Computing

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For the formal concept of computation, see computation. For the magazine, see Computing (magazine). For the scientific journal, see Computing (journal).

RAM (Random Access Memory) is a hardware component

Computing is usually defined as the activity of using and developing computer technology, computer hardware and software. It is the computer-specific part of information technology. Computer science (or computing science) is the study and the science of the theoretical foundations of information and computation and their implementation and application in computer systems.

Computing Curricula 2005[1] defined computing:

> *In a general way, we can define computing to mean any goal-oriented activity requiring, benefiting from, or creating computers. Thus, computing includes designing and building hardware and software systems for a wide range of purposes; processing, structuring, and managing various kinds of information; doing scientific studies using computers; making computer systems behave intelligently; creating and using communications and entertainment media; finding and gathering information relevant to any particular purpose, and so on. The list is virtually endless, and the possibilities are vast.*

A computer is a machine that manipulates data according to a set of instructions called a computer program. The program has an executable form that the computer can use directly to execute the instructions. The same program in its human-readable source code form, enables a programmer to study and develop the algorithm. Because the instructions can be carried out in different types of computers, a single set of source instructions converts to machine instructions according to the central processing unit type.

The execution process carries out the instructions in a computer program. Instructions express the computations performed by the computer. They trigger sequences of simple actions on the executing machine. Those actions produce effects according to the semantics of the instructions.

Computer programming in general is the process of writing, testing, debugging, and maintaining the source code and documentation of computer programs. This source code is written in a programming language, which is an artificial language, restrictive, demanding, and unforgiving to humans but easily translated by the computer. The purpose of programming is to invoke the desired

behaviour (customization) from the machine. The process of writing high quality source code requires knowledge of both the application's domain *and* the computer science domain. The highest quality software is thus developed by a team of various domain experts, each person a specialist in some area of development. But the term *programmer* may apply to a range of program quality, from hacker to open source contributor to professional. And a single programmer could do most or all of the computer programming needed to generate the proof of concept to launch a new "killer" application.

Contents

Definitions

The term *computing* has sometimes been narrowly defined, as in a 1989 ACM report on *Computing as a Discipline*[2]:

> *The discipline of computing is the systematic study of algorithmic processes that describe and transform information: their theory, analysis, design, efficiency, implementation, and application. The fundamental question underlying all computing is 'What can be (efficiently) automated?'*

Computing Curricula 2005[1] also recognizes that the meaning of *computing* depends on the context:-

> *Computing also has other meanings that are more specific, based on the context in which the term is used. For example, an information systems specialist will view*

> *computing somewhat differently from a software engineer. Regardless of the context, doing computing well can be complicated and difficult. Because society needs people to do computing well, we must think of computing not only as a profession but also as a discipline.*

The term *computing* is also synonymous with counting and calculating. In earlier times it was used in reference to mechanical computing machines.

A computer is an electronic device that performs certain arithmetic and logical operations without any errors.

Science and theory

- Computer science
- Theory of computation
- Computational models
- Digital Bibliography & Library Project, as of July 2007, lists over 910 000 bibliographic entries on computer science and several thousand links to the home pages of computer scientists
- Scientific computing
- Metacomputing
- Topological computing
- Autonomic Computing

Hardware

See information processor for a high-level block diagram.

- Computer
- Computer Hardware Design
- Computer network
- Computer system
- History of computing hardware

Instruction-level taxonomies

After the commoditization of memory, attention turned to optimizing CPU performance at the instruction level. Various methods of speeding up the fetch-execute cycle include:

- designing instruction set architectures with simpler, faster instructions: RISC as opposed to CISC
- Superscalar instruction execution
- VLIW architectures, which make parallelism explicit

Software

- Software engineering
- Computer programming
- Computational
- Software patent
- Firmware
- Operating systems
- Application Software
    - Databases
    - Geographic information system

        - Spreadsheet
        - Word processor
    - Programming languages
        - interpreters
        - compilers
    - Speech recognition

History of computing

- History of computing hardware from the tally stick to the quantum computer
- History of computer science
- Punch Card
- Unit record equipment
- IBM 700/7000 series
- IBM 1400 series
- System/360
- Early IBM disk storage

Business computing

- Accounting software
- Computer-aided design
- Computer-aided manufacturing
- Computer-assisted dispatch
- Customer relationship management
- Data warehouse
- Decision support system
- Electronic data processing
- Enterprise resource planning
- Geographic information system
- Management information system
- Material requirements planning
- Strategic enterprise management
- Supply chain management
- Product Lifecycle Management
- Utility Computing

Human factors

- Accessible computing
- Human-computer interaction
- Human-centered computing

Computer network

Wired and wireless computer network

- Types
    - Wide Area Network
    - Metropolitan Area Network
    - City Area Network

        - Village Area Network
        - Local Area Network
            - Wireless Local Area Network
- Mesh networking
- Collaborative workspace
- Internet
- Network Management

Computing technology based wireless networking (CbWN)

The main of goal of CbWN is to optimize the system performance of the flexible wireless network.

- Source coding
    - Codebook design for side information based transmission techniques such as Precoding
    - Wyner-Ziv coding for Cooperative wireless communications
- Security
    - Dirty paper coding for cooperative multiple antenna or user precoding
- Intelligence
    - Game theory for wireless networking
    - Cognitive communications
    - Flexible sectorization, Beamforming and SDMA
- Software
    - Software defined radio (SDR)
    - Programmable air-interface
    - Downloadable algorithm: e.g., downloadable codebook for Precoding

Computer security

- Cryptology - cryptography - information theory
- Cracking - demon dialing - Hacking - war dialing - war driving
- Social engineering - Dumpster diving
- Physical security - Black bag job
- Computer insecurity
- Computer surveillance
- Defensive programming
- Malware
- Security engineering

Data

Numeric data

- integral data types - bit, byte, etc.
- real data types:
    - Floating point (Single precision, Double precision, etc.)
    - Fixed point
    - Rational number
- Decimal
    - Binary-coded decimal (BCD)
    - Excess-3 BCD (XS-3)

        - Biquinary-coded decimal
    - representation: Binary - Octal - Decimal - Hexadecimal (hex)
    - Computer mathematics - Computer numbering formats -

Character data

- storage: Character - String - Plain text
    - representation: ASCII - Unicode - Multibyte - EBCDIC (Widecharacter, Multicharacter) - Fieldata - Baudot

Other data topics

- Data compression
- Digital signal processing
- Image processing
- Indexed
- Data management
- Routing
- Data Protection Act

Mechatronics

- Punch card
- Key punch
- Unit record equipment

Classes of computers

- Analog computer
- Calculator
- Desktop computer
- Desktop replacement computer
- Digital computer
- Embedded computer
- Home computer
- Laptop
- Mainframe
- Minicomputer
- Microcomputer
- Personal computer
- Portable computer
- Personal digital assistant (aka PDA, or Handheld computer)
- Programmable logic controller or PLC
- Server
- Supercomputer
- Tablet PC
- Video game console
- Workstation

Companies - current

- Apple
- Avaya
- Dell
- Fujitsu
- Gateway Computers
- Groupe Bull
- Hewlett-Packard
- Hitachi, Ltd.
- Intel Corporation
- IBM
- Lenovo
- Microsoft
- NEC Corporation
- Novell
- Panasonic
- Red Hat
- Silicon Graphics
- Sun Microsystems
- Unisys

Companies - historic

- Acorn, bought by Olivetti
- Amdahl Corporation, bought by Fujitsu
- Bendix Corporation
- Burroughs Corporation, merged with Sperry to become Unisys
- Compaq, bought by Hewlett-Packard
- Control Data
- Cray
- Data General
- Digital Equipment Corporation, bought by Compaq, in turn bought by Hewlett-Packard
- Digital Research - produced system software for early Intel microprocessor-based computers
- English Electric Company
- Ferranti
- General Electric, computer division bought by Honeywell, then Bull
- Honeywell, computer division bought by Bull
- ICL
- Leo
- Lisp Machines, Inc.
- Marconi
- Micro Instrumentation and Telemetry Systems produced the first widely sold microcomputer system (kit and assembled)
- Nixdorf Computer, bought by Siemens
- Olivetti
- Osborne
- Packard Bell
- Prime Computer
- Raytheon
- Royal McBee
- RCA

- Scientific Data Systems, sold to Xerox
- Siemens
- Sinclair Research, created the Sinclair ZX Spectrum, ZX80 and ZX81
- Southweat Technical products Corporation produced microcomputers systems (kit and assembled), peripherals, and software based on Motorola 6800 and 6809 microcomputer chips
- Sperry, which bought UNIVAC, and later merged with Burroughs to become Unisys
- Symbolics
- UNIVAC
- Varian Data Machines, a division of Varian Associates which was bought by Sperry
- Wang

Organizations

Professional

- Association for Computing Machinery (ACM)
- Association for Survey Computing (ASC)
- British Computer Society (BCS)
- Canadian Information Processing Society (CIPS)
- Computer Measurement Group (CMG)
- Institute of Electrical and Electronics Engineers (IEEE), in particular the IEEE Computer Society
- Institution of Electrical Engineers
- International Electrotechnical Commission (IEC)

Standards bodies

See also: Standardization and Standards organization

- International Electrotechnical Commission (IEC)
- International Organization for Standardization (ISO)
- Institute of Electrical and Electronics Engineers (IEEE)
- Internet Engineering Task Force (IETF)
- World Wide Web Consortium (W3C)

Open standards

See also Open standard

- Apdex Alliance -- *Application Performance Index*
- Application Response Measurement (ARM)

See also

Information technology portal

Look up ***computing*** in Wiktionary, the free dictionary.

- Index of history of computing articles
- List of computer term etymologies

References

1. ^ *a* *b* The Joint Task Force for Computing Curricula 2005. Computing Curricula 2005: The Overview Report (pdf)
2. ^ Computing as a Discipline (pdf)

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Technology

Applied science	Archaeology · Artificial intelligence · Ceramic engineering · Computing · Electronics · Energy · Energy storage · Engineering geology · Engineering physics · Environmental Engineering Science · Environmental technology · Fisheries science · Materials science and engineering · Microtechnology · Nanotechnology · Nuclear technology · Optics · Particle physics · Zoography
Information	Communication · Graphics · Information technology · Music · Speech recognition · Visual technology · Systematics
Industry	Construction · Financial engineering · Fishing · Industrial technology · Manufacturing · Machinery · Mining · Business informatics
Military	Ammunition · Bombs · Combat engineering · Military technology · Military technology and equipment
Domestic	Educational technology · Domestic appliances · Domestic technology · Food technology
Engineering	Aerospace · Agricultural · Architectural · Audio · Automotive · Biological · Biochemical · Biomedical · BioTech · Broadcast · Building officials · Ceramic · Chemical · Civil · Computer · Construction · Control · Cryogenics · Electrical · Electronic · Engineering technology · Enterprise · Environmental · Food · Genetic · Hydraulics · Industrial · Materials · Mechanical · Mechatronics · Metallurgical · Mining · Naval · Network · Nuclear · Ocean · Ontology · Optical · Petroleum · Radio Frequency · Software · Structural · Systems · Technician · Telecommunications · Textile · Tissue · Transport · Traffic
Health / safety	Biomedical · Bioinformatics · Biotechnology · Cheminformatics · Fire protection engineering · Health technologies · Medical technology · Nutrition · Pharmaceuticals · Safety engineering · Sanitary engineering
Transport	Aerospace · Aerospace engineering · Automotive engineering · Marine engineering · Motor vehicles · Naval engineering · Space technology