Seminar on Computing

Introduction

Computing is any goal-oriented activity requiring, benefiting from, or creating computing machinery. It includes the study and experimentation of algorithmic processes, and the development of both hardware and software. Computing has scientific, engineering, mathematical, technological, and social aspects. Major computing disciplines include computer engineering, computer science, cybersecurity, data science, information systems, information technology, and software engineering.

The term computing is also synonymous with counting and calculating. In earlier times, it was used in reference to the action performed by mechanical computing machines, and before that, to human computers.

History:

The history of computing is longer than the history of computing hardware and includes the history of methods intended for pen and paper (or for chalk and slate) with or without the aid of tables. Computing is intimately tied to the representation of numbers, though mathematical concepts necessary for computing existed before numeral systems. The earliest known tool for use in computation is the abacus, and it is thought to have been invented in Babylon circa between 2700 and 2300 BC. Abaci, of a more modern design, are still used as calculation tools today.

The first recorded proposal for using digital electronics in computing was the 1931 paper "The Use of Thyratrons for High Speed Automatic Counting of Physical Phenomena" by C. E. Wynn-Williams. Claude Shannon's 1938 paper "A Symbolic Analysis of Relay and Switching Circuits" then introduced the idea of using electronics for Boolean algebraic operations.

The concept of a field-effect transistor was proposed by Julius Edgar Lilienfeld in 1925. John Bardeen and Walter Brattain, while working under William Shockley at Bell Labs, built the first working transistor, the point-contact transistor, in 1947. In 1953, the University of Manchester built

the first transistorized computer, the Manchester Baby. However, early junction transistors were relatively bulky devices that were difficult to mass-produce, which limited them to a number of specialised applications.

In 1957, Frosch and Derick were able to manufacture the first silicon dioxide field effect transistors at Bell Labs, the first transistors in which drain and source were adjacent at the surface. Subsequently, a team demonstrated a working MOSFET at Bell Labs 1960. The MOSFET made it possible to build high-density integrated circuits, leading to what is known as the computer revolution or microcomputer revolution.

Computer:

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 a sequence of steps known as an 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 CPU 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.

Sub-disciplines of computing:

Research and emerging technologies:

DNA-based computing and quantum computing are areas of active research for both computing hardware and software, such as the development of quantum algorithms. Potential infrastructure for

future technologies includes DNA origami on photolithography and quantum antennae for transferring information between ion traps. By 2011, researchers had entangled 14 qubits. Fast digital circuits, including those based on Josephson junctions and rapid single flux quantum technology, are becoming more nearly realizable with the discovery of nanoscale superconductors.

Fiber-optic and photonic (optical) devices, which already have been used to transport data over long distances, are starting to be used by data centers, along with CPU and semiconductor memory components. This allows the separation of RAM from CPU by optical interconnects. IBM has created an integrated circuit with both electronic and optical information processing in one chip. This is denoted CMOS-integrated nanophotonics (CINP). One benefit of optical interconnects is that motherboards, which formerly required a certain kind of system on a chip (SoC), can now move formerly dedicated memory and network controllers off the motherboards, spreading the controllers out onto the rack. This allows standardization of backplane interconnects and motherboards for multiple types of SoCs, which allows more timely upgrades of CPUs.

Another field of research is spintronics. Spintronics can provide computing power and storage, without heat buildup. Some research is being done on hybrid chips, which combine photonics and spintronics. There is also research ongoing on combining plasmonics, photonics, and electronics.

See also:

Artificial intelligence

Computational science

Computational thinking

Computer algebra

Confidential computing

Creative computing

Data-centric computing

Electronic data processing

Enthusiast computing

Index of history of computing articles

Instruction set architecture

Lehmer sieve

Liquid computing

List of computer term etymologies

Mobile computing

Outline of computers

Outline of computing

Scientific computing

Spatial computing

Ubiquitous computing

Unconventional computing

Urban computing

Virtual reality

References:

External links:

FOLDOC: the Free On-Line Dictionary Of Computing


Application
Platform
Infrastructure