Comp Sci Notes Summarized:

Lecture 1:

* 7-15 seconds to make a good first impression
* Multimedia= everything you can hear or see
* Multimedia technical= describes any application or technology that can be used to present: text, images, sound, animation video
* Goal of software applications is to inform, educate and entertain. Multimedia is used to educate, entertain, inform and for business.

MultiMedia History:

* earliest drawing by humans discovered in France
* first permanent photo taken between 1820-1830
* first motion picture recorded between 1880-1890
* first full length movie with synchronized dialogue--> The Jazz Singer
* one of the first full length movies to use color was the wizard of oz.
* Arpanet was the name of the predecessor to the internet 1969
* Tim Berners Lee invented the WWW 1991
* Mosaic was the first graphical browser for the world wide web 1993.
* The rolling stones was the first band to give a concert over the internet
* toy story was the first full length feature film to be completely computer generated
* Napster was an application which changed the music industry in 1999. Napster allows users to download and share MP3s.

ARPANET: Network technology, standing for Advanced Research projects Agency Network. Objective was to create a network technology that allows researchers at various locations across the country to share information.

Future: Multimedia will continue to grow, with the top three applications being:
1) Entertainment - 15 billion 2) Publishing - 7 billion and 3) education - 7 billion

MultiMedia Features:

1) Interactivity:
- user control over the application, where you can experience an active rather than passive role.

2) Hyperlinking:
- index allows for jumping around sections vs sequential which you start at the beginning and move to the end.

3) Computer Based Delivery
- computer based multimedia applications INTEGRATE the various media componenets and allow interactivity.

WWW vs CD/DVD:

Access Time: View a CD instantly by inserting a drive, WWW may encounter slower connection speeds.
Ability to Change Content: CD cannot- must recreate, WWW easy to change or update.

Development Systems: systems used by multimedia developers to create applications
User Systems: Systems used to playback multimedia applications

MultiMedia Components:
* Text attributes (serve dual role for visual representation of message and graphical element)
* Use of text varies upon type of application and audience.
* Changing mood of a website by changing text attributes or design/layout
* You can add emphasis on text attributes through:
    - font type (serif- tails, Sans Sefif- normal)
    - style
    - kerning (space between pairs of letters)
    - tracking (space between all letters)
    - text leading (vertical space between text)
    - size
    - color
    - special effects

Pixels vs Points:
Pixels: aka dpi, unit of measure for monitor resolution, WEB, standard resolution for mac- 72, for windows- 96, some browsers will not allow certain texts, develop website by using pixel system.

Points: unit of measurement for printer resolution, WORD, dots per inch, absolute type size, higher dpi= better resolution, control over viewing size, **72 pts will always be 1 inch when printed.**
- 10 px is smaller than 10 pts- not equal (pixels is bigger than points)

Text Color: Hexadecimal code (6 digits, decimals, RRGGBB)
CRAP: contrast, repetition, alignment, proximity

<u>Lecture 2:</u>
* we rely on images for information, explanations, entertainment
* graphics originate from non digital medium, outside world.
* computers only speak **Binary.**
* **Digitization=** process of translating a piece of information into binary bits.
* **Bit=** short for binary digit value of 1 or 0
* 8 bits= 1 byte

Systems: binary, octal, decimal, hexadecimal
* Images are represented by a grid called **pixels-** smallest image component with the most detail. **Pixel=** numerical value corresponding to a color indicator.

Used for Web. vs. Used for Printing:
* Web= additive model (primary colors RGB, added light to black background to obtain color shades)

* Print= subtractive model (primary colors cyan, magenta, yellow, subtracted from a white background)

* In **true color** each pixel represents some color shade, uses 24 bit rep
* Color can be expressed in RGB code and Hexadecimal code
* RGB= 3 values ranging from 0-255 (ex: <255, 0, 0> is red)
* Hexadecimal code= 16 unique symbols, color represented by 6 digits

RGB does not equal hexadecimal, you need a convertor.
- a cathode ray tube devices can only display color with red, green and blue light, this is the color system of the web.

Types of Graphics: Bitmap or Vector
* Bitmap= zoom in to pixels, images made up of squares called pixels
    - as image is enlarged dots become larger, edges more jagged, quality decreases
    - advantages: shorter time needed to display on screen, smaller file size.
    - disadvantages: distortion when enlarged
* Vector= zoom in no pixels, image is represented with lines and arcs that have a mathematical relationship.
    - advantages: smaller file, as imaged enlarged dots become clearer, quality is maintained, file size increases though

Vector cannot be converted to Bitmap but Bitmap can be converted to vector.

Bitmap vs. Vector:
- bitmap based programs paint (can edit an images pixels)
- vector based programs draw (free hand tool, display more accurately, donwload faster, smaller file size)

Quantizing: how many discrete values used to represent each pixel
Image Resolution: the number and spacing of pixels in an image (increase in number of pixels- increase in quality)

Image Size: the physical dimensions of an image.
If number of pixels in an image is fixed: decreasing the size of an image increases its resolution, increasing size decreases resolution (more jagged)

<u>Lecture 4:</u>

Image Bit Depth (aka color depth): maximum number of colors used to represent an image (the more bits used the more color info stored to describe the color o a pixel-? quality improves and larger file size)
- the human eye can detect about 10 million colors, therefore pointless to use more... therefore we use 24 bit color.

Universally Supported Files: universally supported by graphics industry

Proprietary Files (Native files): default files used by specific software application (can be bitmap or vector format), not meant to be transferred to other applications, software specific images properties can only be retained in native form.

PSD: Adobe Photoshop
AUP: audacity
MVMM: movie maker
CDR: CorelDraw- vector
DWG: Autocad- Vector

GIF (graphics interchange format) vs. JPG (joint photographic experts groups):
* Gif: compression, color resolution, dithering, interlacing, transparency, supports a max of 8 bit color scheme, best for large areas of solid color.
    - tiny file size, limited color, lossless compression- no data discarded
* JPG: compression, distorts edges where sharp, ARTIFACTS: noise, specs around image, stored full color information- max 24 bits/ pixels, best for blend of colors NOT well defined lines or shapes.
    - large file size but full color scheme, lossy compression- data discarded

GIF= lossless, quality kept, do not get blurry, compresses by finding repeated patterns of pixels. Supports dithering, animation.

JPG= lossy, quality degrades, compression achieved by forgetting certain details of the image. (works with image in native form, degree of looseness can be varied)
* quality of JPEG file is proportional to file size
* higher image quality setting results in less data discarded
* does not support dithering, no animation

1024 bytes= 1 KB
* graphics must be digitized to be used in multimedia applications.

Tagged Image File Format (TIFF): most widely used bitmapped file format, supports bit depth from 1 to 32 bits, output is printed.

Encapsulated Postscript (EPS): vector based graphic

Windows Bitmap (BMP): bitmapped format

Graphics Interchange Format (GIF): bitmapped graphic, standard uses on the web, gif format only supports up to 256 colors.

Digitized cameras, camcorders: captures images and digitized them into computer images through its software (Megapixel= millions of pixels in photograph)

Scanners: digitize drawings, illustrations, the scanner or the camera determines how many samples to take- measured as DPI

Servers and Uploading:
* **Uptime:** how long does server stay up
* **Upload:** transfer files to server so they can be displayed on web
* **Advantage of Server:** connected all the time, always available, taken care of the security.
* **Panther:** western computer server name
* **FTP:** file transfer protocol
* **S-FTP using Secure Shell: Shell Client:** can type in commands by name
* **File Transfer Client:** allows us to transfer files to panther by setting permissions

How Images are used for printing:
- for printing: quality, file size
- for web: file size, quality (download speed)

Optimize Images: reduce the file size without compressing image quality
- reduce file size, format, color resolution

BMP Files: no compression, stores information about each pixel, each pixel is 1 byte
GIF FILEs: divided image into shapes on a grid (starx, stary, endx, endy, color)
- each shape record 5 bytes (another way is to look for patterns, builds a decoding hash table)
- human eye pays more attention to brightness than color details, so if it finds two adjacent pixels with similar color it will store both pixels as the same color and discard other color)

Dithering: when saving GIFs, most common method of reducing the color range of images down to the 256 colors seen in 8 bit GIF images. You can juxtapose two colors to make it give the illusion that a third color is present.

Browser Safe Palette: 216 colors honored between MAC and PC to work on both, can juxtapose to stimulate color not on browser safe palette.

Interlacing Technique: images downloaded onto your screen
Transparency: allows page background to display through the image so image looks like it does not have a border- only supported through GIF and PNG

PNG: portable network graphics (developed to replace GIF because of legal issues with compression)
* lossless compression, allows image to have up to 48 colors
* Advantages: lossless compression, smaller file size as GIFS, supports opacity and translucency.
* Disadvantages: older browsers may not support it, no animation, file size for 24 it color photographs are bigger than JPG.

Goal= download web page fast

- change file size (smaller sized graphics no larger than 100 KB), file format GIF or JPG is best)

Lecture 5: Websites
Process: choose domain name, order web hosting, meet client, create wevsite
* Canadians purchased 40 billion dollars online

Internet:
* a collection of local, regional, national and international computer networks that are linked together to exchange data and distribute processing tasks.
- uses standardized internet protocol suite to serve billions of users and different networks.
- the internet is hardware (WWW runs on internet)
- works by circuit switching or packet switching

Host: a computer on the internet that provides services such as web pages, emails, web storage.
ISP: Internet Service Provider: allows one to connect to internet, company which maintains an internet host and provides internet access. AKA bell or rogers
* data travels from one internet host to another along the **best route,** if links overlouded it is **rerouted.**

IP: Internet Protocol Address: uniquely identifies each computer device connected to the internet.
- 32 bits wide, consists of 4 numbers, picks a route for a packet, stopping at routers, which pick the next best machine to send the packet.

Domain Name: the text name corresponding to the numeric IP address of a computer on the internet. Identifies NETWORK and specific COMPUTER.
- IP address determines successful communication between your computer and website.
- A DNS (Domain name system) maps the domain name to the correct IP address so data can route to the correct computer.

URL: Uniform Resource Locator- an address of a web document on a computer
http= hypertext transfer protocol
www= world wide web
uwo.ca= domain name
others are folders and files

Domain Name rules: max 67 characters, dash characters, no underline, no spaces, cannot start or end with dash, no _, 0-9 or a-z, must end with extension (ex:. .com or .net)

Subdomain: Is a domain that is part of a larger domain, two or more parts separated by .

TLD: identifies the type of organization that is associated with the domain
.com = commercial, .net= internet administrative site, .org= non profit
- pay for domain name per a year

Web Hosting: the service that provides internet users with online systems for storing information, images, video or any content available via the web.

Web Hosts: companies that provide space on a server they own for clients to use.

Why not to host a website on your computer: expensive, need continual connection, 24 hour support.

Criteria for choosing a web hosting company: disk space bandwidth *amount of traffic allowed between your website and internet, web site speed, database, etc.

Lecture 6:

***** Effective websites: consistency, color, balance, easy to navigate

Creating a Website:

1) planning and design
2) Implementation:

- *** Web Page:** HTML computer instructions needed to create web page
- *** Web Site:** collection of web pages created and maintained by individual/ organization.
- *** Web Server:** computer that stores web pages and makes them availavle for people to see on the internet.
- *** Web Browser:** programs which allows you to view the internet

3) Publish
4) Maintenance (update design,etc)

Site Management: organize file/folders, rearrange files, records HTML code as you build
Document Window: area where you build webpage
Panels: commands and properties (like inspector)
Site Panel: folder you are currently working on
Property Panel: characteristics of objects you have inserted
- make sure navigation styles are consistent between pages

When creating a new site always identify to Dreamweaver the folder where yur websites will be stored through manage sites, identify site name and local root folder.
***** In file name do not use spaces, no capital letters
.html= hypertext markup language, **.shtml=** server side includes (special commands or server to process), **.cgi=** (common gateway interface), **.asp=** active server pages (scripting language, same function as CGI), **.php=** hypertext pre processor.
Script: special instructions

Website Layout Views:
* design view (WYSIWYG), split- combo of both, code view
* page title property associates a general description of what webpage is about
* entering text: CSS style sheet, enter for paragraph break, shift enter for line break
* formatting text: headers, text size use pixel system, special affects
* page properties: background images
* graphics: enhance appearance of web page, images from scanner, use smaller graphics to lower download time.
* download time of page: make low
* image attributes- size, border
* alternative text- when cursor is over image
* linking types: URL
* hyperlinks, multi links, anchors(return to top of page) (to get rid of blue link line click on brdr to 0), you can link to variety of files
* tables- control web layout

Lecture 7:
Web Publishing: upload completed page to server with secure shell client
- use FTP- **File Transfer Protocol:** internet standard that allows you to upload and download files with other computers on the internet.
- not all FTP software can connect to server and not all FTP clients can connect

Downloading: process of receiving a program, file, etc from another computer.
Remote site -> local computer

Uploading: local computer-> remote site (publishing the website)
To publish a website you need to know: host name, username, password, URL
* Marketing includes website address

Search Engine vs. Subject Directory:

* **Search Engine:** program which enables the user to search internet sites, users type list of keywords, returns a list of the documents where keywords are founds, searches database of information using spiders or web crawlers to gather info,publish registers into database. Ex: google

* **Subject Directory:** program which enables the user to search internet sites, internet sites are organized by subject and topic, collection of websites organized by topic, human selected internet resources are arranged in hierarchical way, human editors review webpages, ex: yahoo

Spider/ Web Crawler: web software that constantly searches for new web pages

Database: search engines access the database not internet sites (addresses, page titles, topics)

Meta Search Engine/ Meta Crawler: internet search engine which searches other search engines.

How does Google Work?
Gathers the information by crawling WWW (performed by Googlebot- spider), builds a database (list every document containing a certain word), ranks results (terms of relevance- PageRank Algorithm- how many links there are to a web page from other pages, frequency of words on pages)

SEO: Search Engine Optimization:
When wanting to make you website more visible:
1. identify the key words
2. put keywords in best locations
Cached= highlights where searched words are

How to improve rankings of a website?
- ensure meaningful titles, add a meta description, add meta keywords(keywords are not a major factor search engines consider when ranking websites because of abuse) TIPS single words, do not repeat words, keep length short!
- add your page to the actual search engine
- for directories meta tags do not help with rankings because hand picked- best to describe site accurately
- get sites which have high score on search engine to link to your website
- check out the competition

Using Statistics: see what visitors like and dislike about your website. ISP web servers keep logs of all visitor activity.
* # of visitors: users on website
* Files: number of files retrieved from site
* Pages: number of pages looked at
* Hits: number of files sent to user after a page result.

History of Searching the Net:
1990: first searching tool called **Archie** (short for archives). Created by Alan Emtage
- words first internet search engine, downloaded directory listings of all files located on public anonymous, FTP servers- creating a searchable database of file names.

1991: **Gopher** by Mark McCahill
- distributed document search and retrieval network
- goal similar to WWW

1991: WWW **Tim Berners Lee**
- Problem: data difficult to access and exchange due to differing encoding formats
- several criteria for pages

1995- Yahoo by David Filo and Jerry Yang

1998: Google by Larry Page and Sergey Brin

Lecture 8:

Animation: a drawing that moves, bringing the drawing to "life"

- relies on moving image for effective communication

Why use animation? shows progress, indicates movement, visualize 3D obbjects, attracts attention.

* stimulation of movement through a series of pictures that have objects in slightly different positions.
* each drawing is called a frame: snapshot of what is happening at that moment
* FPS= frames per second
* in animation each frame overlaps the previous one

Movement: is caused by rapidly displaying each frame in sequence

- types of animation: computer based training programs, education, games, webs

Types of Animation:

2-D Animation: Cel Based

* Cel: clear sheet material where images are drawn by animators, images placed on stationary background, object changes from frame to frame.

2-d Animation: Path Based

* Moves object along predetermined path on screen, object does not change but resized or rotated, easier than cel based animation, uses tweening

Motion Tween Vs. Shape Tween:

* Motion tween: works with symbols only, can't morph, only one symbol per latyer, can be used with motion guide.
* Shape Tween: works with shapes only, can morph shapes, can have more than one shape per layer, can't use motion guide.

Animation Software Features:

* Frame Rate: speed of animation
* Transitions: special effects
* User Control: play back
* Looping: continuous

- speed up animation by increasing frame rate/ second or eliminating frames

3-d Animation: involved modeling (defining the objects 3D shape), animating (defining objects motion), rendering (giving objects attributes)

* **Ray Tracing:** technique of adding light and shadows to a 3D image.

Special Effects:

* morphing: blending together two images into a series of images
* warping: distorting single image (ex: warp from into smile)

Streaming animation: when GIF document is viewed, multiple images display quickjly in succession.
* Characteristics of animated gifs: file size is affected by number of colors, noise in frames, no plug ins required for gifs, often free to make, no sound

Plug-In: program that permits web browser to access and execute files that the browser would not normally recognize.

Animation file types: animated gifs, flash, macromedia director, sophisticated animation.

Flash Professional CS3: multimedia authoring and playback system, popular for animated graphics, most advanced authoring environment, free client application, supports vector graphics, smaller file size.

KeyFrame Animation: animating a graphical object by creating smooth transitions between various keyframes (the frames which indicate the beginning and end of an objects motion path)

Tweening: the process of generating intermediate frames between two images to give appearance that first image smoothly evolves into next.

Onion Skinning: 2-d computer graphics term for technique used in animating cartoons which allows animator to make decisions based on seeing the whole sequence at once.

Rotoscoping: an animation technique for combining figures with realistic settings

Animated Gif- larger than normal GIF, need nothing to play it
Flash- .fla, .flv, video encoder- vector images take up less space than GIF bitmapped images., need flash player to play
Director- .dir, .dcr, vector images take up less space than GIF bitmapped images., need web browser plug in to play.

<u>Lecture 9:</u>
Video: uses power of motion and sound
* Analog video= smooth electronic waves
* Digital video= converts into digital media (0s and 1s)

Digital Video:
- composed of bitmap graphics each called a frame
- motion in video is illusion created by fast frames
- movie displays 24-30 fps
- bits store color and brightness data for each video frame
- retains image quality no matter how many times it is copied
- easily manipulated

Kinds of Digital Videos:

1. Desktop video: constructed and displayed using a personal computer
2. Web Based video: incorporated in web pages and accessed with a browser.
3. DVD video: used for commercial DVD's
4. PDA video: small format for ipod or phone

Creating Digital Video:
1. Produce video footage
2. Transfer video footage to a computer
3. Edit video footage
4. Store and play video
There is a pre production stage, production stage and post production stage
* post production captures video, downloads video from camcorder to computer, edit digital video and output video to different format.
* capturing video- must be in digital form to use multimedia application.

Source Device: camcorders and digital video cameras can be used to capture full motion images
Video Capture Device: video capture card needed
Connecting Leads: usb cable
Computer: download video and edit
Software: capture, edit, output
Video Capture Device... analog camcorder- need video capture card or digital camcorder- firewire connection.

Source Device Camcorder: camera recording- device for recording video images to use video in multimedia application.

Analog vs Digital:
* Analog: older, records electrical signal, picture looses quality though and video capture card needed
* Digital: newer, records binary code, advantage= no image degradation, plug video camera directly into computer, digital connections allow you to dump footage straight from camera to hard drive.
* Videotape cassette (digital tape), DVD disc (uses recordable DVD discs, hard disk drive (save to non removable hard drive disk), solid state media card (SD or memory card)

Viewing Images on TV: CRT Display vs Flat Panel Display
* CRT display: older technology, electron gun beam activates the dots our eyes see, interlacing affect
* Flat Panel display: plasma, progressive effect

Digital Advantage: higher resolution
Video Capture Card: needed to convert video from analog to digital for computer

Firewire: a means by which information can be sent from camcorder directly ro the computer (a lot of storage, high speed connection)

Benefits of Digital:
- no loss of quality
- no need for analog to digital conversion
- reduces problems such as drop outs
- archival storage
- quality of digital recordings is petter
- has cool features

For pics: RGB color used
For video: Y or UV (Y= luminance and UV= chrominance color/hue)

Color Sampling: numbers rep color sampling, averages out pixels to cut down on width for faster transfer rate
4:4:4
amount of y luminance= 4 samples
amount of U color or hue= 4 samples
amount of v color or hue= 4 samples
amount of compression= none

Video Editing:
* to edit digital video transfer videos in a series of short clips
* **Linear editing-** before digital camcorders
* **Non linear editing-** computer hard disk and video editing software
* Arrange video clips on timeline with video and audio tracks which overlay

Output Video:
- store in Raw format to edit, than edit and trim and than distribute

File Size is Dependent ON: lower frames per second, picture size dimension, color resolution, length of clip

Codecs: Spatial Compression vs. Temporal Compression
Spatial: within a frame compress each frame individually, uses same technique as JPG compression

Temporal: between frames, just save info on selected frames- keyframes, all other frames just save the difference from the previous frame, it is temporal good when difference between current frame and keyframe is small.

Compression Technology: reduces the file size for transfer or storage while maintaining quality
* Codecs- video compression programs. STORAGE- coded, VIEW- decoded

* electronically compress and decompress video and related data: ends in smaller file size, large amounts of info stored, streamed over internet in smaller packages but still looks good.

Codecs: speed up download

Video Transfer for the web:

HTTP: Hypertext Transfer Protocol- download video from host server to the users computer in its entirety, must wait for download process to end, video can be played repeatedly, suited for SMALL video clips.

RTSP: Real time streaming protocol- played directly from server, file played with some delay, video is broadcast to user and after discarded, suited for LARGE file and live broadcast.
* Streaming: process of taking a large video file and transmitting small, continuous amount of that file over a network- steady and continuous. Small buffer space though

Streaming: does not take up lot of space, little wait time, long videos, live videos
Downloadable media files: readily available independent server, higher image quality step through frame by frame.

Unicast: each user gets her own stream of video
Multicast: send the same stream to a bunch of users (but lose ability to pause and rewind)

Video for multimedia application:
* consider source, appropriateness, playback system, user control

Download (Progressive): files download to users computer than play (large files, long wait time, permanently on computer)

Progressive Download: click begins download, after a portion of download stars to play (delay, interruptions in watching, permanently on computer)

True Streaming: file is not downloaded at all, plays immediately (fast, reduces wait time, congestion on net can cause delay)

Lecture 11:
* Sound: record, process, deliver
* Sound= pressure waves of air, in waveforms with volume and pitch
* Source of sound can be pre packaged, purchased or borrowed, create own
* Sound is recorded with a microphone, analog to digital converter, sound CARD (transforms bits into music)

Quality of Digital Recording Depends on:

* sample rate, sample size, channels (MONO signal vs. Stereo Signal)
* Mono Signal- one stream of data reproduced equally on both speaker channels
* Stereo Signal: two streams of data work together
* Codecs: reduce audio file size, lossy compression
* higher sampling rate and larger file size= best audio

Sound File Formats:
* Aiff and wav= lossless
* mp3= lossy with medium quality
* .wma and mp4= lossy and allow for built in lock downs

MIDI: musical instrument digital interface (aka synthesized sound)
- contains instructions for creating pitch, volume and duration of notes that sould like various musical instruments.
- compact but not high quality

Downloadable Audio:
Advantages: once downloaded can be replayed, don't need special streaming
disadvantages: takes long time to download, takes up lots of space

Streamed Audio:
Advantages: plays immediately, consumes RAM only while being played
Disadvantages: can't rewind or pause, need special server to post it