

UNIVERSITÀ DELLA SVIZZERA ITALIANA

FACULTY OF COMPUTER SCIENCE

Master in Artificial Intelligence

Topic: Computer Graphics

By Heider Jeffer

14 December - 20 December 2014

Instructor: Prof. Mehdi Jazayeri

Aassistant: Sasˇa Nesˇic´

Speaker: Prof. Kai Hormann

# Summary

Computer graphics are graphics created using computers and, more generally, the representation and manipulation of image data by a computer. The development of computer graphics, simply referred to as CG, has made computers easier to interact with, and better for understanding and interpreting many types of data. Developments in computer graphics have had a profound impact on many types of media and have revolutionized the animation and video game industry.

The term computer graphics has been used in a broad sense to describe” almost everything on computers that is not text or sound, Typically, the term computer graphics refers to several different things:

“The representation and manipulation of image data by a computer the various technologies used to create and manipulate images the images so produced, and the sub-field of computer science which studies methods for digitally synthesizing and manipulating visual content.”

Today, computers and computer-generated images touch many aspects of our daily life. Computer imagery is found on television, in newspapers, for example in their weather reports, or for example in all kinds of medical investigations and surgical procedures. A well-constructed graph can present complex statistics in a form that is easier to understand and interpret.

In the media “such graphs are used to illustrate papers, reports, theses”, and other presentation material. Many powerful tools have been developed to visualize data. Computer-generated imagery can be categorized into several different types: 2D, 3D, and animated graphics. As technology has improved, 3D computer graphics have become more common, but 2D computer graphics are still widely used.

Computer graphics has emerged as a sub-field of computer science that studies methods for digitally synthesizing and manipulating visual content. Over the past decade, other specialized fields have been developed like information visualization, and scientific visualization more concerned with “the visualization of three-dimensional phenomena (architectural, meteorological, medical, biological, etc.), where the emphasis is on realistic renderings of volumes, surfaces, illumination sources, and so forth, perhaps with a dynamic (time) component”.

# 2D computer graphics

2D computer graphics are the computer-based generation of digital images mostly from two-dimensional models, such as 2D geometric models, text, and digital images, and by techniques specific to them. The word may stand for the branch of computer science that comprises such techniques, or for the models themselves.

# Pixel art

Pixel art is a form of digital art, created through the use of raster graphics software, where images are edited on the pixel level. Graphics in most old (or relatively limited) computer and video games, graphing calculator games, and many mobile phone games are mostly pixel art.

# Vector graphics

Vector graphics formats are complementary to raster graphics, which is the representation of images as an array of pixels, as it is typically used for the representation of photographic images. There are instances when working with vector tools and formats is best practice, and instances when working with raster tools and formats is best practice. There are times when both formats come together. An understanding of the advantages and limitations of each technology and the relationship between them is most likely to result in the efficient and effective use of tools.

# 3-D computer graphics

3D computer graphics in contrast to 2D computer graphics are graphics that use a three-dimensional representation of geometric data that is stored in the computer to perform calculations and render 2D images. Such images may be for later display or real-time viewing. Despite these differences, 3D computer graphics rely on many of the same algorithms as 2D computer vector graphics in the wireframe model and 2D computer raster graphics in the final rendered display. 3D is occasionally blurred; 2D applications may use 3D techniques to achieve effects such as lighting, and primarily 3D may use 2D rendering techniques.

# Computer animation

Computer animation is the art of creating moving images via the use of computers. It is a subfield of computer graphics and animation. Increasingly it is created using 3D computer graphics, though 2D computer graphics are still widely used for stylistic, low bandwidth, and faster real-time rendering needs. Sometimes the target of the animation is the computer itself, but sometimes the target is another medium, such as film. It is also referred to as CGI (Computer-generated imagery or computer-generated imaging), especially when used in films.