**P5 – Animation for the Web**

There are numerous factors that need to be considered when making animations for the web, including the following.

**Size**  
Animations on the web are files, and therefore have a file size. The larger the file is, the longer it will take for a viewer to download. The size of the animation will depend on many factors, such as length, resolution, colour depth and format.  
The most common format for short animations is .GIF, or Graphics Interchangeable Format. This can show a series of images at any framerate or resolution, but is generally used for 24 FPS content at 480p or less. Animations in GIFS tend to be short, perhaps 6 – 12 seconds, and loop.  
Another very common format is .swf, or Flash animation. These are animations that are created in Adobe Flash. They can be played online, and can be interactive, but complex animations may be resource intensive to run and have large file sizes.  
The next most common format are the variety of digital video formats, such as .mp4, .AVI and .MOV. These can all be played in browsers, or uploaded to streaming sites like YouTube. The size of the resulting file will vary with format, length and compression ratio, but can have very high quality and audio, as well as supporting playback on almost all devices.

**Email Attachment**  
Email is one of the most commonly used forms of communications, so animations are often sent by email, such as within an animation studio.  
Email attachments have a maximum size of 25MB, so any animation sent this way must be under this length.  
Luckily, for most short animations (a few minutes), common video formats like .mp4 will be under this size at standard resolutions.  
For very long videos, or high resolutions/framerates, it may be necessary to compress the file to make it smaller. A common way of this doing is to use a .ZIP folder. A .ZIP folder is a special type of folder that losslessly compresses its contents by up to 30%.  
Another way to compress video is to re-encode it. This can change the colour depth, framerate to adjust the size of the file. This way, a smaller of version of the animation can be emailed for review purposes, and the original video can still be used for release.

**E-Cards**E-cards are a way of sending virtual cards via email, and in some cases, any messaging service.  
An E-card is an interactive animation sent in place of a physical card. It usually tells a simple story, or displays a message in an interesting way. One example is a birthday E-card which displays a message once the recipient has clicked on all the candles on a picture of a birthday cake to blow them out.  
E-cards are usually flash animations. To fit inside the email, it may be embedded using an <iFrame> HTML element.  
If the E-card is not embedded in the email, users can also send a link to the recipient, which will direct them to a page on the E-card site with their website. This is useful for messengers that do not support HTML and Flash.

**House Style**  
A company or studio that produces animations is known as an ‘animation house’. A famous example would be Studio Ghibli, which produce anime movies, such as *Spirited Away.*  
Animations houses are usually recognisable by the art style, or ‘house style’ – features unique to that animation house.  
Some animation houses produce very simple, or very short animations. An example of a studio that does this is TurboPunch, an animation studio that produces 2-3 minute animated comedy sketches. They have a simple art style, and the videos are not very long. They host their content on YouTube, and make money from advertisements and merchandising.  
Larger studios, such as Studio Ghibli, cannot use this business approach, as hosting with a third-party company is not profitable. Instead, they sell their movies on DVD.

**M3 – Minimising File Sizes**

While sending or hosting animations on the internet is one reason to try and reduce file size, there are many ways to minify files outside of animation and the internet. Here I will discuss them.

**Resolution**  
Video is a sequence of frames. Each frame is a picture, and a picture has a certain size – its resolution, or the number of pixels that make up the image. This is measured in width \* height, so if an image is 1920 \* 1080 pixels, then ‘1920 \* 1080’ is its resolution. Units are not specified, because the image can be resized, and pixel size will vary with the display it is shown on (1920\*1080 displays can be anywhere from 6 to 50 inches diagonally).  
Instead, the resolution is an indicator of the image quality and file size. Smaller resolutions look bad when displayed at large sizes (upscaled), and high-res images have larger file sizes.  
Because animation is made of pictures, resolution is also used to specify video quality and size. The height of the image is used as shorthand for the quality – 1920 \* 1080 is 1080p (the ‘p’ stands for progressive, a display format used on old CRT displays), 720 \* 480 is 480p, and so on.  
720p is the minimum ‘high definition’ resolution. It generally looks good at sizes of up to 20 inches, and larger sizes if the viewer is further from the screen.  
1080p is the HD standard. Most TVs and newer displays have this resolution, and it can be upscaled to 50 inches or more.  
4k and 8k are the newest HD resolutions, at 4 or 8 times 1080p. These require dedicated graphics hardware to use.  
720p is standard for most animation, as it is a good balance between quality and the resulting file size. However, 1080p or 4k may be preferable for movies and higher quality projects.  
Ultimately, it is up to the producer to decide whether file size or quality is more important. Often, multiple versions of an animation will be released.

**Framerate**Framerate is how many frames are displayed per second. For camera footage, a minimum of 24FPS is needed to trick they brain into seeing fluid motion – any less and the video will become ‘jerky’ and appear to stutter.  
For this reason, 24FPS is also considered a minimum in animation. However, in some cases, different framerates are required or useful.  
The human eye can differentiate between various FPS’s below around 250FPS– the lower the FPS, the easier it is to differentiate between small differences. The difference between 24 and 30, or 30 and 60 is obvious to most viewers, but the difference between 60 and 90 is less obvious, despite being the same as the difference between 30 and 60. This is because different parts of the eye react to light at different speeds. The centre of the eye can see in the most detail, but reacts slowly and needs more light. The edge of the eye (your peripheral vision) sees in greyscale with far less detail, but can see at up to 300FPS, and detect tiny amounts of light.  
So for any motion that mimics real life, such as walking, talking, driving, throwing objects, and other day-to-day activities, it is best to represent them at 24FPS. Some slower motions, such as clouds moving across a sky, can be done at lower framerates, and it will not be noticeable.  
For fast movement and actions scenes, higher framerates make the motion look more fluid and detailed. While films still show action at 24FPS, animation may use framerates up to 60.  
An advantage of animation over real footage is that framerate can change at any time. Slower scenes can use lower framerates, and action scenes can use higher framerates, and a consistent viewing experience is maintained.  
Framerate affects the size of a file containing an animation – higher framerates include more images, so result in larger files than animations of the same length and resolution at lower framerates.  
A variable framerate is preferable, as it gives the best viewer experience with the smallest file sizes.

**Colour Depth**The ‘depth’ of colour is how much data is used to store it. For example, if one byte (8 binary bits) is used to store the colour value, each pixel can have up to 256 colours. The higher the colour depth, the more accurate the colours in the frame are, and the more data is needed to store it. 24 bits can encode all 16.7 million colours that the human eye can distinguish, and is called ‘true colour’. Animations with simpler colour palettes can use much lower colour depths.

**Codec**A video codec specifies how the raw data that makes up a video is stored. It determines all properties of the video, from resolution to colour depth, and the audio properties too (if there is any).  
The codec also specifies the type of compression. Two common types of compression are run-length encoding and frame difference encoding. In run length encoding, patterns of pixels, such as shapes and large areas of the same colour, are stored in a different way that takes less space. This works well with animation, but not so much with actual footage, as each frame is more complex. Frame difference encoding only stores the difference between frames – it assumes the current frame is the same as the previous frame, and stores the difference between them. This is a very efficient method for animation because often large portions of the scene will be static. This is commonly used for streaming video, but can reduce quality at high framerates.

**Frame Dropping**Similar to a variable framerate, some compression algorithms can identify frames that are visually similar, and discards some of them. Reducing framerate this way makes the file smaller, particularly for videos with lots of similar frames, but can negatively impact quality if the compression is too aggressive.