Some Concepts and Terms In Contemporary Media

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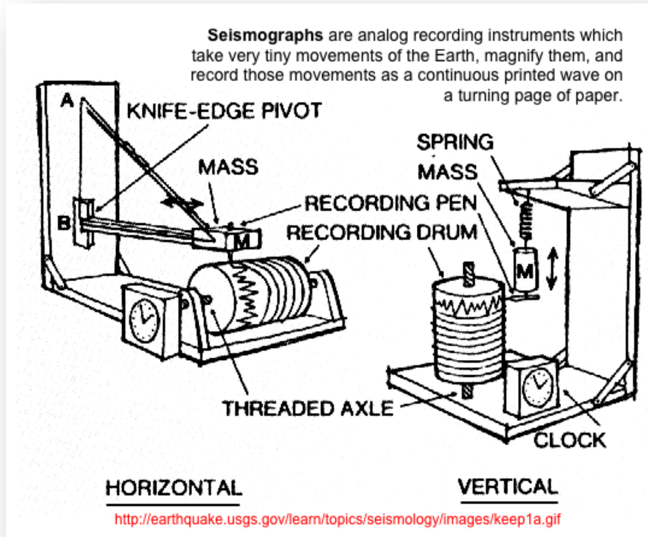
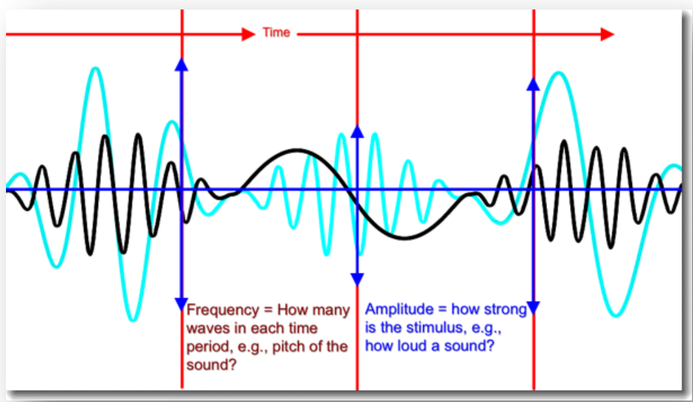
ANALOG VS. DIGITAL



Analog. The real world around us is filled with a continuous stream of information coming to us as many different types of stimuli or signals. These include sound, light, temperature, physical motion, etc. Each of these types of signals or stimuli varies continuously as time unfolds. Analog data encode whatever stimuli are being recorded so that it preserves the quality of continuous variation across time.

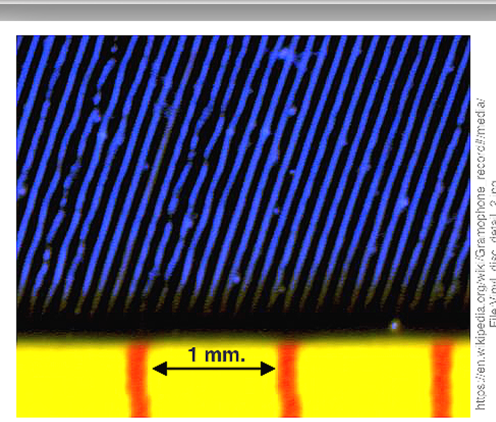
Until the advent of computers almost all information in the world around us was produced, measured or stored in analog form: photographs, vinyl records, printed books, fever thermometers, voltage meters, car speedometers, alarm clocks and sweep-hand wristwatches, earthquake seismometers (see illustration), and musical instruments from pianos to trombones–all of these are analog examples.

Example of Sound



Here is an example of the sound waves made by two sound sources (one in black and one in light blue)*. Notice that each sound varies continuously over time. The sound itself is composed of waves that have a certain frequency (# of waves per sec.) and amplitude (how tall or short the waves are). Frequency is what we hear as "pitch" and amplitude is what we hear as loudness. Sound waves in the "real world" are examples of analog signals.

* http://cliparts.co/cliparts/pT5/rAx/pT5rAxBac.jpg



Magnified grooves. Dust can be seen. Red lines mark 1 mm.

In creating a vinyl record, sound is picked up by a microphone that translates the physical sound waves into a corresponding electromagnetic wave. In turn, this electromagnetic wave is sent to a "cutting stylus" which converts the electromagnetic wave into a physical wave pattern that is cut into the surface of a blank piece of vinyl as it spins around.

Hence, on a vinyl record, the overall original pattern of waves is reproduced as grooves in the surface of the record. As the record is played back for listening, it spins around and a "pickup stylus" in the groove wiggles back and forth as the grooves move. This causes an electrical coil at the top of the stylus to pick up the movement. It then turns that physical wiggle into a continuous electronic wave that can then be sent to a loudspeaker where the electronic wave movement is converted back into a continuous sound stream.

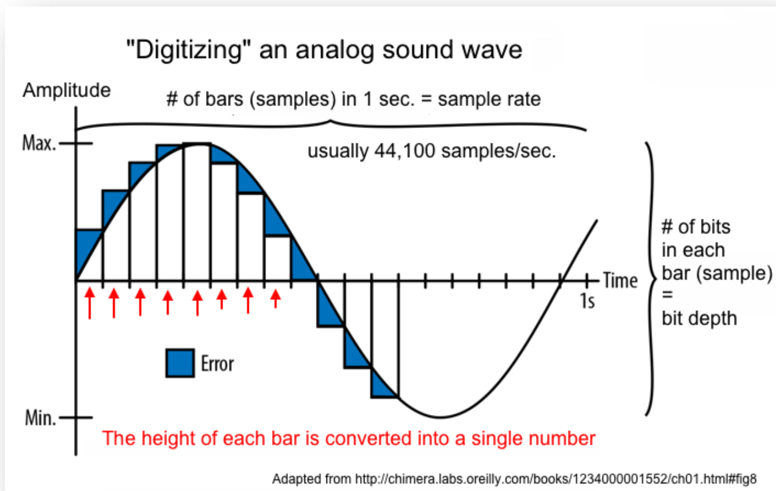
Notice that in every step of the operation, the information remains a continuous stream of data that gets converted from one form to another, but retains its original shape.

Natural stimuli in the world around us are almost always analog.

Digital. When we use digital data sources, we have transformed the physical properties of the original analog signal (a continuously changing stream in time) into an ordered series of numbers that correspond to those physical properties. These numbers can be stored, for example, in the memory of a computer, an optical disk drive, or a digital flash drive and, at a later time, be used to reproduce an approximation of the original analog signal.

How does this happen with sound?

The analog sound wave is fed into a converter which breaks down the wave into a sequence of square wave approximations of the original wave (see illustration). Usually there are 44.1K samples per second. The height of the wave at each sample point (each bar) is converted into a number. Depending on how pure a resulting digital sound is desired, the number has a certain depth, e.g., greater numbers of bits in each sample number allows for finer differences in sound to be registered. The sequence of these numbers are then stored electronically, e.g., pressed into the surface of a CD or in a disk drive.



Notice that we are talking about extraordinarily large quantities of numbers. 44.1K samples per second of a 5-minute song require 13,200,000 separate values. However, even personal computers these days can often handle 1 billion values per second. Hence, it is comparatively easy for the computer to deal with this kind of data. Note, of course, that sound requires far fewer values than digitizing entire computer screens of constantly changing visual information. It is no surprise, then, that earlier digital computers could handle audio recordings a lot better than visual games or motion pictures.

Note that the numbers in digital data are usually stored as binary values, i.e., a series of either 0's or 1's. For example, as you may have learned in math during high school, the number "24,832" as a 16-bit binary number would be "0110000100000000" or the number 18,329,313 would be "1000101111010111011100001". Human minds don't deal with binary numbers easily, but computers handle them very easily.

Some Other Differences

	Analog	**Digital**
Data Transmission Errors?	Quality of the signal can deteriorate over distances and with repeated read/write cycles	Quality of signal does not deteriorate over distances or with repeated read/write cycles
Power requirements	Tend to require large amounts of power	Uses very little power
Accuracy	Very accurate	Some error (but often too slight for human senses to notice)

If you still need to see more explanation of the differences, you might want to go visit this website: http://www.explainthatstuff.com/analog-and-digital.html

METADATA

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"Metadata is structured information that describes, explains, locates, or otherwise makes it easier to retrieve, use, or manage an information resource. Metadata is often called "data about data" or "information about information."" (National Information Standards Organization [NISO], "Understanding metadata," 2004, p. 1) The Wikipedia entry on "metadata" is at this link.

Common examples of metadata in daily life include the entries in a library's card catalog (Author, Title, etc.), the index or table of contents of a book, the labels on a filing cabinet door or the headings of a file folder, the information cards next to pieces of art on the wall of a museum, etc.

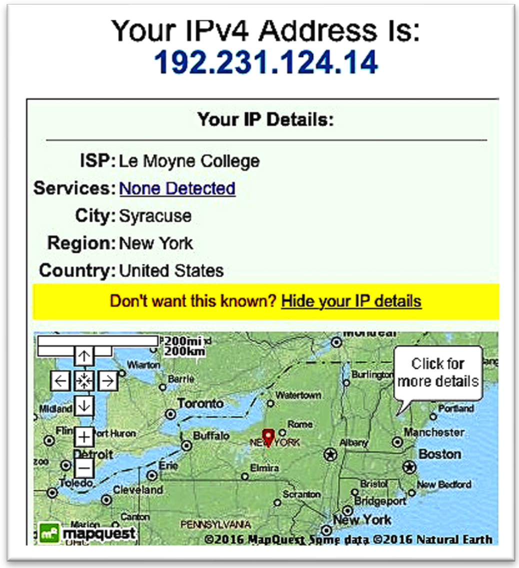
In the digital age, however, metadata has taken a whole new life. There is metadata everywhere but usually hidden from immediate view. The three general types of metadata (NISO, 2004, p. 1) are:

- ***Descriptive:*** helps searchers discover or identify a digital document. This metadata may include the page title, author, keywords, etc. that tell researchers about the document.
- ***Structural***: provides information about how the document is put together, e.g., what pages go with what chapters.
- ***Administrative***: Offers information which helps to manage the document or resource, e.g., type of file, technical specifications, date of creation and modification, copyright or ownership information, etc.

There are many different examples of metadata, but I am going to illustrate just two types:

- Online Search Requests
- Tweets on Twitter®

(A) **Online Search Requests**. Whenever you send out any information on the World Wide Web such as a request to Google or another website, that message is broken up into smaller size chunks and transmitted in the form of digitized packets of data. For example, you might send to an online dating site a search request that says, "Looking for a blond girl, 20 to 25 years of age, who likes hip-hop music and outdoor sports" That message of 91 characters including spaces might be broken down into 10 packets of 10 characters each: `/Looking fo/r a blond /girl, 20 t/o 25 years/ of age, w/ho likes h/ip-hop mus/ic and out/door sport/s/`



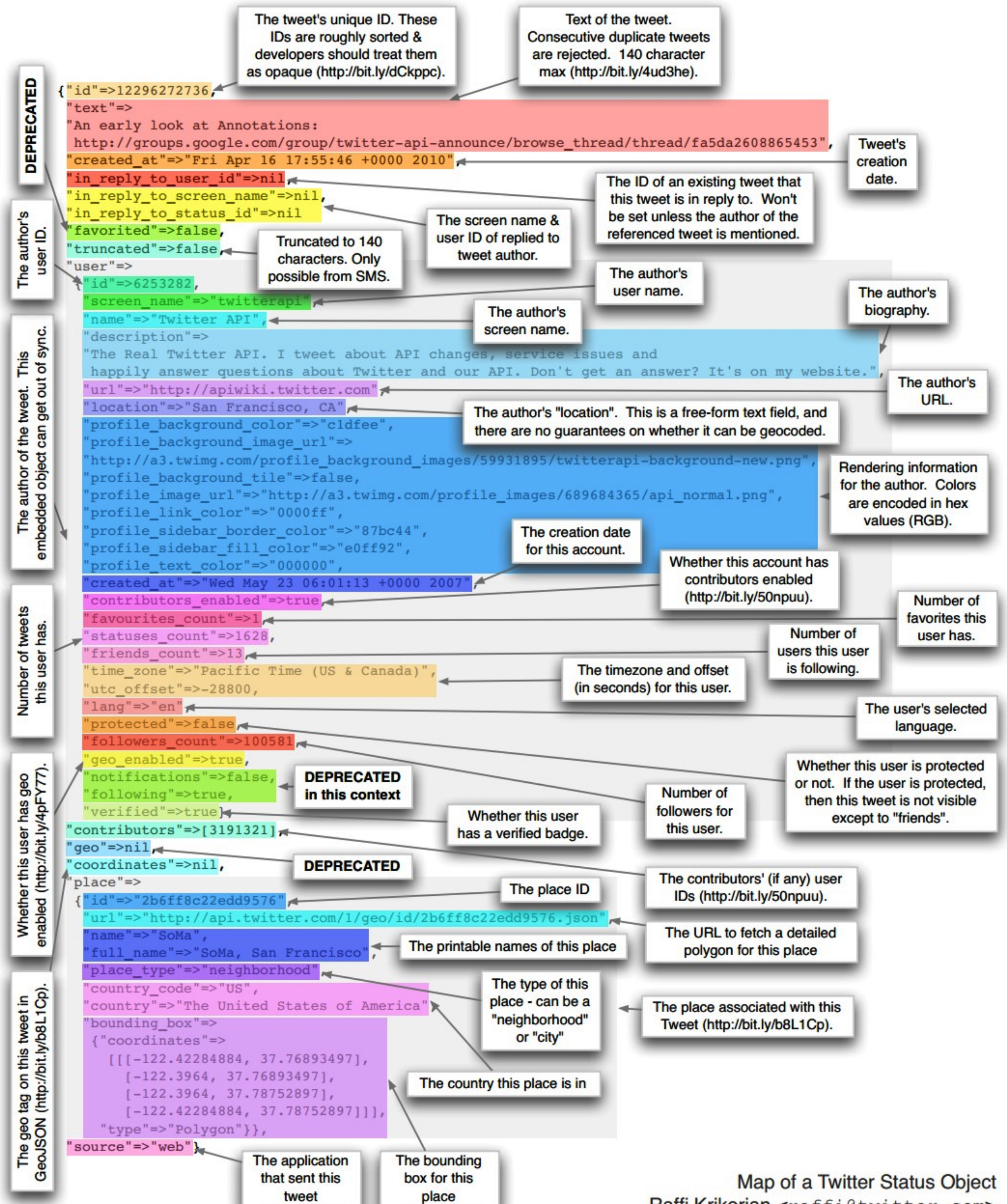
Each packet would then be given (a) the IP address of the destination, (b) a sequence number [packet #*X* out of 10], (c) a check-sum value to assure that the message wasn't garbled in transmission, and **(d) an originating IP address**. It's that last item **(d)** which identifies where the message is coming from. Every computer which is hooked up to the World Wide Web is assigned an IP (= Internet Protocol) address. As I am writing this, my computer's IP address is "**192.231.124.14"**. When all ten packets of information are received at the destination, the computer there will reassemble the original message back into the same order. Because each packet of information has the location where it comes from, the destination computer can know who is sending the message, or, at least, the computer from which the message came.

Are there ways of keeping the other computer from knowing who is sending the message? Of course. You can use what are called "proxy servers" which take your message, change your IP address to its own IP address, and then sends the message on to the destination. It's like having a mail forwarding office which intercepts all outgoing and incoming mail for you.

Increasingly business and other users are turning to Virtual Private Networks (VPNs) which send data in an encrypted form between sender and receiver. As the online company, Norton, explains: "A virtual private network (VPN) gives you online privacy and anonymity by creating a private network from a public internet connection. VPNs mask your internet protocol (IP) address so your online actions are virtually untraceable."

(B) **Tweets on Twitter**®. Anyone who uses Twitter to send out messages knows that there is now (since November 2017) a 280-character limit to any single Tweet (as of Dec 2022, Elon Musk, the new owner of Twitter, intends to expand that limit to 4,000 characters sometime). What most users of Twitter don't know is that every single tweet that is sent out also includes 150 points of metadata including "a unique numerical ID attached to each tweet, as well as IDs for all the replies, favorites and retweets that it gets. It also includes a *timestamp*, a *location stamp*, the *language*, the *date the account was created*, the *URL of the author* if a website is referenced, the number of followers, and many other technical specifications that engineers can analyze" (Dwoskin, 2014).

You can find a copy of a Tweet with all of the metadata identified on the next page.



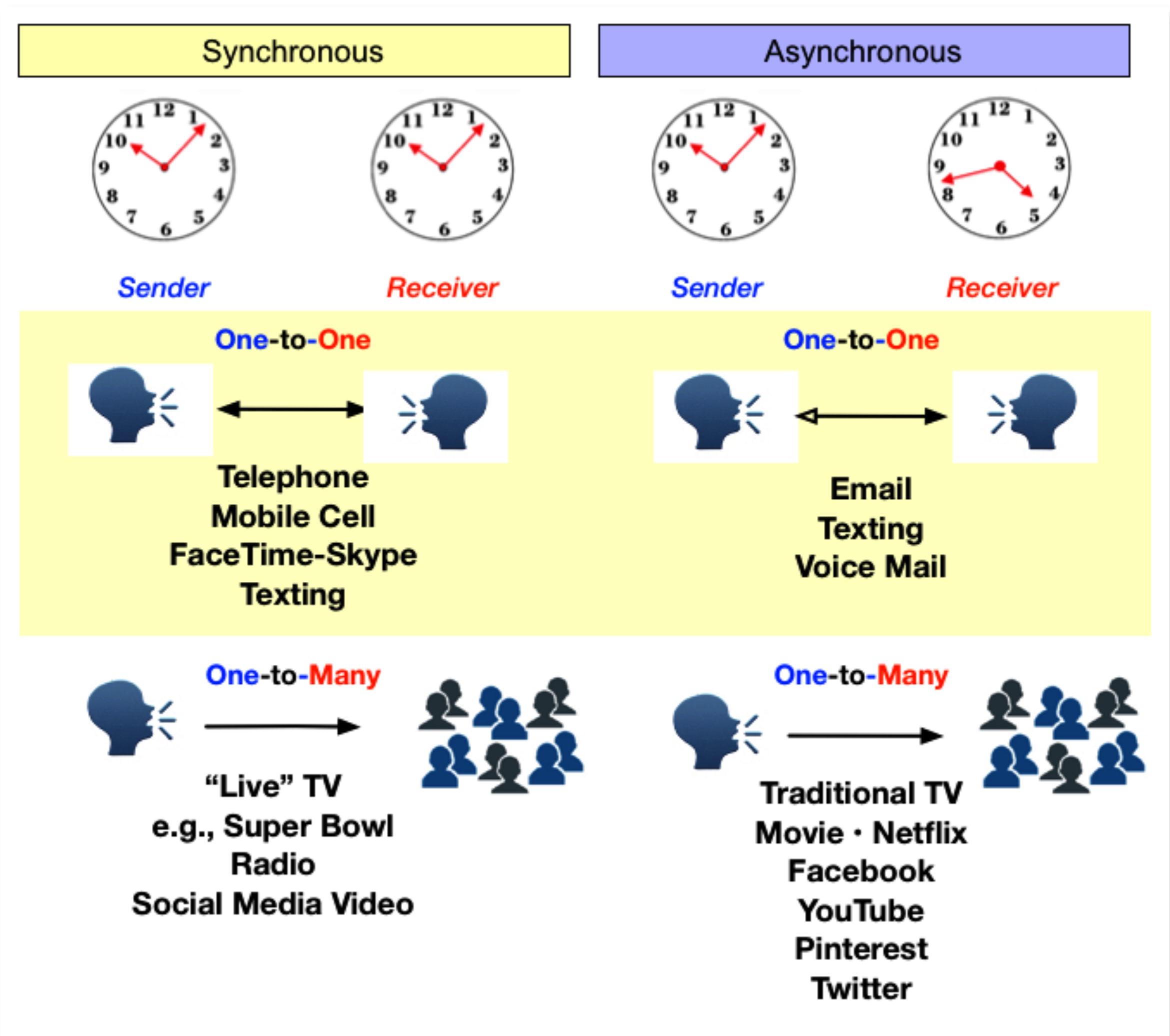
Map of a Twitter Status Object
Raffi Krikorian <raffi@twitter.com>
18 April 2010

SYNCHRONOUS VS. ASYNCHRONOUS

The word *synchronous* means “at the same time” (*syn-* = together; *chronos* = time; thus, together in time).

The word *asynchronous* means “not together in time” (since the initial letter *a-* = not).

Media are categorized, among other qualities, as being either synchronous or asynchronous. In synchronous media, the sender and the receiver of the message are experiencing the exchange simultaneously in real time. In asynchronous media, the sender offers a message which receivers get or experience at a later time.



Forms of **synchronous** (“At the same time”) communications media include

One-to-many communication
- "Live" television, radio broadcasts

One-to-one communication
- Telephone
- Cellphone
- Skype, FaceTime, or other video conferencing
- Texting (can also be asynchronous as noted below)

Forms of **asynchronous** ("Not at the same time") communications media include

One-to-many communication
- Traditional TV shows, movies, books, newspapers, magazines
- Facebook, YouTube, Tumblr and many social media sites
- Blogs, Instagram, Pinterest, Flickr & other photo sharing
- Email to multiple recipients, listservs, online email discussion groups

One-to-one communication
- Voice-mail
- Email
- Texting: While individuals generally send texts in a conversational synchronous fashion, recipients can decide not to respond immediately. This would make their use of texting asynchronous.

Reference

Dwoskin, E. (2014, June 6). In a single tweet, as many pieces of metadata as there are characters. Digits Tech News and Analysis from the WSJ. Retrieved from http://blogs.wsj.com/digits/2014/06/06/in-a-single-tweet-as-many-pieces-of-metadata-as-there-are-characters/