

Outline of the course:

Hardware

Architecture

Algorithm

Operating Systems

Network

Databases

Intelligent Systems

Programming languages

Software Engineering

Role of algorithm

Representation of an algorithm is a program

The example below shows a “classic” algorithm to find GCD of two numbers:

Figure 0.2 The Euclidean algorithm for finding the greatest common divisor of two positive integers

Description: This algorithm assumes that its input consists of two positive integers and proceeds to compute the greatest common divisor of these two values.

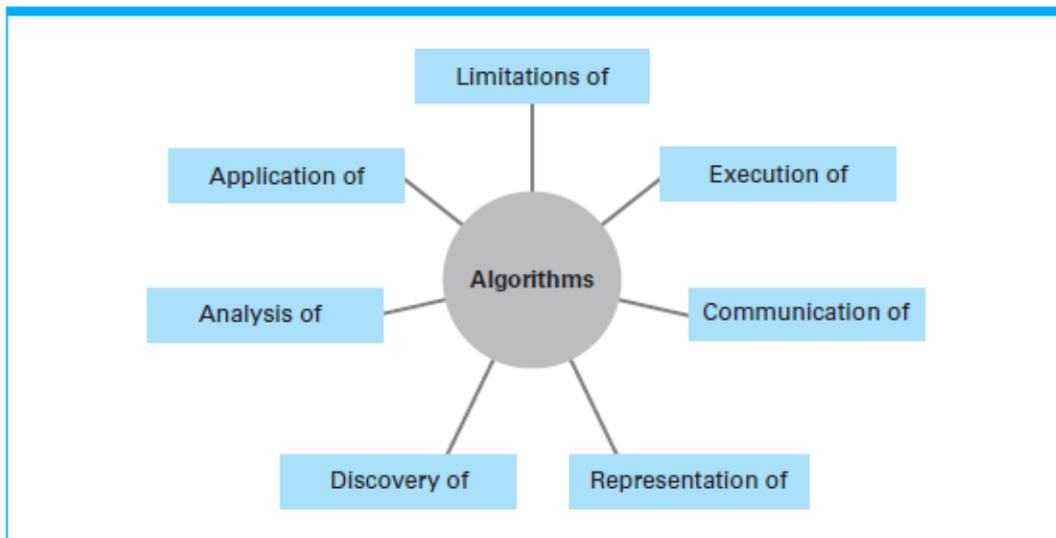
Procedure:

Step 1. Assign M and N the value of the larger and smaller of the two input values, respectively.

Step 2. Divide M by N, and call the remainder R.

Step 3. If R is not 0, then assign M the value of N, assign N the value of R, and return to step 2; otherwise, the greatest common divisor is the value currently assigned to N.

Figure 0.5 The central role of algorithms in computer science



Computer Systems

Computer systems can be regarded as layers of abstraction:

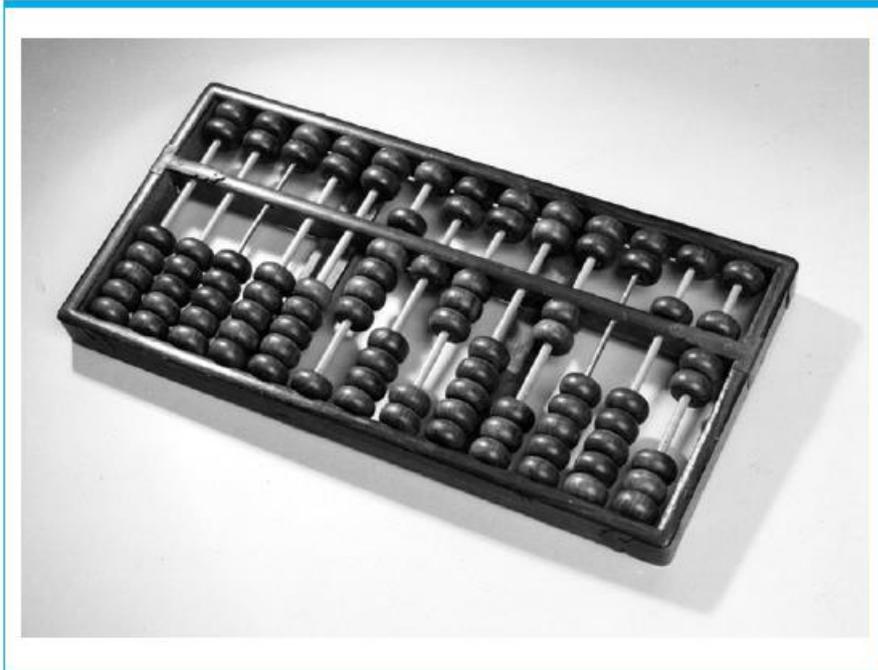
- Applications
- Operating system
- Instruction set
- Functional units
- Finite state machine
- Logic gates
- Electronics

Figure the level of description of computer systems

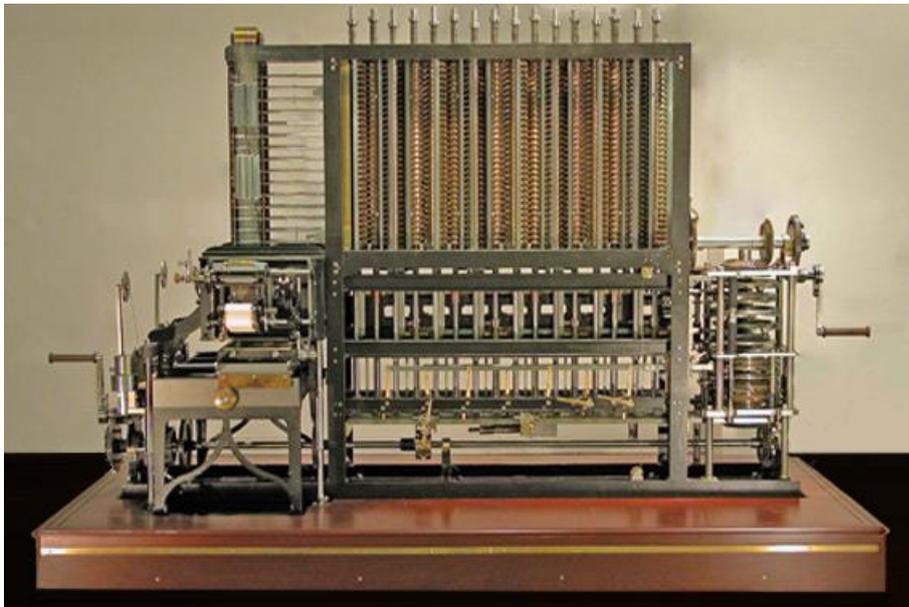
History of computing machines

Mechanical calculators

Figure 0.3 An abacus (photography by Wayne Chandler)



Charles Babbages: Difference Engine number 2



Howard Aiken: Electro-mechanics, Mark I

Figure 0.4 The Mark I computer (Courtesy of IBM archives. Unauthorized use is not permitted.)



Anatasoff and Berry: Electronics, ABC computer (Iowa University)

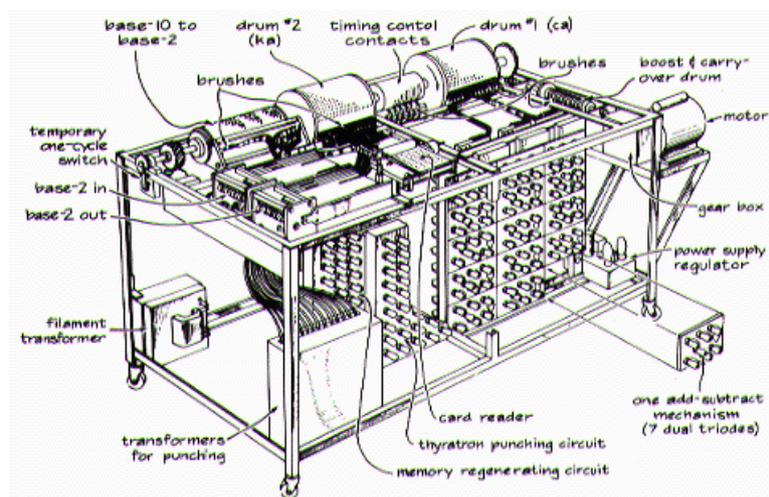
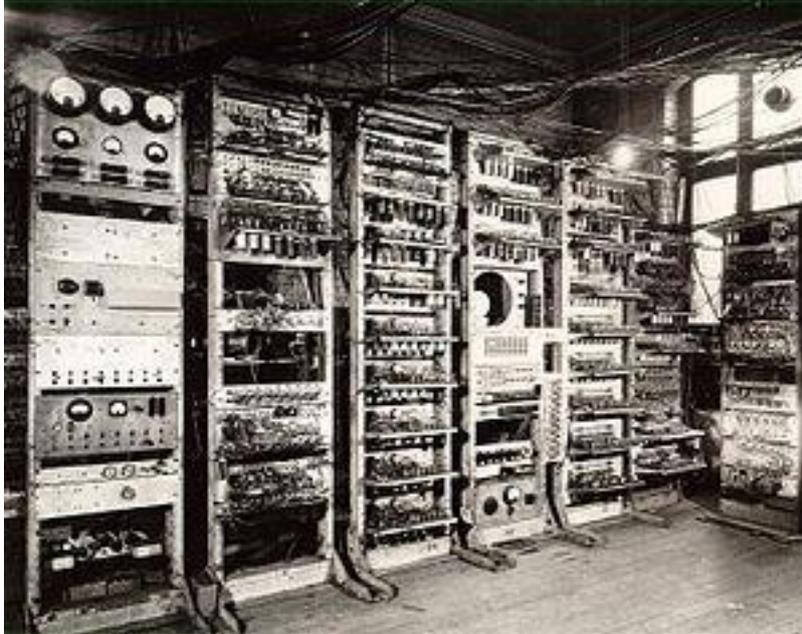


Figure the ABC diagram



The Manchester Mark 1 was one of the world's first stored-program computers.

1917/49
Kilburn Highest Factor Routine (amended)

Function	C	26	26'	27	Line	0	1	2	3	4	5	6
-24 to C	- b_1	-	-	-	1	000	11	010				
+ to 26			- b_1		2	010	11	110				
-26 to C	b_1				3	010	11	010				
+ to 27			b_1	b_1	4	110	11	110				
-23 to C	a	T_{n+1}	- b_n	b_n	5	111	01	010				
Subr. 27	a- b_n				6	110	11	001				
Test					7	-	-	011				
Address 26					8	001	01	100				or 000
Subr. 26	T_n				9	010	11	001				
+ to 25	T_n	T_n			10	100	11	110				
-25 to C					11	100	11	010				
Test					12	-	-	011				
Stop	0	0	- b_n	b_n	13			111				
-26 to C	b_n	T_n	- b_n	b_n	14	010	11	010				
Subr. 21	b_{n+1}				15	101	01	001				
+ to 27	b_{n+1}			b_{n+1}	16	110	11	110				
-27 to C	b_{n+1}				17	110	11	010				
+ to 26			- b_{n+1}	b_{n+1}	18	010	11	110				
-22 to 26	T_n		- b_{n+1}	b_{n+1}	19	011	01	000				

20	-3	1011	011
21	1	10000	
22	4	00100	

or 10100

23	-a	
24	b_1	

25	-	T_n (b_1)
26	-	- b_n
27	-	b_n

Figure the first program, on Baby computer

Time line of the history of computer

Mechanical era

1642 Blaise Pascal invented a machine that can add/subtract numbers

1666 Samuel Morland invented a machine that can multiply by repeated addition.

1671 Gottfried Leibniz, an adding and multiplying machine

1820 Charles Babbage, Difference engine

1830 Charles Babbage, Analytical engine (Father of modern computer)

Electro-mechanical era (relays)

1880 Herman Hollerith, punch card machine

1924 Thomas J. Watson founded IBM

1930 Beginning of computer age

Howard H. Aiken, Harvard university (MARK I)

John V. Atanasoff, Iowa State univ.

George R. Stibitz, Bell telephone lab.

Konrad Zuse, Technische Hochschule in Berlin, ZUSE 1

1943 Flowers, Colossus

1946 Eckert & Mauchly, ENIAC

Electronics era

1948 Manchester SSEM

1949 Manchester Mark I

1950 John Von Neumann, EDVAC

1950 Alan Turing, ACE

1951 Forrester (MIT), Whirlwind

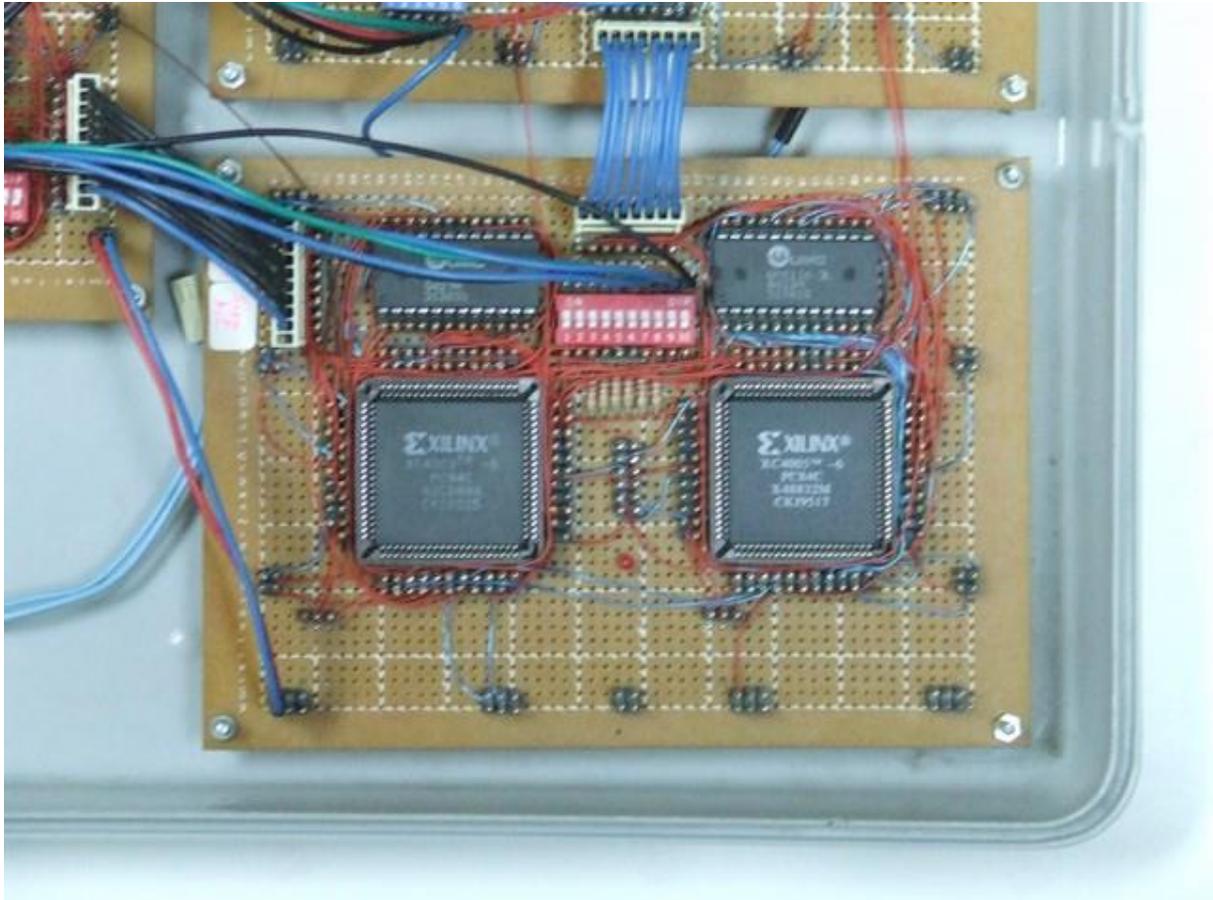
1952 Goldstine and Neumann, IAS

Computer industry era

1951 Remington Rand, UNIVAC

1952 IBM 701

Microelectronics



A board of Field Programmable Gate Arrays (FPGA) that functions as a real-time edge detection of video signals (Master Thesis circa 1996) Ref: Sukitti Punak, A hardware design of modified Canny edge detection algorithm, MSc thesis, Computer Engineering, Chulalongkorn, 1996.

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