Introduction to Computer Programming

Instructor Özgür ZEYDAN
BEU Dept. of Enve. Eng.
http://cevre.beun.edu.tr/zeydan/

CIV 112 – Computer Programming
Lecture Notes (1)

Computer Programming

- A computer is a programmable machine. This means it can execute a programmed list of instructions and respond to new instructions that it is given.
- Computer Programming is the process of developing and implementing various sets of instructions to enable a computer to do a certain task.
- Programs are written to solve problems or perform tasks on a computer.

Computer Programming

- Programmers translate the solutions or tasks into a language the computer can understand.
- As we write programs, we must keep in mind that the computer will only do what we instruct it to do.
- Because of this, we must be very careful and thorough with our instructions.

First Computer Programmer: Ada Lovelace

Ada Lovelace is the first person to develop an algorithm for a machine.

- In 1842-1843, Lovelace translated an article about Charles Babbage's proposed Analytic Engine. In her notes, she describes an algorithm that is cited as the first computer program, making her the first computer programmer.
- She also theorized that the computer could, one day, play music and chess.
- Ada, a U.S. Department of Defense computer language, is named in her honor.

Algorithm

- An **algorithm** is a list of instructions, procedures, or formulas used to solve a problem.
- The word derives from the name of the mathematician, Mohammed ibn-Musa al-Khwarizmi (**El-Harezmî**), (780 – 850).

Pseudocode

- Pseudocode is a computer programming language that resembles plain English that cannot be compiled or executed, but explains a resolution to a problem.

Source Code

- The source code consists of the programming statements that are created by a programmer with a text editor or a visual programming tool and then saved in a file.
- For example, a programmer using the C language types in a desired sequence of C language statements using a text editor and then saves them as a named file.
- This file is said to contain the source code.

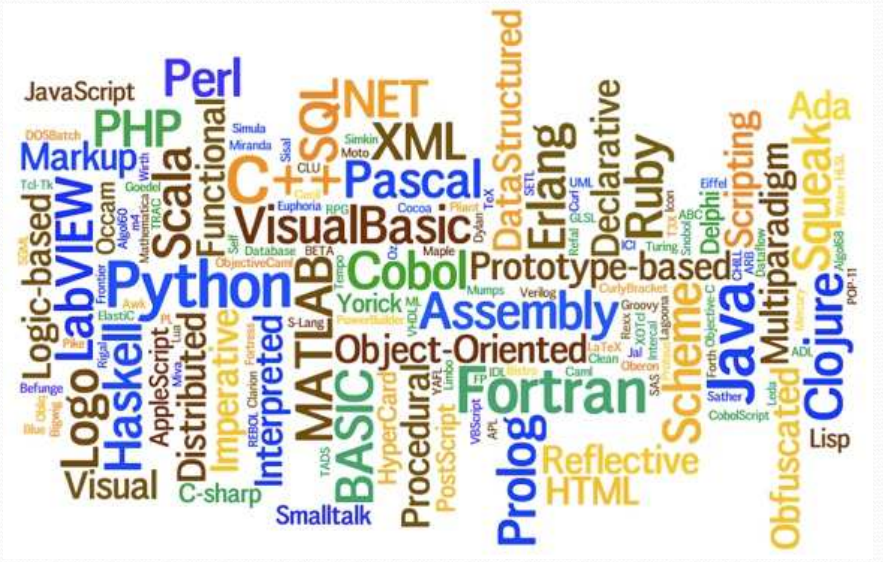
Flowchart

- A flowchart is a formalized graphic representation of a logic sequence, work or manufacturing process, organization chart, or similar formalized structure.
- The purpose of a flow chart is to provide people with a common language or reference point when dealing with a project or process.
- Flowcharts use simple geometric symbols and arrows to define relationships.

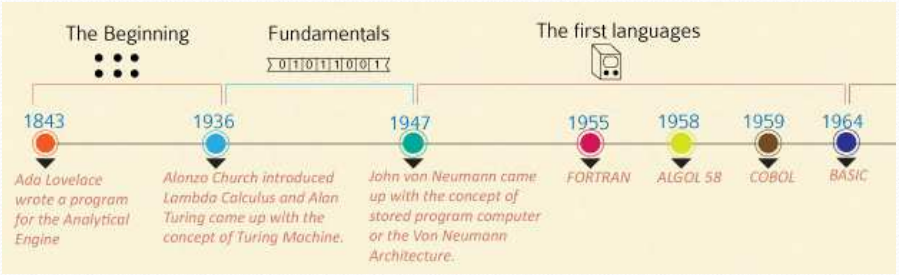
Programming Languages

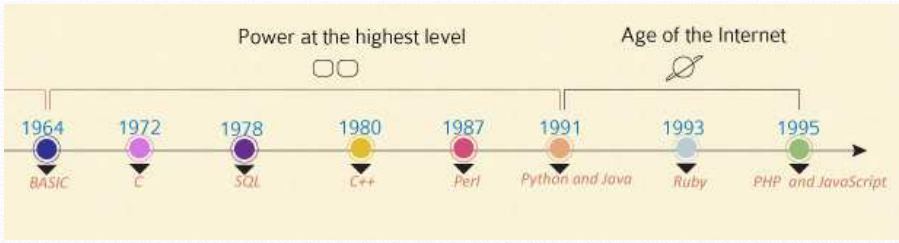
- Computer programming is almost always done by means of Programming Language.
- There exists more than 2500 programming languages in the world.
- Some of them are known by only their developers!

- For further information: http://en.wikipedia.org/wiki/List_of_programming_languages

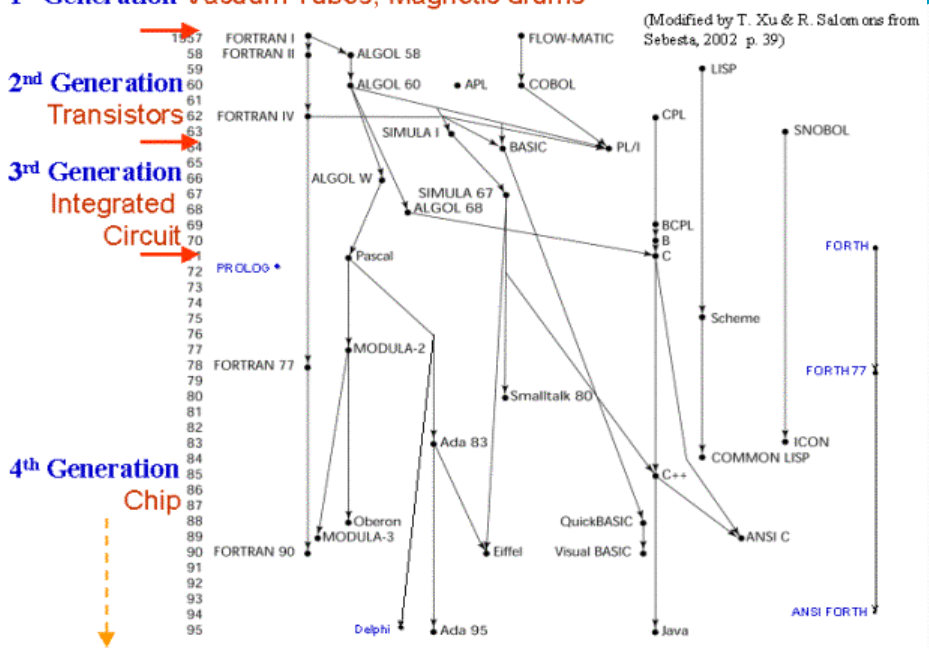


History of Programming Languages





1st Generation Vacuum Tubes, Magnetic drums



Programming Language Generations

- 1GL or first-generation language was (and still is) machine language or the level of instructions and data that the processor is actually given to work on.
- 2GL or second-generation language is assembler (sometimes called "assembly") language.

Programming Language Generations

- 3GL or third-generation language is a "high-level" programming language, such as PL/I, C, or Java. A compiler converts the statements of a specific high-level programming language into machine language. A 3GL language requires a considerable amount of programming knowledge.
- 4GL or fourth-generation language is designed to be closer to natural language than a 3GL language. Languages for accessing databases are often described as 4GLs.

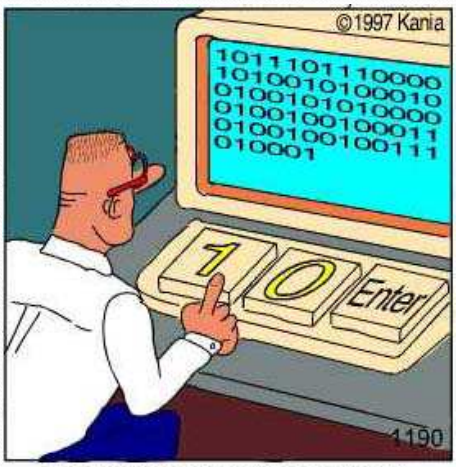
Programming Language Generations

- 5GL or fifth-generation language is programming that uses a visual or graphical development interface to create source language that is usually compiled with a 3GL or 4GL language compiler. Microsoft, Borland, IBM, and other companies make 5GL visual programming products for developing applications in Java, for example. Visual programming allows you to easily envision object-oriented programming class hierarchies and drag icons to assemble program components.

Machine Code (machine language)

- Machine code, also known as machine language, is the elemental language of computers, comprising a long sequence of binary digital zeros and ones (bits).
- Sometimes referred to as machine code or object code, machine language is a collection of binary digits or bits that the computer reads and interprets. Machine language is the only language a computer is capable of understanding.

Machine Code



Real programmers code in binary.

Assembly Language

- Sometimes referred to as assembly or ASL, assembly language is a low-level programming language used to interface with computer hardware.
- Assembly language uses structured commands as substitutions for numbers allowing humans to read the code easier than looking at binary. Although easier to read than binary, assembly language is a difficult language and is usually substituted for a higher language such as C.

Low-level Languages

- Low-level languages have the advantage that they can be written to take advantage of any peculiarities in the architecture of the central processing unit (CPU).
- Thus, a program written in a low-level language can be extremely efficient, making optimum use of both computer memory and processing time.
- However, to write a low-level program takes a substantial amount of time, as well as a clear understanding of the inner workings of the processor itself. Therefore, low-level programming is typically used only for very small programs, or for segments of code that are highly critical and must run as efficiently as possible.

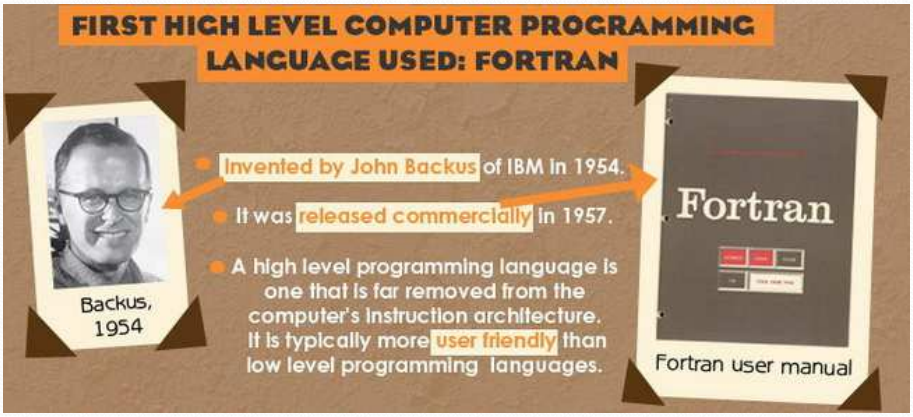
http://www.play-hookey.com/computers/language_levels.html

High-level Languages

- High-level languages permit faster development of large programs. The final program as executed by the computer is not as efficient, but the savings in programmer time generally far outweigh the inefficiencies of the finished product.
- This is because the cost of writing a program is nearly constant for each line of code, regardless of the language.
- Thus, a high-level language where each line of code translates to 1-0 machine instructions costs only one tenth as much in program development as a low-level language where each line of code represents only a single machine instruction.

http://www.play-hookey.com/computers/language_levels.html

First High Level Language

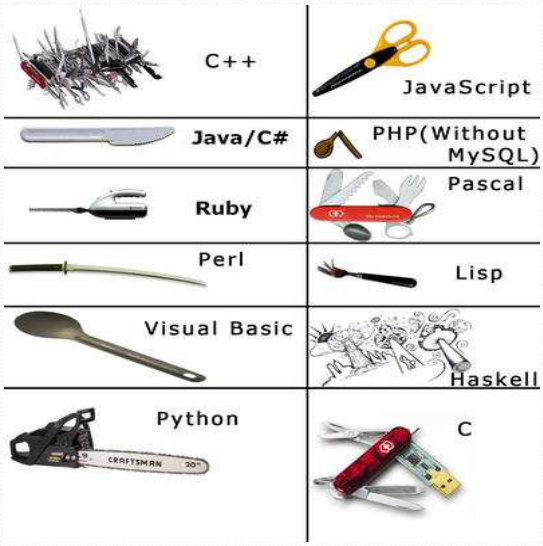


Programming Language Popularities

Position Jan 2013	Position Jan 2012	Delta in Position	Programming Language	Ratings Jan 2013	Delta Jan 2012	Status
1	2	⬆	C	17.855%	+0.89%	A
2	1	⬇	Java	17.417%	-0.05%	A
3	5	⬆⬆	Objective-C	10.283%	+3.37%	A
4	4	=	C++	9.140%	+1.09%	A
5	3	⬇⬇	C#	6.196%	-2.57%	A
6	6	=	PHP	5.546%	-0.16%	A
7	7	=	(Visual) Basic	4.749%	+0.23%	A
8	8	=	Python	4.173%	+0.96%	A
9	9	=	Perl	2.264%	-0.50%	A
10	10	=	JavaScript	1.976%	-0.34%	A
11	12	⬆	Ruby	1.775%	+0.34%	A
12	24	⬆⬆⬆⬆⬆⬆⬆⬆⬆⬆	Visual Basic .NET	1.043%	+0.56%	A
13	13	=	Lisp	0.953%	-0.16%	A
14	14	=	Pascal	0.932%	+0.14%	A
15	11	⬇⬇⬇⬇	Delphi/Object Pascal	0.919%	-0.65%	A
16	17	⬆	Ada	0.651%	+0.02%	B
17	23	⬆⬆⬆⬆⬆⬆	MATLAB	0.641%	+0.13%	B
18	20	⬆⬆	Lua	0.633%	+0.07%	B
19	21	⬆⬆	Assembly	0.629%	+0.08%	B
20	72	⬆⬆⬆⬆⬆⬆⬆⬆⬆⬆	Bash	0.613%	+0.49%	B

http://www.tiobe.com/index.php/content/paperinfo/tpci/index.html

Comparison of Programming Languages

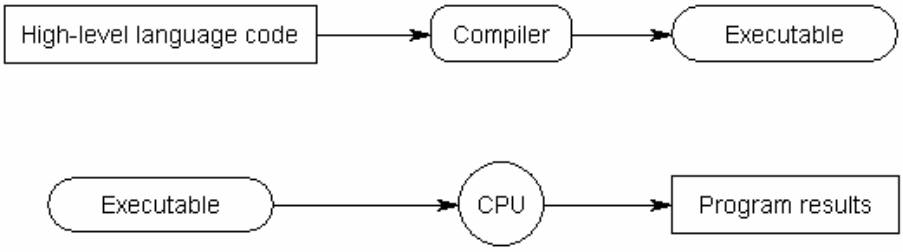


http://anggriawan.web.id/2011/06/if-programming-languages-were.html

Compiler

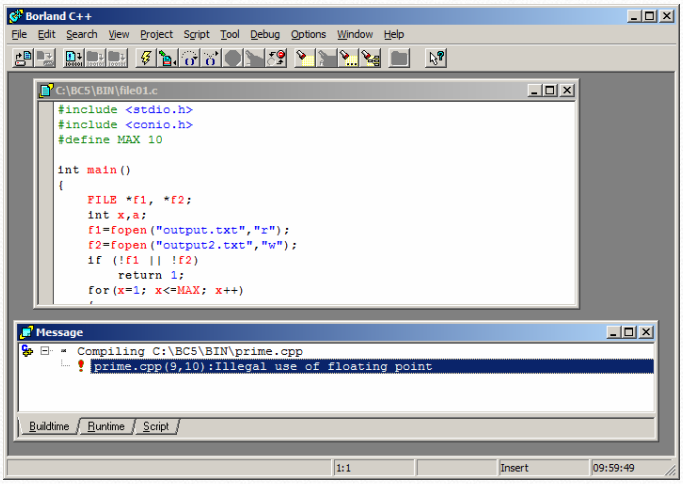
- A compiler is a special program that processes statements written in a particular programming language and turns them into machine language or "code" that a computer's processor uses.
- After you write a program, your source language statements are compiled into machine code that is stored as an executable file.
- Scripting languages like Perl and PHP do not need to be compiled.

Compiler



http://www.learncpp.com/cpp-tutorial/02-introduction-to-programming-languages/

Borland C++ Compiler



Compiler is available from following page after free registration:
http://forms.embarcadero.com/forms/BCC32CompilerDownload

Structured Programming (modular programming)

- Structured programming (sometimes known as modular programming) is a subset of procedural programming that enforces a logical structure on the program being written to make it more efficient and easier to understand and modify. Certain languages such as Ada, Pascal, and dBASE are designed with features that encourage or enforce a logical program structure.
- Structured programming frequently employs a top-down design model, in which developers map out the overall program structure into separate subsections.
- Program flow follows a simple hierarchical model that employs looping constructs such as "for", "repeat", and "while" Use of the "Go To" statement is discouraged.
- Structured programming was first suggested by Corrado Bohm and Guiseppe Jacopini. The two mathematicians demonstrated that any computer program can be written with just three structures: decisions, sequences, and loops.

Object-Oriented Programming (OOP)

- Object-oriented programming (OOP) is a programming language model organized around "objects" rather than "actions" and data rather than logic.
- Historically, a program has been viewed as a logical procedure that takes input data, processes it, and produces output data.

Classification of Programming Languages

- **Procedure-oriented programming**
- COBOL, FORTRAN, Pascal and C

- **Object oriented programming**
- Objective C, C++, Java, and PHP

Integrated Development Environment (IDE)

An IDE or Integrated Development Environment is a software program that is designed to help programmers and developers build software.

Most IDEs include:

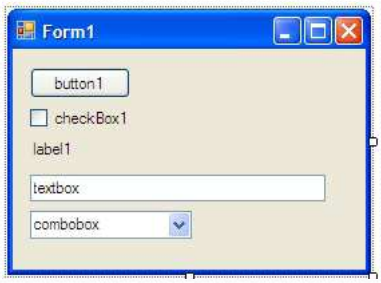
- a source code editor
- a compiler
- build automation tools
- a debugger

Debugger

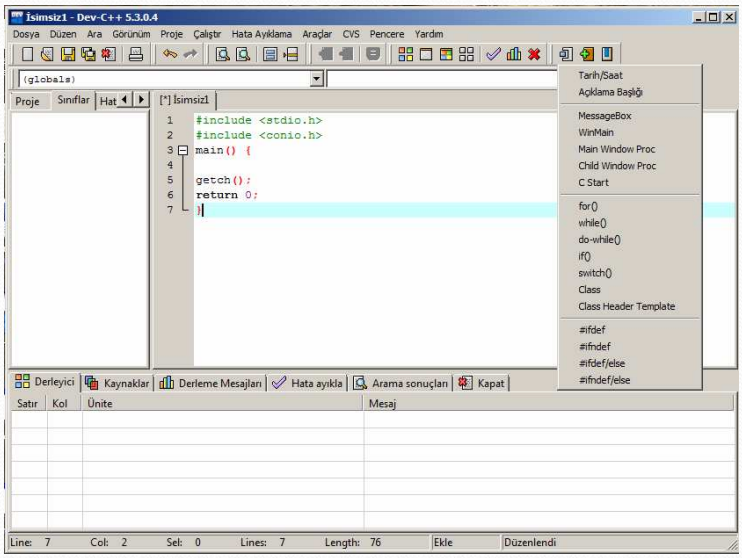
- A special program used to find errors (bugs) in other programs. A debugger allows a programmer to stop a program at any point and examine and change the values of variables.
- http://www.webopedia.com/TERM/D/debugger.html

Graphical User Interface (GUI)

- A GUI is a graphical (rather than purely textual) user interface to a computer.
- Elements of a GUI include textboxes, buttons, pulldown menues, list and combo boxes



DEV C++ IDE

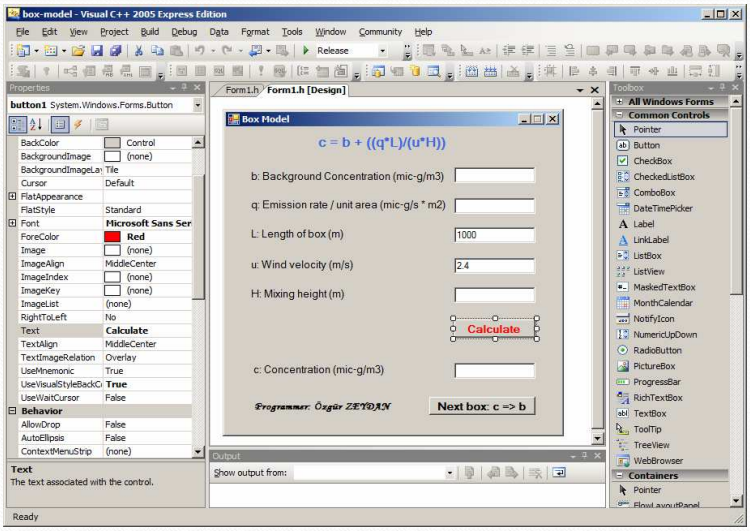


http://www.bloodshed.net/dev/devcpp.html

DEV C++ IDE download page

http://www.bloodshed.net/dev/devcpp.html

Visual C++ Express Edition



http://www.microsoft.com/visualstudio/tur/downloads#d-2010-express

Software Development Languages

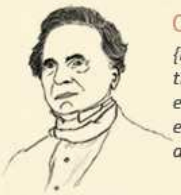
- C
- C++ (C-plus-plus)
- C# (C-Sharp)
- Pascal
- Delphi
- Visual Basic

Web Languages

- HTML (Hyper Text Markup Language)
- XML (Extensible Markup Language)
- Javascript
- VBScript
- PHP (Hypertext Preprocessor)
- Java
- ASP (Active Server Pages)

http://landofcode.com/programming-intro/computer-programming-languages.php

Important People in Computer Programming



Charles Babbage

{He first came up with the idea of difference engine & analytical engine and is regarded as father of computer}

John Backus

{He is well known for the development of FORTRAN and ALGOL. He is also the inventor of Backus-Naur form and has also helped to popularize functional level programming}

Alan Turing

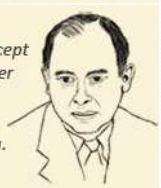
{He is well known for the Halting problem, Turing machines, crypto-analysis of Enigma & Turing test. Turing award is given annually for exceptional work in the field of computing}

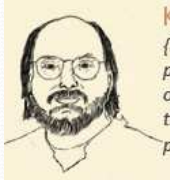
Dennis Ritchie

{He is the creator of C programming language and was also amongst the key developers of UNIX operating system. He received the Turing award in 1983}

John von Neumann

{He came up with the concept ofstored program computer that uses a CPU and a separate storage to hold both instructions and data. This is also known as von Neumann architecture}





Ken Thompson

{He is well known as the principal creator of the UNIX operating system and is also the co-creator of the Go programming language}

Important People in Computer Programming

Bjarne Stroustrup

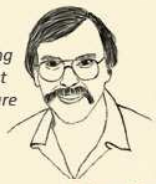
{He is well known for the creation and development of C++programming language and currently holds the college of engineering chair in computer science at Texas A&M.}

Guido van Rossum

{He is well known as the author of Python programming language and is currently employed by Google}

Larry Wall

{He is well known for the creation of Perl programming language and is also the first recepient of the Free Software Foundation Award for the Advancement of Free Software}



Richard Stallman

{He is the creator of Emacs editor and the lead architect and organizer of the GNU project. He has been actively involved in the free software movement}

Linus Torvalds

{He is best known for having initiated the development of Linux Kernel and the Git revision control system. He is also a strong supporter of Open Source software}

GeekGraphic
part of what - a - geek.com
Designed By Adit Gupta

List of other reference web pages:

- http://www.techterms.com/
- http://www.computerhope.com
- http://whatis.com/