

Digitized Media



Digital encoding of information means the data is stored in discrete units – effectively numbers. Once we have digital data, we can use it to represent any form of digital media

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FIT 100 Remember ...

- ❖ Digital data is discrete: unambiguous and exact
 - It's either "on" or "off"
- ❖ With one piece of data (e.g. a light switch), you can represent 2 pieces of information
 - "On" or "Off" – even when you use a dimmer switch!!!
- ❖ We call a single piece of data with 2 states a *bit*.
- ❖ If we look at a bunch of bits at the same time, we can represent more pieces of information.

<u>BITS</u>	<u>Number of Pieces of Information</u>	<u>Examples</u>
1	2	0, 1
2	4	00, 01, 10, 11
3	8	000, 001, 010, 011, ...

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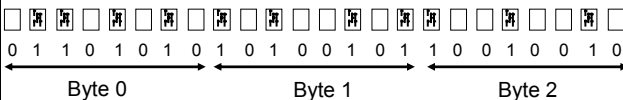
FIT 100 Encoding the Number

- ❖ Information is often stored by charge or magnetic field



Schematic diagram of magnetic spots, like on a disk

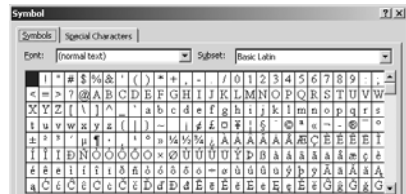
- ❖ Its presence or absence can be detected, leading to a natural association with 1 and 0 to charged/neutral states



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FIT 100 Some Information is Discrete: Character Encodings

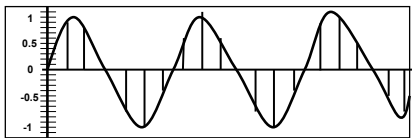
- ❖ Review:
 - Keyboard characters are encoded into a byte or two
 - ASCII is one of many encoding of the characters
 - ✦ What does ASCII stand for?
 - A byte (8 bits) permits 256 things to be represented



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FIT 100 But Not All Information is Discrete...

- ❖ The physical world is analog –sound comes from pushing air with a certain energy at a certain rate, etc.
- ❖ By measuring a phenomenon one derives a value (number) of the phenomenon at that moment
- ❖ Sampling – taking many measurements at uniform intervals –gives a series of numbers, the digital form

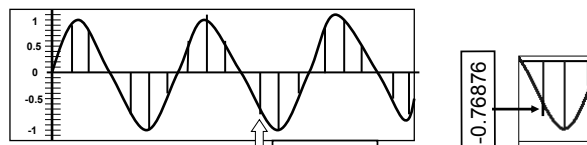


0, .9, .8, 0, -.7, -1, -.3, .4, 1, .4, 0, -.7, -1, -.3

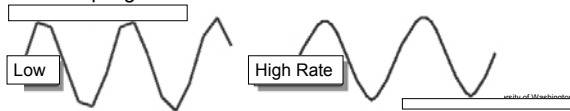
Digital audio:
 44,100 sample/s
 2 bytes/sample
 2 channels, L & R
 176,400 B/s
 635 MB/hour

FIT 100 Digital Data

- ❖ Digital samples capture the basic structure of analog data, but it can be inaccurate due to limited precision

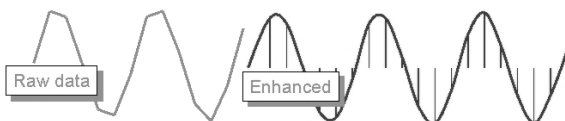


- ❖ Or sampling rate



FIT 100 Two Advantages of Digital Data

- ❖ A computer can “compute on” digital data, enhancing it to remove noise, artifacts of imprecision, etc.



- ❖ Digital data can be transmitted and replicated exactly
 - The numbers are the complete representation of data
 - Assuring each number is duplicated or transmitted accurately, means the data is exact

0.87089227146145154
 0.870892289227146145154
 0.870892289227146145154
 0.870892289227146145154

FIT 100 Picture Elements (Pixels)

- ❖ The phosphor on the screen naturally displays the on/off property of binary
 - Suitable for one color (B&W) video
 - The bits in memory are streamed out on the screen is “raster” order, like a standard TV

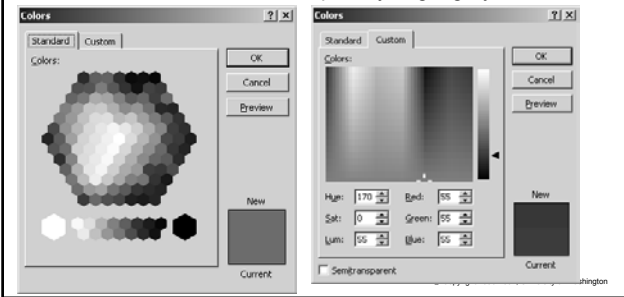


- ❖ For a color display, three (basic) colors of light must be displayed: red, green and blue (RGB)
 - Requires three different numbers, e.g. one byte each
 - Range of colors is determined by the intensity of each component
 - When all three values are at their maximum, the color is white, and when they are at their minimum the color is black



FIT 100 Color Control

- ❖ Select the color palette from an application and play
- ❖ Notice when values are equal – you get gray results



FIT 100 Bits as a Medium

- ❖ What does this string of bits represent?

0 1 1 0 1 0 1 0 1 0 1 0 0 1 0 1 1 0 0 1 0 0 1 0

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FIT 100 Bits as a Medium

- ❖ The way that bits represent information is determined by how we interpret the bits

0 1 1 0 1 0 1 0 1 0 1 0 0 1 0 1 1 0 0 1 0 0 1 0

- ❖ As separate byte these are: 106, 165, 146
- ❖ As ASCII these bytes are: 0, ¥, □
- ❖ As a 24 bit integer these bytes are: 6,989,202
- ❖ As a color value these bytes are:
- ❖ Bytes can be interpreted in an unlimited number of ways

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FIT 100 Summary

- ❖ Digital representation can be faithfully replicated and transmitted
- ❖ It's common to "compute" on a digital representation
- ❖ The binary digits (bits) 0 and 1 are a natural way to interpret the presence or absence of a phenomenon
- ❖ Binary numbers and arithmetic are like decimal except they are limited to the two numerals 0 and 1
- ❖ Bits are bits—what they mean depends on how we interpret their meaning... sometimes they are numbers, sometimes letters, sometimes sound, sometimes color, ...

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