**11.1: P1 – Characteristics and Methods of Processing Graphics and Animations**

**Digital Image:**

* **Raster** –
  + Resolution – measurement of monitors height x width.
  + Bit depth – how many colours are in a pixel.
  + Compression (lossy, lossless) – lossy, remover unnecessary data. Lossless, breaks it into a smaller form and puts it back together.
* **Vector** –
  + Geometrical primitives (point, lines, curves, polygons) – basic, simple shapes
  + Paths (splines) – a line that connects control points together
  + Voxel – A 3d pixel, has x y z coords.
* **Saving Methods:** 
  + How are raster graphics saved? JPG, GIF - jpeg supports up to 24-bit colour and is compressed using lossy compression. is commonly used for storing digital photos and web graphics. - JPG compression works by identifying similar areas of colour inside the image and converting them to actually the same colour code, and storing all one colour together. If you have an image that is 24-bit colour this means each pixel of the image should be able to store the colour value out of 16,777,216 colours. This might take lots of space, especially in images with a lot of different colours. Humans are unable to really see differences between all of the 16,777,216 colours; JPG compression takes advantage of this. The algorithm scans the image, and identifies the parts of the image that might be classed as same colour by the human eye.

Gif use lossless compression that does not degrade the quality of the image. They store image data using indexed colour, meaning a standard GIF image can include a maximum of 256 colours. It works by reading a sequence of symbols, grouping the symbols into strings, and converting the strings into codes, it also uses a code table. Codes 0-255 in the code table are always assigned to represent single bytes from the input file. When encoding begins the code table contains only the first 256 entries, with the remainder of the table being blanks. Compression is achieved by using codes 256 through 4095 to represent sequences of bytes. It identifies repeated sequences in the data, and adds them to the code table. Decoding is achieved by taking each code from the compressed file and translating it through the code table to find what character or characters it represents.

* + How are vector files saved? - It works by dividing a large set of points (vectors) into groups having approximately the same number of points closest to them. Each group is represented by its centroid point. Since data points are represented by the index of their closest centroid, commonly occurring data have low error, and rare data high error. It can also be used for lossy data correction and density estimation.

**3D images (Coordinate systems):**

* Geometrical primitives (points, lines, voxel) – made up of points, lines that allow you to change the shape / appearance.
* 3D viewport – can change the angle you view a 3d object from.
* Camera – the POV you view the model from.
* Saving Methods:
  + How are 3D images saved?
  + OBJ - a simple data-format that represents 3D geometry alone — namely, the position of each vertex, the UV position of each texture coordinate vertex, vertex normals, and the faces that make each polygon defined as a list of vertices, and texture vertices
  + 3DS - a 3D image format that contains mesh data, material attributes, bitmap references, smoothing group data, viewport configurations, camera locations, and lighting information. 3DS files may also include object animation data.
  + STL - STL has several backronyms such as "Standard Triangle Language" and "Standard Tessellation Language".

**Animation:**

* Keyframes - a drawing that defines the starting and ending points of any smooth transition.
* Tweening - generating intermediate frames between two images, called key frames, to give the appearance that the first image evolves smoothly into the second image.
* Motion capture - recording the movement of objects or people.
* Wire Frame – viewing option that allows you to se an object in skeletal mode
* Coordinate systems (2D and 3D) - used to specify all locations in 2D or 3D space.
* Environmental Physics – simulation of the environment.
* Behavioural Animation - In behavioral animation an autonomous character determines its own actions, at least to a certain extent.
* Saving Methods:
  + How are animations saved?
  + SWF - an Adobe flash file format which contains videos and vector-based animations. The full abbreviation of SWF is Small Web Format but sometimes it is referred as Shockwave Format.
  + APNG - an extension to the Portable Network Graphics (PNG) specification. It allows for animated PNG files that work similarly to animated GIF files, while supporting 24-bit images and 8-bit transparency not available for GIFs.
  + FLA - a program used to draw and publish interactive animations. It contains graphics, video, text elements, audio, and other assets. FLA files are often saved as. SWF files for use on the web as they are viewable in most web browsers with the Flash plugin.