


Announcements

Beginning Monday, we'll start grading reflection papers. Each is worth ten points.


The three projects are each worth 150 points and 15% of your grade. Part A is worth 50 points and Part B is worth 100 points. That is true for each project.



Digital Representation

Everyone knows computers use bits and bytes ... but what are they?

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Human/Computer Divide

Information must be in a form that

- * Humans can understand and
- * Computers can manipulate

Digitizing bridges the gap




Info Representation

Digitization: representing information by any fixed set of symbols

1	2	3	The representation associates one item with each symbol ... encode the telephone keypad using ten colors			
4	5	6				
7	8	9				
*	0	#				


What number is:



Creating Symbols

Often, there are many things to digitize, but too few symbols available

- * The solution is to create more symbols by composing patterns ...
- * Three patterns make three symbols:
- * Pairing them makes 9 symbols; when they are triples, 27 symbols, and ...



Patterns as Symbols


A particular pattern of digits represents your

- * school ID

The numeric properties don't matter, only the sequence.



Digits are familiar, easy to remember, and short unlike some other symbols:

- * "one, one, five" vs. "exclamation, exclamation, semicolon."




An Encoding


Encode the Latin alphabet

Three pattern   triples = 27 symbols

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■



Digitize -- encode with symbols



Info in the Physical World


Physical world:

- * The most fundamental representation of information is presence/absence of a phenomenon
 - matter, light, magnetism, flow, charge, ...

The PandA representation

- detect: "Is the phenomenon present?"
- set: make phenomenon present or absent

Any controllable phenomenon works: define it right




Info in the Logical World

Logical World:

- * Information, reasoning, computation are formulated by true/false and logic
 - All men are mortal
 - Aristotle is a man
 - Aristotle is mortal


True and false can be the patterns for encoding information



Connect Physical/Logical

The miracle of IT is that physical and logical worlds can be connected

Present	Absent
Magnetized	Non-Magnetized
On	Off
Yes	No
1	0
True	False
+	-
Black	White
For	Against
Yin	Yang




Bits

PandA is a *binary representation* because it uses 2 patterns (0s,1s)

Bit -- it's a contraction for "binary digit"

-- a position in space/time capable of being set and detected in 2 patterns

Sherlock Holmes's *Mystery of Silver Blaze* -- a popular example where "absent" gives information ... the dog didn't bark, that is the phenomenon wasn't detected




Bytes

A byte is eight bits treated as a unit

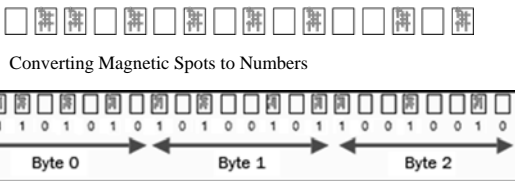
- * Adopted by IBM in 1960s
- * A standard measure ever since
- * Bytes encode the Latin alphabet using ASCII -- the American Standard Code for Information Interchange

0100 0110
0100 1001
0101 0100

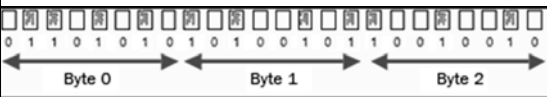



PandA

Schematic Diagram of Magnetic Spots, as on a Disk



Converting Magnetic Spots to Numbers





ASCII

ASCII	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0000																																
0001																																
0010																																
0011																																
0100	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O																
0101	P	Q	R	S	T	U	V	W	X	Y	Z	[\]	^	_																
0110	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o																
0111	p	q	r	s	t	u	v	w	x	y	z	{		}	~																	
1000	`	~	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	
1001	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	
1010	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	
1011	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	
1100	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A																
1101	D	R	O	O	O	O	O	O	O	O	O	O	O	O	O	O																
1110	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	
1111	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	`	

0100 0110
0100 1001
0101 0100


0100 1000.0111 0101.0111 0011.0110 1011.0110 1001.0110 0101.0111 0011.0010 0001



Demonstration

Course Web site:
 * <http://www.cs.washington.edu/education/courses/100/07au/>


Address munging:
<http://www.addressmunger.com>



Encoding Information

Bits and bytes encode the information, but that's not all


- * Tags encode format and some structure in word processors
- * Tags encode format and some structure in HTML
- * In the *Oxford English Dictionary* tags encode structure and some formatting



OED Entry For Byte

byte (bait). *Computers.* [Arbitrary, prob. influenced by *bit* sb.⁴ and *bit* sb.] A group of eight consecutive bits operated on as a unit in a computer. **1964** *Blaauw & Brooks in IBM Systems Jnl.* III. 122 An 8-bit unit of information is fundamental to most of the formats [of the System/360]. A consecutive group of *n* such units constitutes a field of length *n*. Fixed-length fields of length one, two, four, and eight are termed bytes, halfwords, words, and double words respectively. **1964** *IBM Jnl. Res. & Developm.* VIII. 97/1 When a byte of data appears from an I/O device, the CPU is seized, dumped, used and restored. **1967** *P. A. Stark Digital Computer Programming* xix. 351 The normal operations in fixed point are done on four bytes at a time. **1968** *Dataweek* 24 Jan. 1/1 Tape reading and writing is at from 34,160 to 192,000 bytes per second.

<e><hg><hw>byte</hw> <pr><ph>bait</ph></pr></hg>. <la>Computers</la>. <etym>Arbitrary, prob. influenced by <xr><x>bit</x></xr>
 <ps><.chm></hm></ps>and <xr><x>bit</x> <ps></ps> </xr></etym>
 <st><a> group of eight consecutive bits operated on as a unit in a computer.</s4> <q><q>1964</q></q><a>Blaauw & <a>Brooks <chibin</bib> <w>IBM Systems Jnl.</w> <lc>III. 122</lc> <qt>An 8-bit unit of information is fundamental to most of the formats <ed>of the System/360</ed>. &es.A consecutive group of <i>n</i> such units constitutes a field of length <i>n</i>. &es.Fixed-length fields of length one, two, four, and eight are termed bytes, halfwords, words, and double words respectively. </qt></q><q>1964</q></q> <w>IBM Jnl. Res. & Developm.</w> <lc>VIII. 97/1</lc> <qt>When a byte of data appears from an I/O device, the CPU is seized, dumped, used and restored.</qt></q> <q><q>1967</q></q> <a>P. A. Stark <w>Digital



Reflection

Write for five minutes on the following topic:

- * List the indicators that a Web site is truthful and authoritative. Pick the one that you think is the most important and explain why.



Summary

IT joins physical & logical domains so physical devices do our logical work

- * Symbols represent things 1-to-1
- * Create symbols by grouping patterns
- * PandA representation is fundamental
- * Bit, a place where 2 patterns set/detect
- * ASCII is a byte encoding of Latin α bet
- * In addition to content, encode structure



Next Monday

- * Beginning Monday, we'll start grading your reflection papers. Each one is worth 10 points.
- * Turn in Project 1A before 10pm on Monday to Collect It (see link on Project 1 description)
- * Read Chapter 11 for Monday
- * Keep following the calendar to stay caught up