THE UNIVERSITY OF NOTTINGHAM

FACULTY OF APPLIED SCIENCE

Applications of Computers

LECTURE 17

"SOME COMMERCIALLY AVAILABLE COMPUTING MACHINES"

by

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"SOME COMMERCIALLY AVAILABLE COMPUTING MACHINES"

The machines described fall into three groups:

1. Large scale scientific machines

   Ferranti Mercury

   I.B.M. 704

2. Medium sized scientific machines

   Elliott Bros. 402E and 402F

   English Electric DEUCE

   Ferranti Pegasus

3. Computers for business problems

   Elliott Bros. 405

   Ferranti Perseus

   I.B.M. 650

   Leo Computers LEO II

A Tabular summary of the characteristics of each group is given on the following pages.

N.B. The accuracy of these tables is not guaranteed. All information, (particularly prices) should be verified with the manufacturers before any action is based on it.

LARGE SCALE SCIENTIFIC COMPUTERS

	FERRANTI MERCURY	I.B.M. 704
Number	Binary Serial 1 Mc digit rate 40 bit words	Binary Parallel 36 bit words
Orders	Single Address 2 orders per word 7 Modifiers	Single Address 1 order per word 3 Modifiers
Arithmetic Times	Floating point 30/10 10 bit fixed point arithmetic for counters ± Floating point 180 μs x " " 360 μs No Division Red Tape 60μ s	Fixed point Floating point 27/9 (?) ± Fixed point 24 μs Floating point 100μs x ÷ 24-240 μs Red Tape 24 μs
Store 1. Immediate Access 2. Drums, etc. 3. Magnetic Tape	1024 words on cores Up to 32,768 words on 8 drums 18 ms revolution time Yes	Up to 32,768 words on cores 8K or 16K words 13 ms access time Yes
Input/Output	Paper Tape Punched cards and line printer may be available	Punched cards, line printer, CRT
Refrigeration	Refrigeration supplied	Elaborate air conditioning required
Cost	£100,000 upwards	£500,000 upwards Rental £100,000 upwards
Notes	Not suitable for data-processing. Lack of fixed point arithmetic makes difficulties in some programming. Address system inconvenient and confusing, two level store difficult. AUTOCODE makes certain types of problem very simple.	Exceedingly costly by English standards. Large single level store very convenient for programming. Modification facilities not very convenient. FORTRAN(similar to AUTOCODE) and other routines simplify certain problems. I.B.M. 709 is an improved, faster and still more expensive machine.

N.B. For both these machines, the cost of a full installation with a reasonable number of tape units, a line printer and other auxillary equipment would probably be of the order of twice the cost of the minimum machine.

MEDIUM SIZED SCIENTIFIC COMPUTERS

	ELLIOTT BROS. 402E and 402F	ENGLISH ELECTRIC DEUCE	FERRANTI PEGASUS
Number	Binary Serial 330 Kc digit rate 32 bit words	Binary Serial 1Mc digit rate 39 bit words	Binary Serial 330Kc digit rate 39 bit words
Orders	1+1 Address (Optimum Coded 128 words) Source/Function/Destination Type of order (a' = f(a, s) / d' = a) 7 modifiers 1 order per word	1+1 Address (Optimum Coded 32 words) Source/Destination Type of order. (functions are associated with special sources or destinations) No modification 1 order per word	Two address (Not optimum coded) 7 accumulators Special counting orders for 2 level store 7 modifiers(same as accumulators) 2 orders per word
Arithmetic	Fixed Point (402F also has floating point)	Fixed Point Multiplication unsigned(hence usually a subroutine) Mult. and div. are autonomous	Fixed Point
Times	± 204 μs / x ÷ 3.4 ms Plus access time for operand and instruction	± 64 μs / x ÷ 2ms Plus access time for operand and instruction	± 300 μs / x 2.0 ms - 5.5 ms No waiting times
Store 1. Immediate	17 words (including acc)	4 x 1 word 3 x 2 words 2 x 4 words 12 x 32 words (1 ms circulation time)	55 words(including 7 accs)
2. Drum	1024+3968 with relay switching (Revolution time 13ms) Access time 13ms-26 ms. No block transfers	8,192 words (Revolution time 13ms) Transfers take 13-48 ms(for 32 words)and are autonomous	4096+(1024 isolated)(revolution time 16 ms) Single word or block(8 word) Transfers
3. Magnetic Tape	No	No	Yes at extra cost
Refrigeration	No (7KVA)	None provided (9KVA) 46 cwt Some special ventilation may be needed	None provided (12KVA) Some special ventilation needed
Input/Output	Paper Tape	Punched Cards	Paper Tape
Cost	402E £27,000 402F £36,000	£43,000	£45,000

COMPUTERS FOR BUSINESS PROBLEMS

	ELLIOTT BROS. 405	FERRANTI PERSEUS	I.B.M. 650	LEO COMPUTERS LEO II
Number	Binary Serial 330Kc digit rate 32 bit words	Binary, Coded Binary Serial 330Kc digit rate 72 bit (12 character) word	Decimal Serial 10 decimal digits (and sign) word	Binary Serial 525Kc digit rate 19 or 39 bit words
Order	Single address 2 orders per word 2 modifiers	Single address 3 orders per word 7 modifiers	1+1 Address (optimum coded) 1 order per word Standard machine has no modifier	Single Address 1 order per 19 bit word 3 modifiers
Arithmetic Times	Fixed point binary $\pm$ .1 ms $\times$ 3.3 ms $\div$ 3.3 ms Plus access (average .76ms)	Binary Accumulator Variable (mixed) radix acc. $\pm$ .39ms $\times$ 1-9.5 ms $\div$ 3-21 ms (autonomous mult. and div.)	Decimal (fixed point) $\pm$ .76 ms $\times$ 12 ms $\div$ 16.2ms Red Tape .44 ms Plus access (av. 2.4ms)	Fixed point binary $\pm$ .34ms $\times$ .65-3.5ms $\div$ 3.5ms Plus access time (average .16ms)
Store 1. Immediate 2. Drum 3. Mag. Tape	3x1 word + acc. 8to32x16 words (128-512 words) Either 4K (revolution time 12.8ms) or 16K (revolution time 25.6ms) Yes	160 x 1 word 54x16 words) 1024 words Data normally in 1 word lines, programme in 16 word lines. No Yes	3 words (acc etc) 2000 words (main store) (Revolution time 4.8ms) Yes	14 long words 64 x 32 short words Up to 65K words on 8 drums Revolution time 11 ms No
Input/Output	Paper Tape Punched Cards, Elec. Typewriter Magnetic Tape/Paper Tape/Teleprinter Line printer optional	Paper Tape Punched Cards Lineprinter (off line)	Punched Cards Line printer (off line)	Paper Tape Punched Cards Line Printer
Refrigeration	None provided	Provided	Elaborate air conditioning necessary	? Weight 197 cwt. 40KVA
Cost	According to size £40,000 upward	about £260,000 (with 8 magnetic tape units)	£70,000 upwards	£68,000 upwards

N.B. Relative costs of commercial machines are generally very misleading as the cost of the ancillary equipment (such as magnetic tapes, printers etc.), are sometimes included and sometimes not. As the cost of these is frequently half the total cost of the installation, no valid comparison is possible without an exact knowledge of what is included in the price.