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Learning aim A

Investigate the purpose and characteristics of digital graphics that are an important part of visual communications.

Unit 17 2d & 3D Graphics

Assignment 1

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# Introduction

This report will aim to discuss all the available aspects of digital graphics listed below including, but not limited to, the impact on usability and accuracy of graphics, the evaluation of technical characteristics of digital graphics and how they impact their purpose, and discussing how different factors of technical characteristics can impact different aspects of successful products, such as quality, scalability, and many more.

# Purpose of digital graphics

Digital graphics has grown throughout the 21st century, where previously the dominant graphic types were all hand made and there was minimal involvement of computers in making any kind of graphics. As such, the purpose of digital graphics has also evolved and there remains a few key points that must be included when discussing the purpose of digital graphics.

Digital graphics, just like any other kind of media, has the specific purpose to visually convey information, messages, and a meaning to an audience, through the use of computer-generated images, designs, or illustrations. These images have a number of uses, most notably the following, to educate, information, promotion, advertising, and entertainment.

# Legal requirements of digital graphics

There are a number of legal nuances that digital graphics, or any kind of media, have to follow and keep in mind in order to make sure that they do not breach any of these. The most notable ones that must be considered include:

* Human Rights Act (1998) including
  + Protection of property
  + Freedom from torture & inhumane/degrade treatment
  + Freedom from slavery/forced labour
  + Right to liberty and security
  + Respect for your family and private life
  + Freedom of expression
  + Protection from discrimination
* Copyright, Designs and Patents Act 1988 (CDPA).
* Trade Marks Act 1994
* Patents Act 1977
* Defamation Act 2013
* Consumer Rights Act 2015

It is crucial to consider these laws governing digital graphics as they work to safeguard the rights of individuals and organizations and ensure that those who develop them do so in a legally and ethically correct manner.

For instance, privacy law helps to protect individuals to ensure that their personal information is not exploited and used against them, in a manner that could be detrimental to them. Defamation laws exist to shield the reputations of individuals and organisations by guaranteeing that false, misleading, or damaging statements are made regarding them. Additionally, consumer laws help to protect consumers and make sure that they are not misled or exploited by businesses.

To continue, copyright legislation ensures that authors and artists receive fair compensation for their work, thereby promoting the protection of their rights. Trademark law helps to prevent confusion among consumers by ensuring that trademarks are used properly and only by authorized parties. Patent law helps to protect the rights of inventors by ensuring that they are properly compensated for their inventions.

Through following these legislations and laws, digital graphics creators, alongside with consumers, can continue to produce and consume content guilt free with peace of mind.

# Digital graphics

There are two primary versions of digital graphics that are used within 2D and 3D graphics. These are raster graphics and vector graphics which will both be discussed and compared below.

## Raster

Raster graphics are digital images that are made up of a large number of pixels. Every pixel in a raster image has a value that represents its colour and all together these come to make a complete graphic.

Raster graphics, unlike vector graphics, are made using pixels and therefore resolution dependent. This means that if an image is scaled up or down, the quality of the image will decrease or increase respectively due to the number of pixels being used to display the image being stretched or shrunk. When enlarged, pixels often become clearly visible, and it is easy to tell and differentiate individual pixels.

There are a number of raster graphics principles and they each serve their own important purpose. These are;

* 2D arrays – This is where each pixel in the array is designated a colour value and serves to portray that colour.
* Resolution/Dimensions – This determines the number of pixels in an image, which in turn, determines the quality of the image.
* Sampling – This is the process of getting a number of specific values from a function, map, and image.
* Bit depth – This is where the number of bits are determined for each pixel and helps to determine how many colours are able to be used in the image.
* Colour modes – This determines how colours are represented in the image.

### Applications

Common applications of raster graphics are things like web graphics, digital paintings, game assets, print advertising, packaging, textures and patterns, and finally logos and icons. The main reason that raster graphics is due to their ability to accurately represent complex and detailed images. This allows them to be used to situations where there is a high level of detail involved, which could be considered contrary to their limitations of being resolution dependent.

Furthermore, raster graphics are also highly compatible with a large variety of software and hardware, making it readily accessible to a larger audience and therefore increasing its consumption/usage. Many devices and programs are designed to interact with raster images and therefore raster graphics are commonly used in several scenarios, ranging from the previously mentioned fields such as web graphics and game design.

Finally, they are also commonly used in scenarios where the images are unlikely to be resized as this is one of the biggest limitations of raster graphics. If there is a situation where it is highly unlikely that the raster graphics will need to be resized then it is more likely that they will be used in this situation as they will be highly compatible.

## Vector

Vector graphics are digital graphics that are created using mathematical equations and are notorious for being completely opposite to the basic idea of raster graphics. This means that, while raster graphics rely on pixels and can be scaled into lower quality, the nature of vector graphics using mathematical equations to make graphics means that it is able to scale up without the loss of any quality. These are created using geometric shapes such as points, lines, curves, and polygons. The secret to the scalability lies in the fact that the mathematical equations designed to create the images will simply be recalculated based on the new design, allowing for scalability.

Some of the core vector principles include:

* Geometrical primitives – This refers to the aforementioned points, lines, curves, and polygons and can be manipulated in order to create complex shapes and designs.
* Nodes – This is the point where lines and curves of an image meet, and nodes are commonly used to adjust the shape of an image.
* Paths – Paths are made up of lines and curves and are used to connect different nodes together, just like the name mentions, creating a path between the two nodes.
* Voxel – A voxel in 3D vector graphics is a term used to refer to a point being represented in space.

### Applications

Some core applications of vector graphics is often in many different fields including, but not limited to, graphic design, engineering, web design, fashion, and architecture.

Contrary to raster graphics, the reason that these fields commonly use vector graphics is due to the innate ability to scale up or down without the compromise of losing quality. This ability is key in some fields, like engineering or architecture, and therefore is a crucial application of vector graphics.

Additionally, the fine and precise control over vector graphics, through the use of nodes, paths, geometric primitives, and voxels, means that vector graphics allow an intimate control over design elements that allow the designers to create and adjust complex graphics with much ease, unlike raster graphics.

This large flexibility and fine control ability has led to vector graphics being essential in many different industries in the modern world, and it continues to be at the forefront of graphics alongside raster graphics.

## Principles of 3D images

There are three main principles involved in 3D images. These are discussed below.

Geometric theory is the use of mathematics, similar to vector graphics in that regard, in order to define and utilise 3D objects inside of a digital image/space. Geometric theory provides the equipment in order to create 3D objects through different mathematical aspects such as positions, orientation, and shape. Geometric theory is essential for creating realistic and accurate digital models that can be further manipulated using the other key principles in order to produce a final finished product.

Mesh construction is the creation of a 3D mesh which, in very simple terms, is a collection of different vertices, faces and edges. These 3 different aspects define the structure and shape of a 3D object and are critical. Construction of a mesh is usually done using a 3D modelling software, such as blender, however it can also be achieved manually, and similarly to before, is essential in creating accurate 3D models.

Finally, rendering is the process of converting a 3D model into a 3D image, which involves the other different aspects of the 3D model including, but not limited to, lighting, shadows, and textures. Rendering is what truly allows a realistic image to be created and can be done either in real time, such as during playing games, or beforehand such as during film and video production as in these scenarios it is often a time intensive process. For example, when creating a 3D model, the textures for the 3D model will have to be rendered separately and often times, the texture will have to be reapplied afterwards onto the model. This is often done by “baking” the 3D texture onto a 2D texture map.

These three different principles combined allow for high quality 3D models to be created and used in modern environment, such as video games or film and animation.

### Applications of 3D images

3D images have a wide variety of applications amongst the many various industries out there. They are commonly used to create realistic – and sometimes interactive – models of landscapes that serve a variety of purposes, such as planning and entertainment. Additionally, 3D graphics are used extensively in video games in order to enhance the user experience while playing the game, by providing realistic game features in order to further immerse the player into the game and allow them the sensation of feeling like they are truly there or involved. To further expand computer games, 3D graphics are used heavily in the production and usage of virtual reality environments that can be made immersive and interactive with the right 3D graphics/models.

Furthermore, 3D graphics are also used in the entertainment industry, such as animation for films and TV, allowing for 3D characters and environments to be introduced into the chosen media. To add on this, 3D graphics are essential for the production of realistic and detailed effects for special effects such as explosions or other video effects.

## Impact of 2D and 3D Digital graphic representation principles

# Hardware

## Capture

## Graphics card

## Output

# Software

## Applications for manipulating graphics