 2^{30}(\approx 10^9)$ bytes
- $TB = 2^{40}(\approx 10^{12})$ bytes
- ...

...
A **character** is a symbol of written language (e.g. ‘K’, ‘m’, ‘!’)
Representation of Text

- A **character** is a symbol of written language (e.g. ‘K’, ‘m’, ‘!’)
- A **string** is a sequence of characters (e.g. ‘CS 1109’)
Representation of Text

- **A character** is a symbol of written language (e.g. ‘K’, ‘m’, ‘!’)
- **A string** is a sequence of characters (e.g. ‘CS 1109’)
- \{0, 1\}
A **character** is a symbol of written language (e.g. ‘K’, ‘m’, ‘!’)

A **string** is a sequence of characters (e.g. ‘CS 1109’)

\[
\{0, 1\} \quad \leftrightarrow \quad \{A, B, \ldots, a, b, \ldots, 0, 1, 2, 3, \ldots\}
\]
Representation of Text

- A **character** is a symbol of written language (e.g. ‘K’, ‘m’, ‘!’)
- A **string** is a sequence of characters (e.g. ‘CS 1109’)

\[
\{0, 1\} \leftrightarrow \{A, B, \ldots, a, b, \ldots, 0, 1, 2, 3, \ldots\}
\]

- Need a translation between two *alphabets*
- Standards: ASCII (1 byte), Unicode (2 bytes)
A **character** is a symbol of written language (e.g. ‘K’, ‘m’, ‘!’)

A **string** is a sequence of characters (e.g. ‘CS 1109’)

{0, 1} ↔ {A, B, ..., a, b, ..., 0, 1, 2, 3, ...}

Need a translation between two *alphabets*

Standards: ASCII (1 byte), Unicode (2 bytes)

‘A’ ≡ 65 = (01000001)₂
Representation of Text

- **A character** is a symbol of written language (e.g. ‘K’, ‘m’, ‘!’)
- **A string** is a sequence of characters (e.g. ‘CS 1109’)

\[
\{0, 1\} \leftrightarrow \{A, B, \ldots, a, b, \ldots, 0, 1, 2, 3, \ldots\}
\]

Need a translation between two *alphabets*

- Standards: ASCII (1 byte), Unicode (2 bytes)
- ‘A’ \(\equiv 65 = (01000001)_2\)
- ‘B’ \(\equiv 66 = (01000010)_2\)
Representation of Text

- A **character** is a symbol of written language (e.g. ‘K’, ‘m’, ‘!’)
- A **string** is a sequence of characters (e.g. ‘CS 1109’)

\[
\{0, 1\} \leftrightarrow \{A, B, \ldots, a, b, \ldots, 0, 1, 2, 3, \ldots\}
\]

- Need a translation between two *alphabets*
- Standards: ASCII (1 byte), Unicode (2 bytes)

‘A’ \(\equiv 65 = (01000001)_2\)

‘B’ \(\equiv 66 = (01000010)_2\)

‘a’ \(\equiv 97 = (01100001)_2\)
Variables, Assignment

A variable is a labeled memory location which holds a value

\[
a = 5; \\
b = a + 1; \\
c = 2 \times b;
\]

At the end: \(a\) stores 5, \(b\) stores 6, \(c\) stores 12.
Variables, Assignment

- A **variable** is a *labeled* memory location which holds a *value*
- An **assignment** is storing the result of an expression into a variable
  - *variable = expression*

```
a = 5;
b = a + 1;
c = 2 * b;
```

At the end:
- *a* stores 5,
- *b* stores 6,
- *c* stores 12.
A **variable** is a *labeled* memory location which holds a *value*

An **assignment** is storing the result of an expression into a variable

*variable = expression*

\[ a = 5; \\
    b = a + 1; \\
    c = 2 \times b; \]
Variables, Assignment

- A **variable** is a *labeled* memory location which holds a *value*

- An **assignment** is storing the result of an expression into a variable

  - *variable = expression*

    
    - $a = 5$
    - $b = a + 1$
    - $c = 2 \times b$

- At the end: $a$ stores 5, $b$ stores 6, $c$ stores 12.
Simple Calculator

(enter a number) 17
Simple Calculator

- (enter a number) 17
- (select an operation) +

What is missing?
Labels for stored values!
We implicitly refer to them:
the first number and the second number
But there is no way we can reuse them!
Variables provide labels for stored values.
Simple Calculator

- (enter a number) 17
- (select an operation) +
- (enter another number) 29
Simple Calculator

- (enter a number) 17
- (select an operation) +
- (enter another number) 29
- (press execute)
Simple Calculator

- (enter a number) 17
- (select an operation) +
- (enter another number) 29
- (press execute)
- (result) 46

What is missing?

Labels for stored values!
We implicitly refer to them: the first number and the second number.
But there is no way we can reuse them!

Variables provide labels for stored values.
Simple Calculator

- (enter a number) 17
- (select an operation) +
- (enter another number) 29
- (press execute)
- (result) 46

What is missing?
Simple Calculator

- (enter a number) 17
- (select an operation) +
- (enter another number) 29
- (press execute)
- (result) 46

What is missing?
- Labels for stored values!
- We implicitly refer to them: the first number and the second number
- But there is no way we can reuse them!
- Variables provide labels for stored values.
MATLAB Demo

- Command Window
- Workspace
- Command History
- Current Directory
- Help