Computer Fundamentals

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Lecture 4

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Outline

- Printers
- How Computers Represent Data

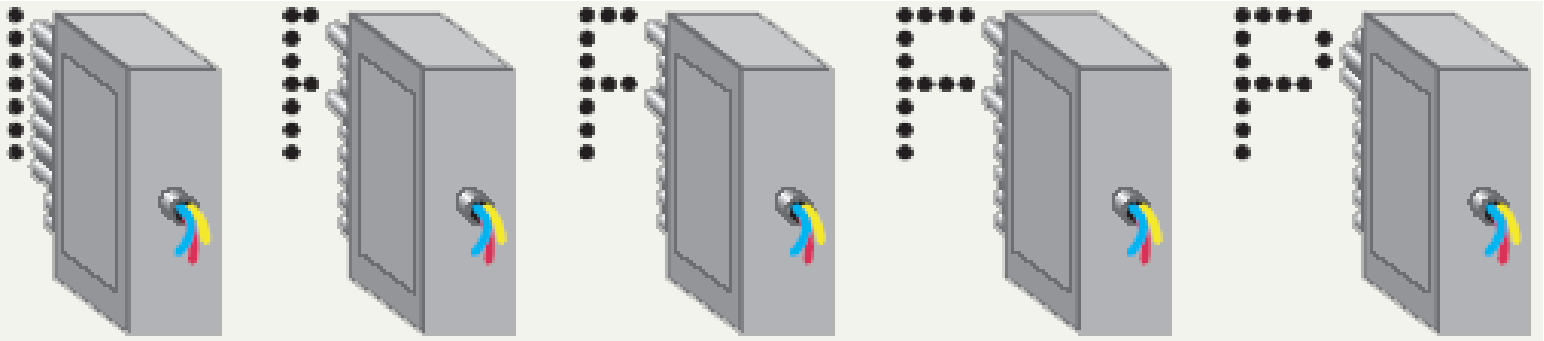
Printers

- Impact printers
  - Generate output by striking the paper
  - Uses an inked ribbon or hammer embossed with different alphabets
- Non-impact printers
  - Use methods other than force
  - Tend to be quiet and fast

Source: *http://www.thehaystackneedleonline.com/2009/10/typewriter-collection.html*

Printers (cont.)

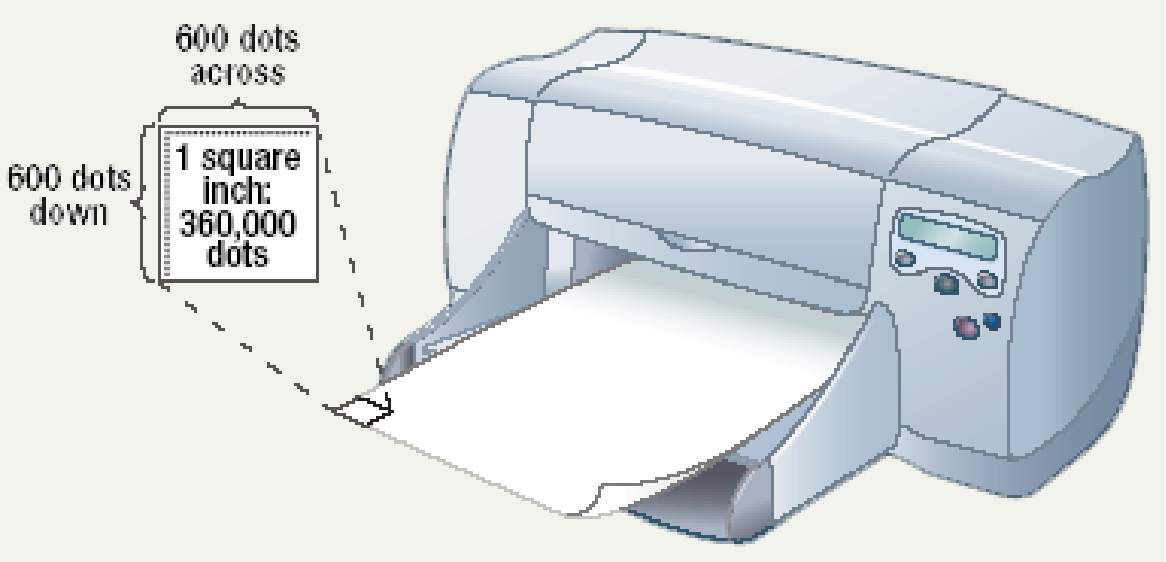
- Dot matrix printers
  - Impact printer
  - Print head strikes inked ribbon
  - Speed measured in characters per second
    - Range from 50 to 500 cps
  - Types
    - Line printers for printing line
    - Band printers with rotating band embossed with characters



Dot Matrix Print Head

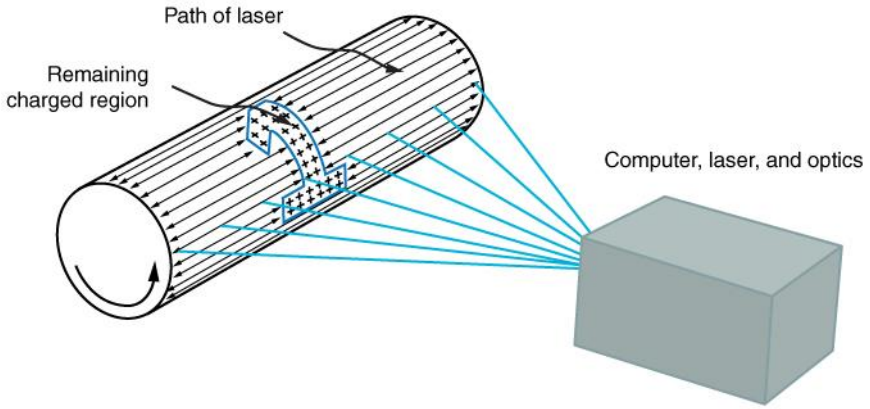
Printers (cont.)

- Ink-jet printers
  - Non-impact printer
  - Inexpensive home printer
  - Color output common using CMYK
    - Cyan (like blue), magenta (like red), yellow, key (black)
  - Sprays ink onto paper
  - Speed measured in pages per minute
  - Quality expressed as dots per inch



Printers (cont.)

- Laser printer
  - Non-impact printer
  - Produces high quality documents
  - Color or black & white
  - Print process
    - Laser draws text on drum
    - Toner sticks to text on drum to page
    - Toner melted to page
  - Speed measured in pages per minute
  - Quality expressed as dots per inch



Source: *http://devarchive.cnx.org/contents/b76ece9b-3fb0-4701-bb7a-b92b7941e4c5@1/18-9-applications-of-electrostatics*

Printers (cont.)

- All-in-one peripherals
  - Scanner, copier, printer and fax
  - Popular in home and offices
  - Prices are very reasonable

Source: *https://www.amazon.com/HP-LaserJet-Printer-Q6500A-ABA/dp/B000E6Z4E2*

Printer Comparison

- Determine what you need
- Determine what you can spend

- Initial cost
- Cost of operating
- Image quality
- Speed

High Quality Printers

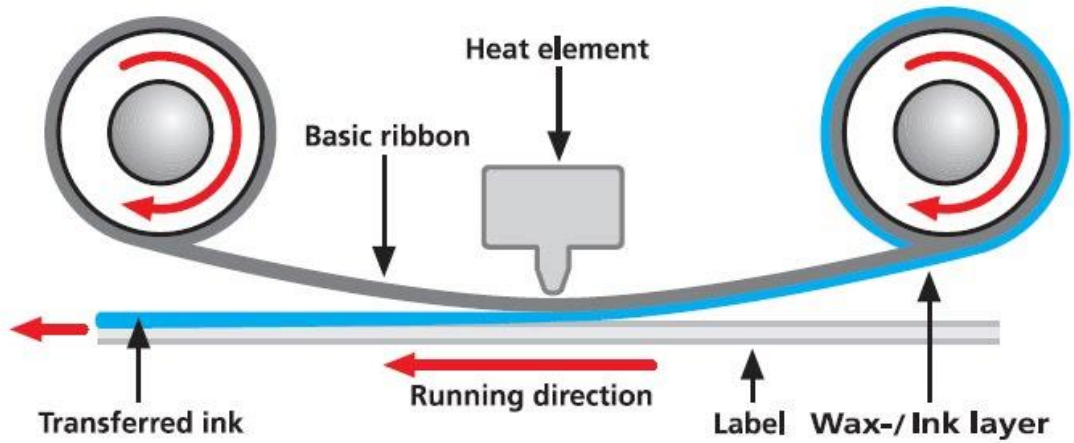
- Special purpose printers
  - Used by a print shop
  - Output is professional grade
  - Prints to a variety of surfaces

High Quality Printers (cont.)

- Photo printers
  - Produces film quality pictures
  - Prints a variety of sizes
  - Prints very slow

High Quality Printers (cont.)

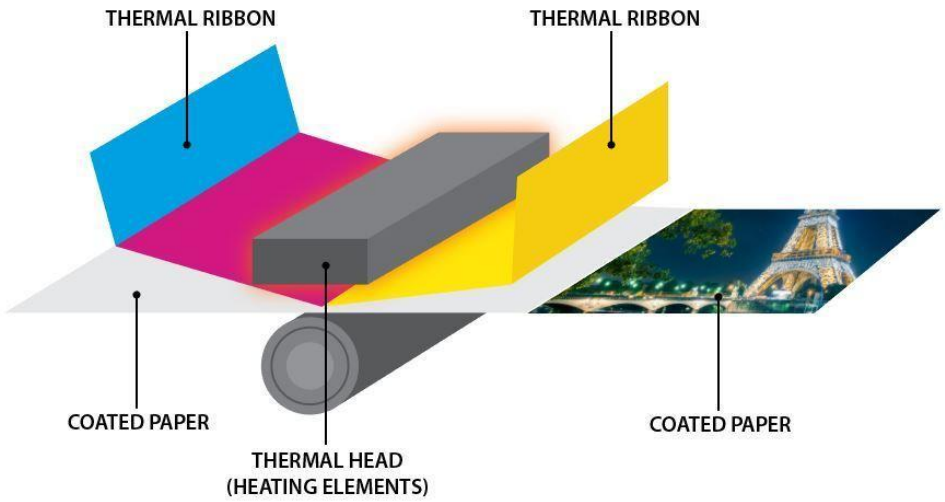
- Thermal wax printers
  - Produces bold color output
  - Color generated by melting wax
    - Ribbon coated with panels of colored wax
    - Wax melted with focused heat source
  - Colors do not bleed
  - Operation costs are low
  - Output is slow



Source: *https://sites.google.com/site/htechnology23/assignments/output-hardware/hardcopy*

High-Quality Printers (cont.)

- Dye sublimation printers
  - Color is produced by evaporating ink
    - Ribbon with color panels moved across a focused heat source
    - Evaporated dye diffuse on special coated paper
  - Produces realistic output
  - Used by graphic designers
  - Very high quality
  - Operation costs are high
  - Output is very slow



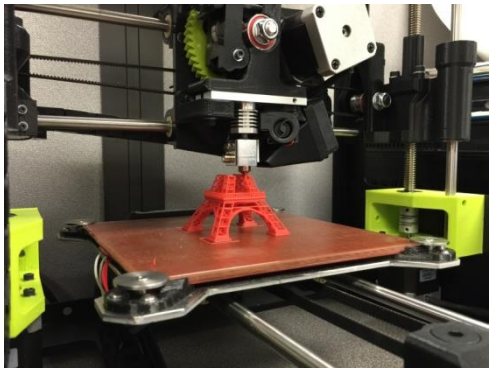
Source: *https://www.georgiaexpo.com/what-is-dye-sublimation-custom-printed-fabric*

High-Quality Printers (cont.)

- Plotters
  - Large high quality images
  - Older models draw with pens
    - Paper is held stationary
  - Operational costs are low
  - Output is very slow
  - Advanced plotter are called roller plotters
    - Paper is moved back and fourth along with pen
    - Produce perfect circles and drawings

High-Quality Printers (cont.)

- 3D printers
  - Also known as additive manufacturers
  - Process of making three dimensional solid objects from digital file
    - Using additive processes
    - Object created by laying down successive layers of material
    - Process continues until object created
    - Each layers seen as a thinly sliced horizontal cross-section of eventual object
  - Opposite of subtractive manufacturers
    - Subtractive manufacturing is cutting out / hollowing out
  - 3D printing enables to produce complex (functional) shapes
    - Using less material than traditional manufacturing methods



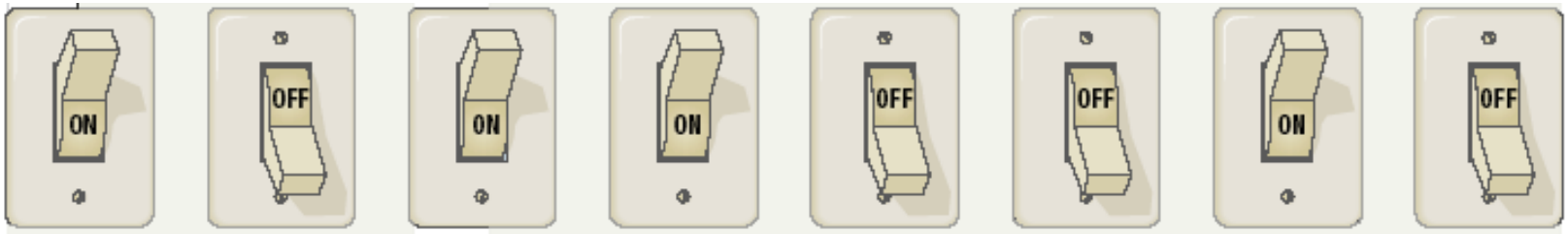
Source:s *https://3dprinting.com/what-is-3d-printing*
https://www.computerworld.com/article/2868817/review-lulzbot-mini-3d-printer-delivers-outstanding-details.html

How Computers Represent Data

- Number systems
  - A manner of counting
  - Several different number systems exist
- Decimal number system
  - Used by humans to count
  - Contains ten distinct digits
  - Digits combine to make larger numbers
- Binary number system
  - Used by computers to count
  - Two distinct digits, 0 and 1
  - 0 and 1 combine to make numbers

How Computers Represent Data (cont.)

- Bits and bytes
  - Binary numbers are made of bits
  - Bit represents a switch
  - A byte is 8 bits
  - Byte represents one character



How Computers Represent Data (cont.)

- Text codes
  - Converts letters into binary
  - Standard codes necessary for data transfer
  - ASCII
    - American Standard Code for Information Interchange
    - American English symbols
  - Extended ASCII
    - Graphics and other symbols
  - Unicode
    - All languages on the planet

How Computers Represent Data (cont.)

ASCII Code	Decimal Equivalent	Character	ASCII Code	Decimal Equivalent	Character
0010 1011	43	+	0101 0110	86	V
0010 1100	44	,	0101 0111	87	W
0010 1101	45	-	0101 1000	88	X
0010 1110	46	.	0101 1001	89	Y
0010 1111	47	/	0101 1010	90	Z
0011 0000	48	0	0101 1011	91	[
0011 0001	49	1	0101 1100	92	\
0011 0010	50	2	0101 1101	93	]
0011 0011	51	3	0101 1110	94	^
0011 0100	52	4	0101 1111	95	_
0011 0101	53	5	0110 0000	96	`
0011 0110	54	6	0110 0001	97	a
0011 0111	55	7	0110 0010	98	b
0011 1000	56	8	0110 0011	99	c
0011 1001	57	9	0110 0100	100	d
0011 1010	58	:	0110 0101	101	e
0011 1011	59	;	0110 0110	102	f
0011 1100	60	<	0110 0111	103	g