Computer Application

Email (ghadeer.haider@uomus.edu.iq)

Al-Mustaqbal University
Department (Department of Prosthetics & Orthotics Engineering)
Class (third)
Subject (**Computer Application**)
Lecturer (Asst.Lec.Ghadeer Haider Abbas)
٥st term – Lect.٢ (Computer graphics)

Introduction:

Computer graphics

Refers to a technology that generates images on a computer screen. As you seek to understand it better, it can be helpful to think of computer graphics as the intersection of design and computer science. Digital photography, film and television, video games, and electronic devices rely on computer-generated graphics to create engaging displays.

Computer Graphics including digital images, animations, and interactive graphics used in various sectors such as entertainment, education, scientific visualization, and virtual reality. Computer Graphics can be used in UI design, rendering, geometric objects, animation, and many more. In most areas, computer graphics is an abbreviation of CG.

Computer Graphics refers to several things

- The manipulation and the representation of the image or the data in a graphical manner.
- Various technologies are required for the creation and manipulation.
- Digital synthesis and its manipulation.

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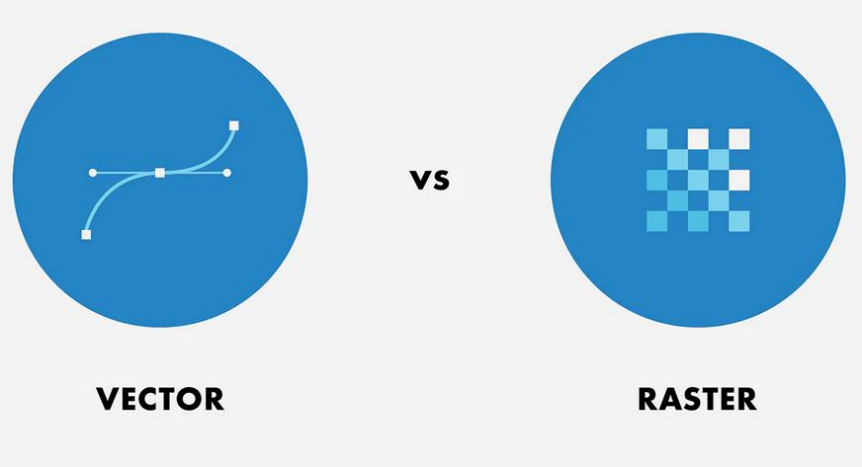
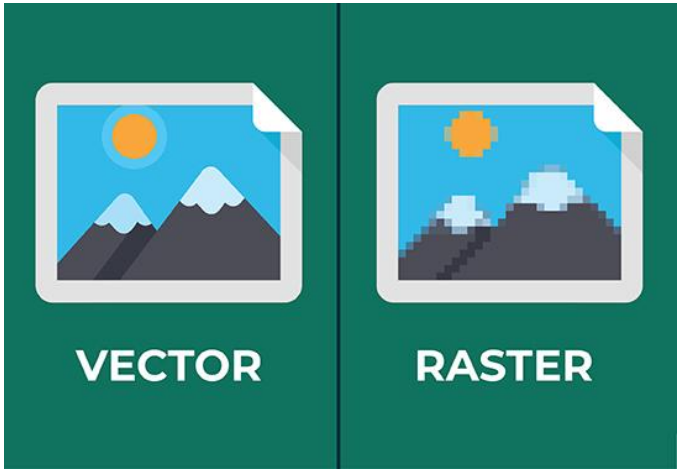
Types of Computer Graphics

- **Raster Graphics:** In raster, graphics pixels are used for an image to be drawn. It is also known as a bitmap image in which a sequence of images is into smaller pixels. Basically, a bitmap indicates a large number of pixels together.
- **Vector Graphics:** In vector graphics , mathematical formulae are used to draw different types of shapes, lines, objects, and so on.





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How To Get Started in Computer Graphics

Step by step process to getting started with computer graphics-

Step-١: Understaind the basics

Learn the fundamental and basics of computer graphics such as rendering, shading, animation, and modeling. Learn basic concepts of mathematics like linear algebra, geometry, and calculus as well as basic principles of physics that support computer graphics.

Step-٢: **Choose Your Area of Interest**

Choose your area of interest like ٢D-Graphics, ٣D-Graphics, Animation, and special effect (VFX).

Step-٣: Learn Programming

Learn programming language that is used in graphics, such as Python, C++, and JavaScript. Learn about Graphics Libraries and APIs like OpenGL, Vulkan, DirectX, and frameworks like WebGL that is used in web based graphics.

Step-٤: **Use Graphics Software**

Learn about modeling and animation tools such as **Blender**, **Autodesk Maya**, or **٣ds Max** for ٣D modeling and animation. Learn about ٢D-Graphics software like Adobe Photoshop, Illustrator, and GIMP.

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Step-٥: **Study and Practice**

Take online courses and tutorials, many institution offer Computer Graphics course like Coursera, Udemy, and Khan Academy. And read textbooks like "Computer Graphics: Principles and Practice" by John F. Hughes. Now, Starts with simple projects, such as creating basic shapes and gradually move on to more complex scenes and animations.

The Graphics Pipeline: A series of steps involved in generating an image, including:

- Modeling: Creating the digital objects and scenes.
- Rendering: Calculating the final image based on the model, lighting, and viewpoint.
- Displaying: Showing the finished image on a screen.

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Image display

Images have high information content, both in terms of information theory (i.e., the number of bits required to represent images) and in terms of semantics (i.e., the meaning that images can convey to the viewer). Because of the importance of images in any domain in which complex information is displayed or manipulated, and also because of the high expectations that consumers have of image quality, computer graphics have always placed heavy demands on computer hardware and software.

٣-D rendering

Although used for display, bitmaps are not appropriate for most computational tasks, which need a three-dimensional representation of the objects composing the image. One standard benchmark for the rendering of computer models into graphical images is the Utah Teapot, created at the University of Utah in ١٩٧٥.

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Shading and texturing

Visual appearance includes more than just shape and colour; texture and surface finish (e.g., matte, satin, glossy) also must be accurately modeled. The effects that these attributes have on an object's appearance depend in turn on the illumination, which may be diffuse, from a single source, or both. There are several approaches to rendering the interaction of light with surfaces. The simplest shading techniques are flat, Gouraud, and Phong. In flat shading, no textures are used and only one colour tone is used for the entire object, with different amounts of white or black added to each face of the object to simulate shading. The resulting model appears flat and unrealistic. In Gouraud shading, textures may be used (such as wood, stone, stucco, and so forth); each edge of the object is given a colour that factors in lighting, and the computer interpolates (calculates intermediate values) to create a smooth gradient over each face. This results in a much more realistic image. Modern computer graphics systems can render Gouraud images in real time. In Phong shading each pixel takes into account any texture and all light sources. It generally gives more realistic results but is somewhat slower.

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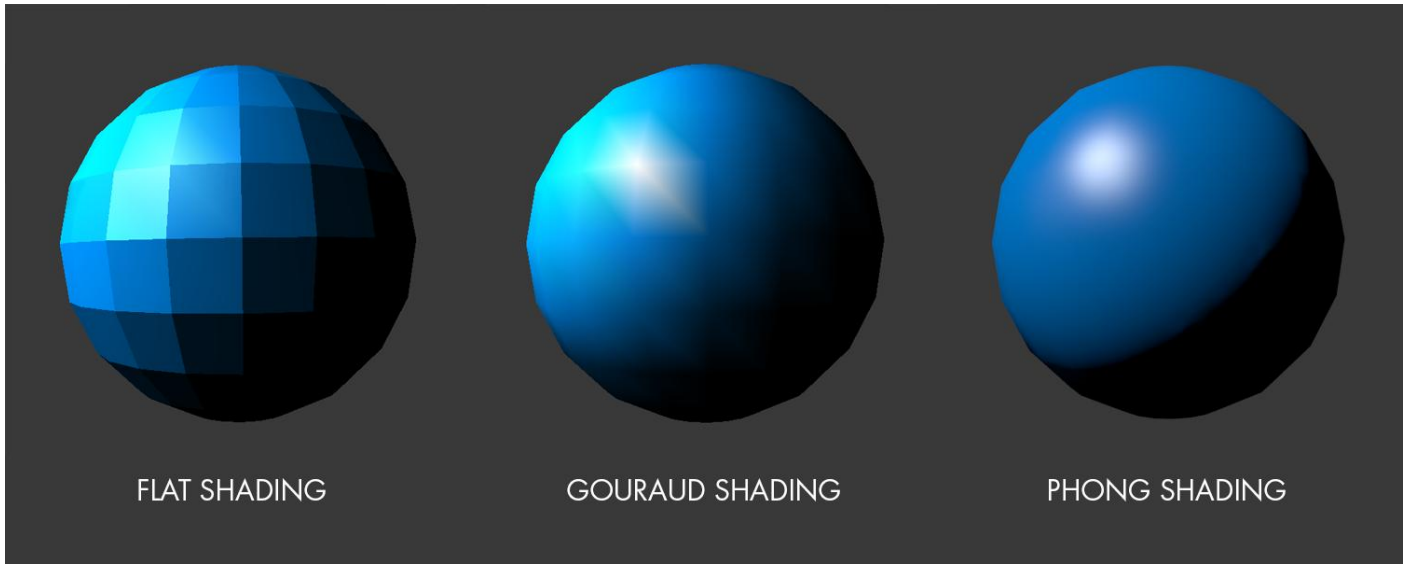

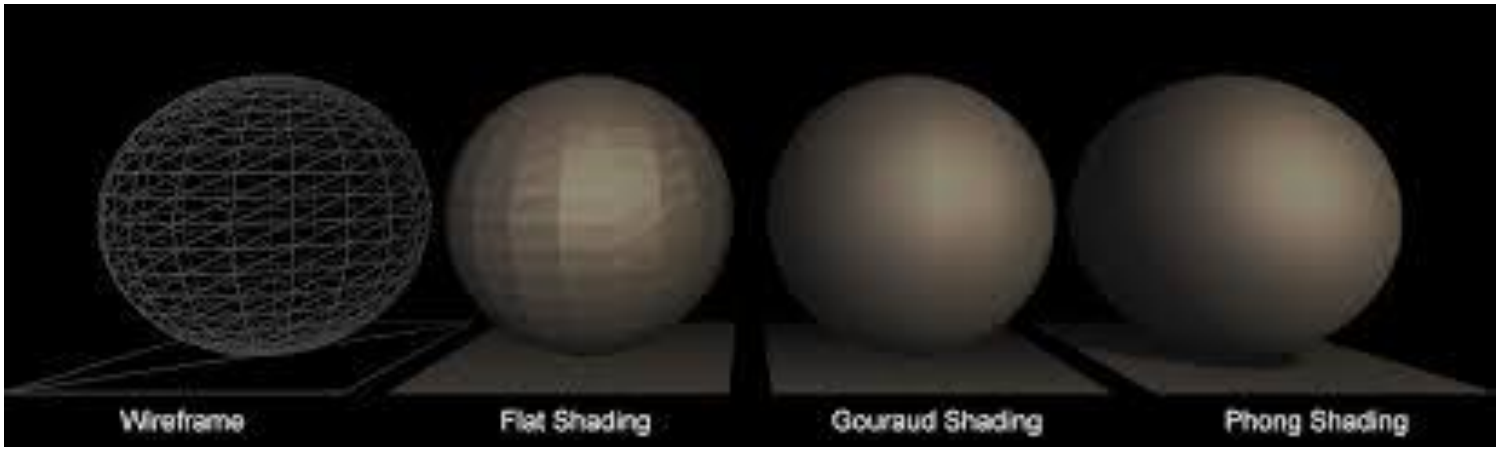

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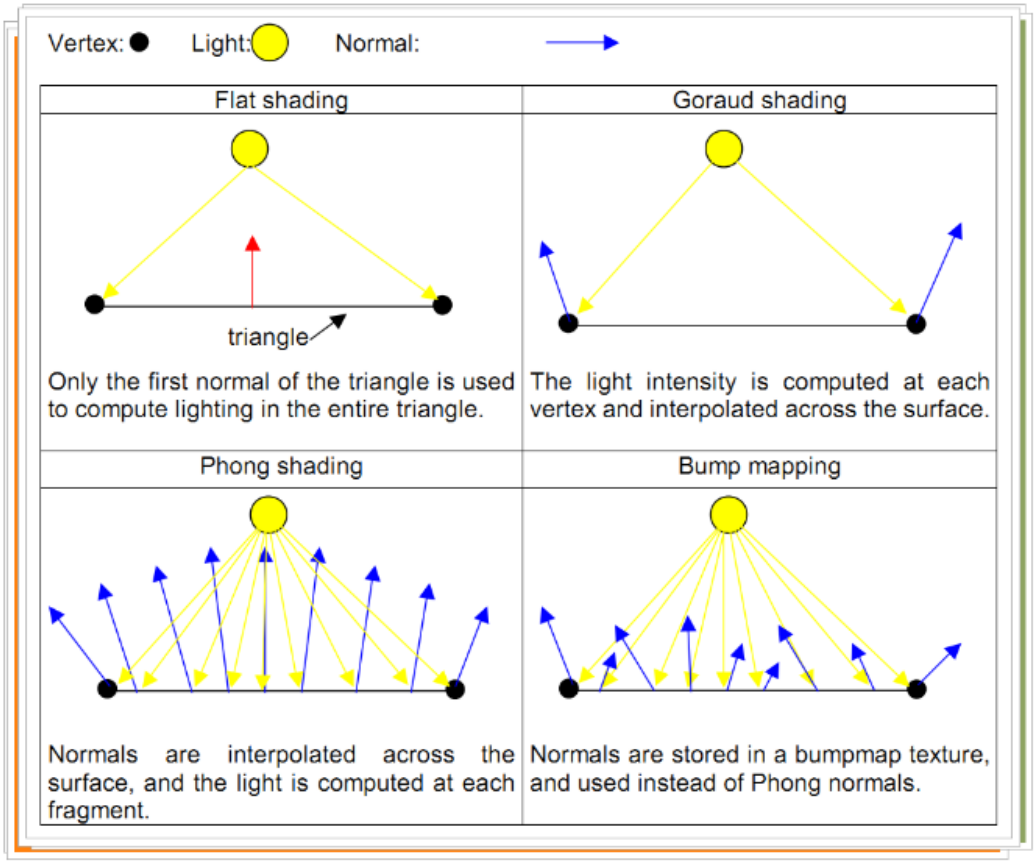
Ray tracing follows an imaginary light ray from the viewpoint through each point in a scene. When the ray encounters an object, it is traced as it is reflected or refracted. Ray tracing is a recursive procedure; each reflected or refracted ray is again traced in the same fashion until it vanishes into the background or makes an insignificant contribution. Ray tracing may take a long time—minutes or even hours can be consumed in creating a complex scene. In reality, objects are illuminated not only directly by a light source such as the Sun or a lamp but also more diffusely by reflected light from other objects.



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Computer graphics relies heavily on standard software packages. The OpenGL (open graphics library) specifies a standard set of graphics routines that may be implemented in computer programming languages such as C or Java. PHIGS (programmer's hierarchical interactive graphics system) is another set of graphics routines. VRML (virtual reality modeling language) is a graphics description language for World Wide Web applications. Several commercial and free packages provide extensive three-dimensional modeling capabilities for realistic graphics. More modest tools, offering only elementary two-dimensional graphics, are the "paint" programs commonly installed on home computers.

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Programmer

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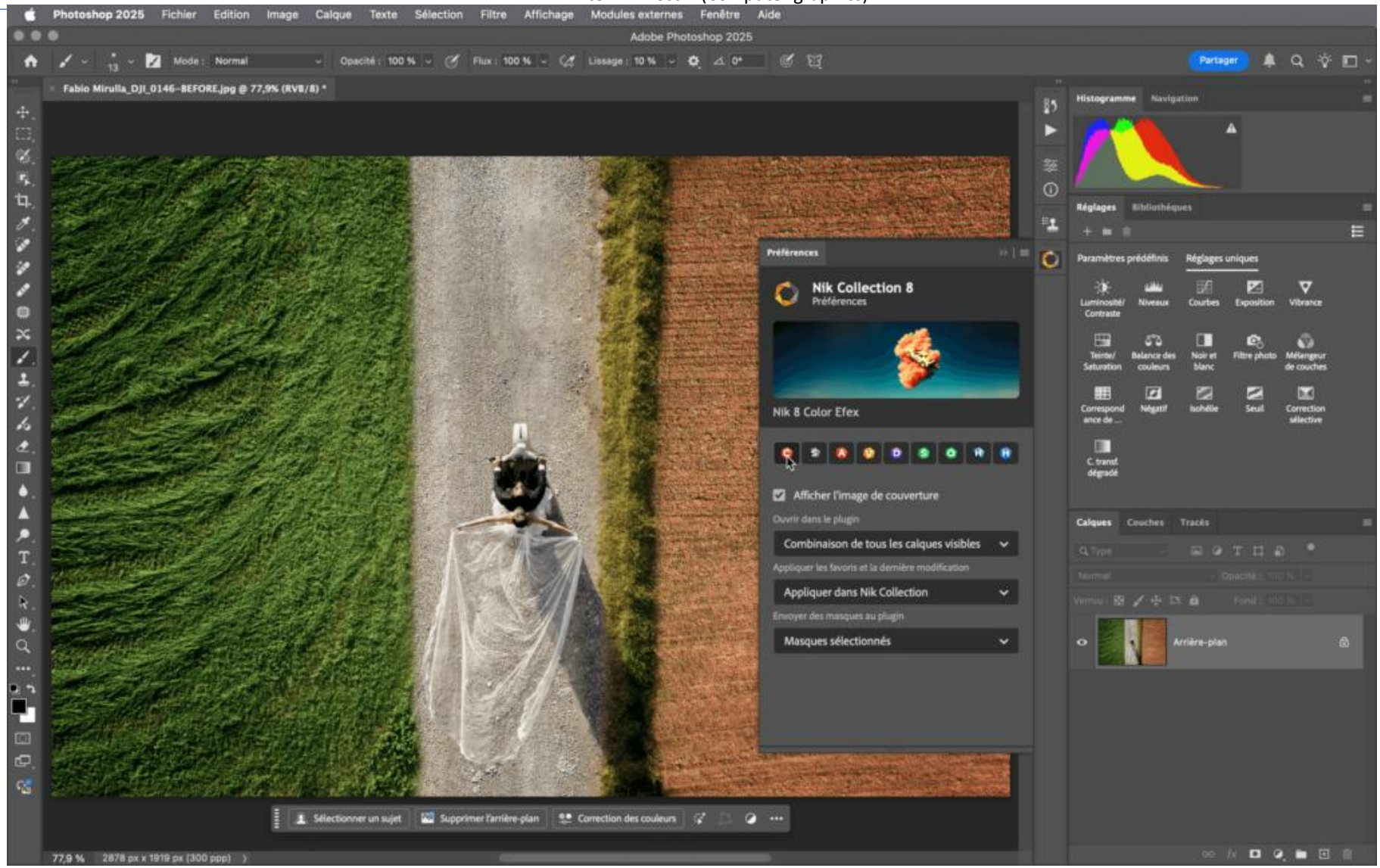

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