codecycle

Computer Science 1033 – Week 8

ANIMATION

"Live action writers will give you a structure, but who the hell is talking about structure? Animation is closer to jazz than some kind of classical stage structure." → Ralph Bakshi

Textbook Readings for this Week

- Animation

Make sure you get a copy of all your work!

- Your assignment 2 and 3 websites will only be posted for the next month (till about ONE month after our final exam) so make sure you take a copy of everything you want to save and put it on a memory stick or in the cloud.
- ONE MONTH AFTER THE COURSE ENDS YOU WILL **NOT** BE ABLE TO GET ANYTHING YOU POSTED ON cs1033.gaul.csd.uwo.ca BACK. KEEP COPIES!

Good Review for Searching!

- https://www.youtube.com/watch?v=LVV_93mBfSU Lean[

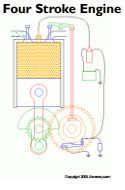
What is animation

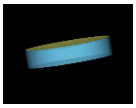
- A sequence of images that create the illusion of movement when played in succession.
- QUESTION: How does the illusion work, what is each still image called? A FRAME
- Here are some simple examples:



Why use animation?

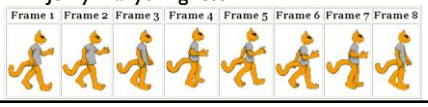
- Easier to show somebody how something works then to try and explain it.
- Also animation:
  - Indicate movement
  - Illustrate change over time
  - Visualize three-dimensional objects
  - Attracts attention




How does animation work?

- Simulation of movement through a series of pictures that have objects in slightly different positions
- Each drawing is called a ***frame*** (a snapshot of what's happening at a particular moment)
- Required Frames Per Second FPS:
  - Movies on film → 24 fps
  - TV →30 fps
    - 9000 frames for five minute cartoon
  - Computer animation → 12 to15 fps
- Jerky if anything less



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Sampling and Quantizing of Motion

- Since each frame is just an image →
  - Each frame is sampled into a discrete samples and each sample becomes a pixel → **Sampling process**
    - Remember:
      - More samples means better quality (same image represented in10 pixels by 10 pixels or in 200 pixels by 200 pixels)
      - More samples means bigger file sizes (10 pixels by 10 pixels vs 200 pixels by 200 pixels)
  - Each pixel gets assigned a colour, maybe just 2 colours(black and white→1bit colour) or maybe 16 million colour (24 bit colour) → **Quantization process**
- **Question**: What else can we "***Sample***" with MOTION?

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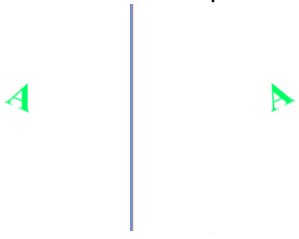
Frame Rate (Frames Per Second FPS)

- **Frame Rate**: indicates the playback speed of the animation in frames per second



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2-D Animation

- two types of 2-D animation:
  - **Cel Animation** (also called traditional animation, classical animation, hand-drawn animation, frame by frame animation)
  - **Path Based Animation**
- Both types still are made of frames:
  - The more frames per second, the more believable the movement will be.
  - The more frames per second, the bigger the final version of the movie file will be (more bytes)

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5 Types of Animation

- https://www.youtube.com/watch?v=NZbrdCAsYqU (start at 30 seconds)
  - Traditional Animation (**Cel Animation**)
    - Rotoscoping is one type
  - 2D Animation (**Path Based Animation**)
  - Computer Animation
  - Motion Graphics (this is what we will be doing, it uses Path Based Animation behind the scenes)
  - Stop Motion

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3-D Animation (Type of Computer Animation)

- 3-Dimension animation involves 3 steps:
  - Modelling
  - Rendering
  - Animating
- Demo

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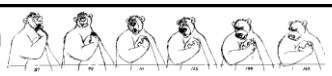
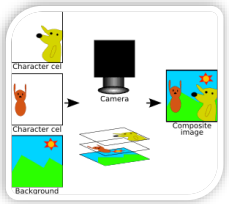
Cel Animation



- An animator must HAND draw every single frame!
- To simplify, one background is drawn and then the item that will move is drawn on a clear sheet of plastic (a cel), one drawing for each frame.
- When moving to the next scene, just change the background
- Traditional Animation (start at second 55)



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Path Based Animation

- Pick:
  - a starting point for an object, (start frame)
  - an ending point for an object (end frame)
  - a path for the object to follow
- And then the computer generated all the frames in between (called **TWEENING**), so that the artist doesn't have to draw the intermediate frames (like the artist did in cel based animation)

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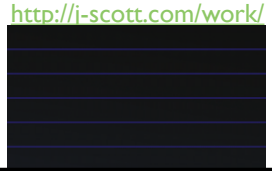
2-D Animation Terminology

- **Question**: What do these terms mean?
  - *Keyframe*
  - *Tweening*
  - *Onion Skinning*

- Some Inspiration → An amazing animator: http://j-scott.com/work/



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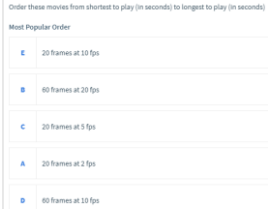
Path Based Animation

- **Question** If I have a 40 frame movie playing at 5 frames per second. how long will the movie be? ____ seconds
- **Question :**

A – 10 sec
B – 3 sec
C – 4 sec
D – 6 sec
E – 2 sec
ORDER: EBCDA



- **Question**: The path the object follows have to be a straight line, TRUE or FALSE?
- **Question**: What software allows us to do path based animation?

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Path Based Animation Software

- The software that generates the frames has features such as:
  - **Looping**
  - **Transition (Fade in and Fade out)**
  - **Repetitions** → allows the user to pick how many times the animation repeats
  - Setting the **Frames Per Second**
    - **Question:** What does a bigger FPS imply?

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What can we do to change the motion?

- **If the animation appears too slow, we can speed up the motion by:**
  - Reduce the number of frames (say pull out every other frame)

  OR
  - Increase the frame rate (go from 10fps to 20fps)
- Assume we have an animation is the 40 frames and our frame rate is 10 frames per second.
  - **QUESTION: how long will the animation be?** 4 seconds
  - **QUESTION: what happens to the movie if we pull out every other frame?** 2 seconds – 20 frames now and file size will be ~ ½
  - **QUESTION: what happens if we go from 10fps to 20fps?** 2 seconds – no change to original file size because same number of frames

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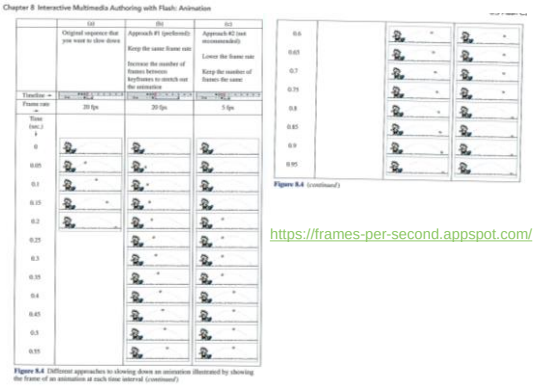
Slowing down the motion by adding more frames

- Assume now that the motion is a bit too fast, 2 ways to slow it down:
  - **Way 1:Add more frames:**
    - Keep the frame rate the same
    - Increase the number of frames between the keyframes to stretch out the animation
  - **Way 2: Lower the frame rate (go from 20fps to 5fps)**
    - Keep the same number of frames as original but stretches out movie
  - Original Clip has 5 frames, at 20 fps, so finishes playing at 0.2 seconds, too fast!
    - **Way 1**: still have 20 fps, but add in extra frames between, now have 20 frames
    - **Way 2:** holds frame on screen for 0.2 seconds, then moves to frame 2, on screen for 0.2 second, etc….

- **Question**: What is wrong with Way (c)?



https://frames-per-second.appspot.com/

From the text book: Digital Media Primer by Yue-Ling Wong

Cel Animation vs. Path Based Animation

Figure 8.3a shows a simple nine-frame animation of a bird flying. The visual content of all nine frames are explicitly placed. Figure 8.3b shows an example of a tweened animation, which is discussed next.

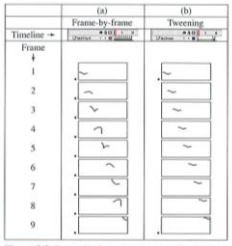
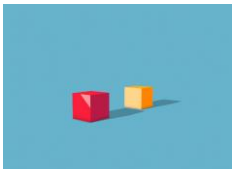


Figure 8.3 Frame-by-frame versus tweening showing the • next to the image frame to indicate that the image is created manually (a) Frame-by-frame (b) Tweening

From the text book: Digital Media Primer by Yue-Ling Wong

5 Tips to Create Realistic Motion

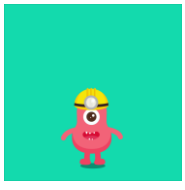
- **Question: which object is heavier? How do you know this?** How did the artist achieve this?
- Timing



- **Question**: How does the artist show the speed with the poker chips? What is Ease?

- **Slow Out)** in your animation software → hEaseqbKhY

- **Question**:What do you notice about the movement of the helmet compared to the body in this image?



- **Question**: What do you think the box is about to do? What term do we use when we think something is about to happen?

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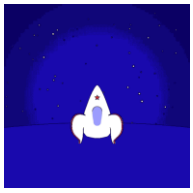
- **Question**: What is interesting about the shape of this rocket as it starts and stops? What terms would you use to describe this? What other common object do we often use to display this phenomena?



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Where can you get animation?

- Purchase CDs or buy off the Internet or get free clipart on the Internet, for example:
  - https://classroomclipart.com/clipart/Animations.htm
- OR, you can create your own:
  - Animated Gifs can be create in Photoshop or in other software tools
  - Using Flash
- We will look at different file types of animation:
  - Animated gifs (.gif)
  - Flash Animations (.swf)
  - PowerPoint Animations (.mp4)

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Animated GIFS

- **Question**: What do you think the file size of an animated gif is affected by:

- **Question**: What do you think is the maximum number of colours you can have in an animated gif?
- **No Plug-ins Required:** Animated GIFs require no plug-ins, and the authoring tools to create them are often free and easy to learn.
- **No Sound:** If you need sound in addition to motion, you cannot use an animated GIF by itself. Instead, you may want to consider other animation alternatives, such as Flash, or even video

Plug-in: A program that permits web browser to access and execute files that the browser would not normally recognize. Flash uses Shockwave

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As of fall 2019, we are using PowerPoint to do our animations:

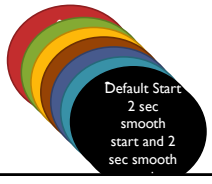
- First decide on how to create the animation:
  - To make an object arrives
  - To emphasis an object while it is still there
  - To make an object leave
  - To make an object follow a path

Ease in/Ease Out (Smooth Start/End) and Bounce End

- Smooth Start – makes it start slowly (ease in)
- Smooth End – makes it end slowly (ease out)
- Smooth Start + Smooth End <= Duration
- How to make a ball bounce in PowerPoint

Smooth Start – slow at the beginning, gets quicker at that end

Smooth End – starts quickly but slows down at the end



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Regular Smooth Start Smooth End Bounce

Control your Timing and Duration

When motion path (ghosted shape) has a green circle (start) or red **circle** (end), motion is selected. When motion path has a green **triangle** (start) or red triangle (end), motion is NOT selected.

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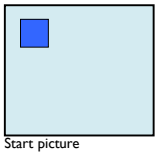
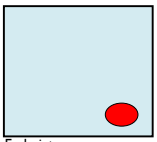
Tweening in Action

- **QUESTION:** Suppose we had the following starting picture and the given ending picture, what **THREE** things do you think you would have to consider in order to make it appear animated but it should have a smooth animation, not jerky?
- **QUESTION**: What colour will the tween frames be?



Start picture



End picture

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3 Things All Happening At Once:

- **Tweening**: Creating the intermediate frames based on the starting keyframe and ending keyframe. In the above case, the tweening operation needs to create frames that are doing 3 things all at once:
  1. Going from a **square** to a **circle**
  2. Going from the **top left corner** to the **bottom right corner** (following a path)
  3. Going from **blue** to **red** (so it MUST go through purple in order for the transition to look smooth)

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Try it yourself in PowerPoint

Both of these shapes start at blue but the left one morphs to red and the right one morphs to green. Before pushing play, try to figure out which colours each oval must go through to get to its ending colour. Then try it out in PowerPoint

Starts at blue, morphs to red

Starts at blue, morphs to yellow

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Laura's first venture into the world of PowerPoint Animation ☺

- First time I tried PowerPoint and this happened ☹ (can you see the problem?)

Comparing File Types:

	Animated GIF	Flash	Photoshop	PowerPoint
Created by	Depends	Adobe	Adobe	Microsoft
Extension	Source depends .gif (movie)	.fla (source) .swf (movie) .gif (Flash can make gifs too!)	.psd (source) .mp4 OR .gif	.ppt (source) .mp4 (final version)
File Size	Larger than normal gif	Vector images take up less space than GIF bitmapped images	Fairly large (.mp4 files are compressed but still large)	Fairly large (.mp4 files are compressed but still large)
Need to play it	Nothing	Flash Player (Free – used to work with most browsers but now it is not supported in Chrome and Safari)	No plugin for .gif and most browsers can now play .mp4	No plug in required for .mp4 anymore

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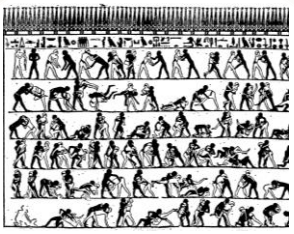


Ancient Egypt Mural attempting to depict movement (4000 years old)

History of Animation:
→ early cave drawings show animals with 8 legs (trying to show animal moving)
→ **1868** – Flip book patented
→ **1877** - Praxinoscope Cylinder containing slits that when spun gave the illusion of movement
→ **1892** - Reynaud showed how he could use 12 pictures and loop the pictures. He had 500 frames using something similar to the modern film projector
→ **1898** – **Stop motion** animation introduced

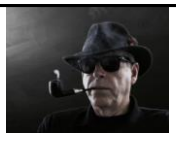
Gertie The Dinosaur

1906 → Blacktons makes "The Humorous Phases of Funny Faces" using a blackboard and frame by frame shots
1914 → McCay makes "Gertie the Dinosaur", the first successful character animation
1928 → Walt Disney uses sound and animation in Steamboat Willie
1937 → first full length feature animation movie: Snow White

Chris Griffin

1960 → first prime time animation TV Show debuted **Question:** What was it?
Question: What is the longest running animation prime time show
1982 → Star Trek, The Wrath of Khan includes computer generated effects. TRON, a Disney animation includes 15 minutes of computer generated scenes
1986 → Take On Me by aha, creates much hyped video that uses **rotoscoping** (pencil-sketch animation/live-action combination)
1995 → **Question:** What was the first full length completely computer generated animation movie released?
Question: What is the highest grossing animated film of all time?
2011 → **Cinemagraphs** are invented…

Cinemagraphs



- Introduced in 2011
- Sample One
- Usually stored as animated .gif
- To create one you will need BOTH a still picture and a video
- Sample Two
- Laura's first tries at Cinemagraphs

- Finally, for the major assignment, you must create an animation. Here is a previous one to inspire you!
  - Cute major from a former year:

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