Escuela Profesional de
Ciencia de la Computación

Computer graphics

Raster Images

MSc. Vicente Machaca Arceda

Universidad Nacional de San Agustín de Arequipa

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Overview

vmachacaa@unsa.edu.pe

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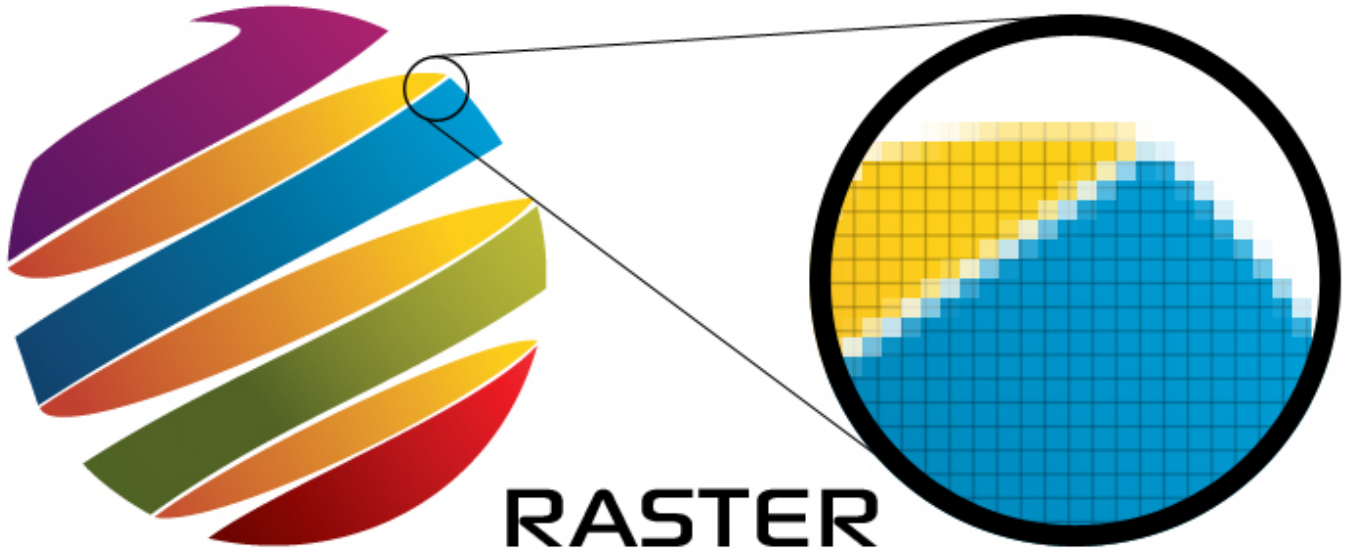
vmachacaa@unsa.edu.pe

Raster Images

Definition

A raster image is simply a 2D array that stores the pixel value for each pixel, usually a color stored as three numbers, for red, green, and blue [1].



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Raster devices

Output

- Display
  - Transmissive: liquid crystal display (LCD).
  - Emissive: light-emitting diode (LED) display.
- Hardcopy.
  - Binary: ink-jet printer.
  - Continuous tone: dye sublimation printer.

input

- 2D array sensor: digital camera.
- 1D array sensor: flatbed scanner.

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Raster devices

Display

There are two types

- Emissive display (LED, AMOLED).
- Transmissive displays (LCD).

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Raster devices

Display - Emissive light

Light-emitting diode (LED) displays are an example of the emissive type. Each pixel is composed of one or more LEDs.

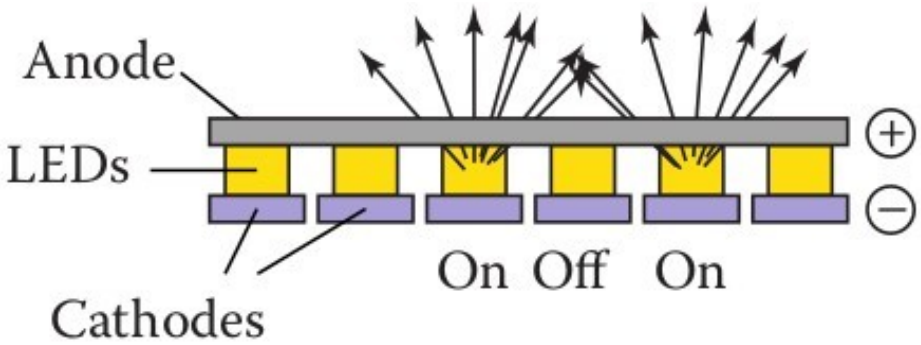

Figure: The operation of light-emitting diode (LED) display. Source: [1]

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Raster devices

Display - Emissive light

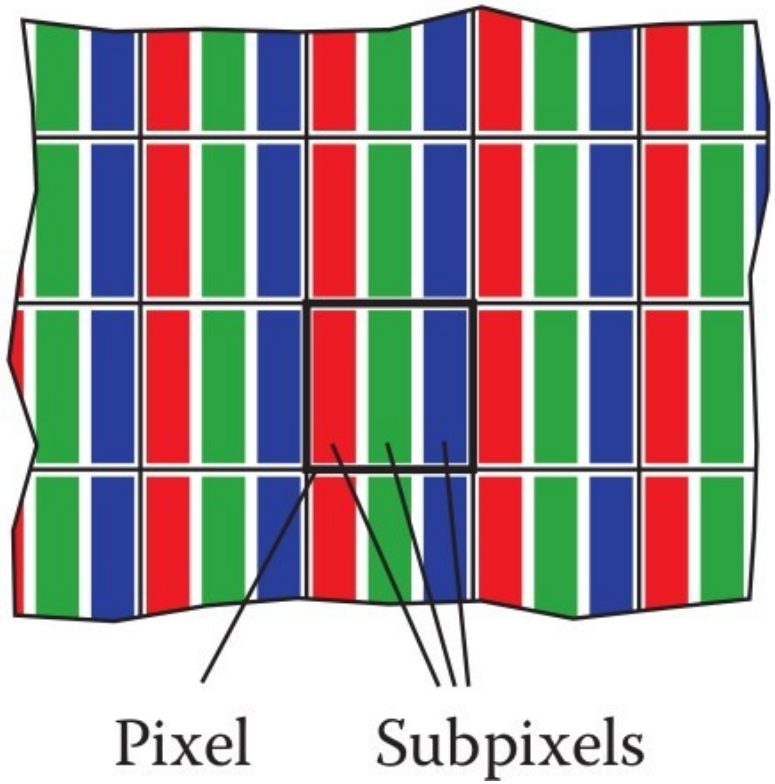

Figure: The red, green, and blue subpixels within a pixel of a flat-panel display. Source: [1]

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Raster devices

Display - Transmissive light

Liquid crystal displays (LCDs) are an example of the transmissive type. A liquid crystal is a material whose molecular structure enables it to rotate the polarization of light that passes through it.

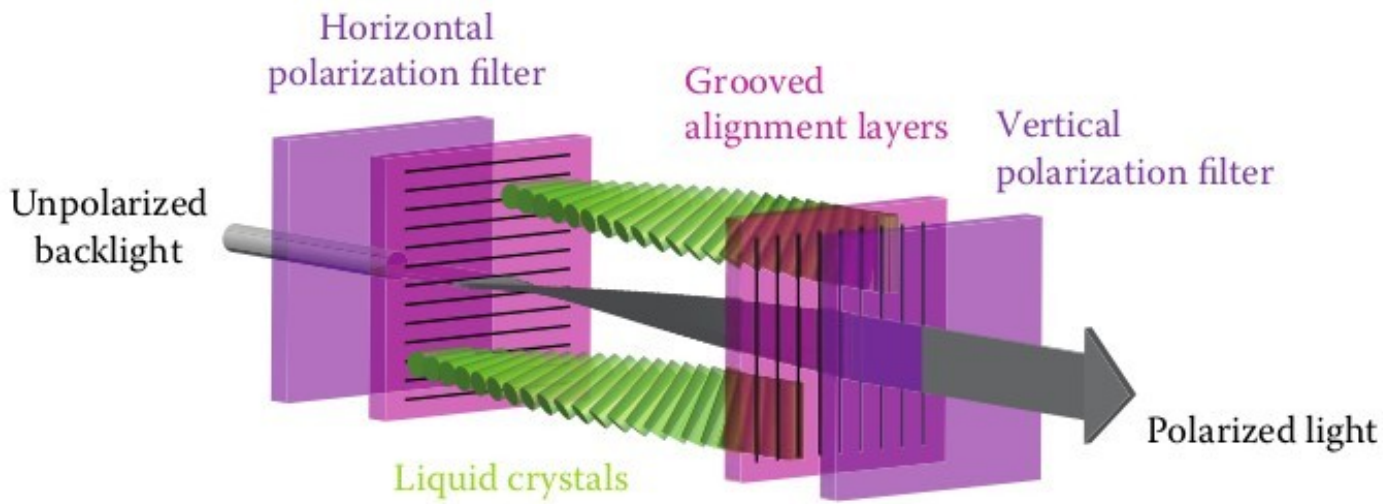

Figure: LCD displays. Source: [1]

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Hardcopy devices

Ink-jet printer

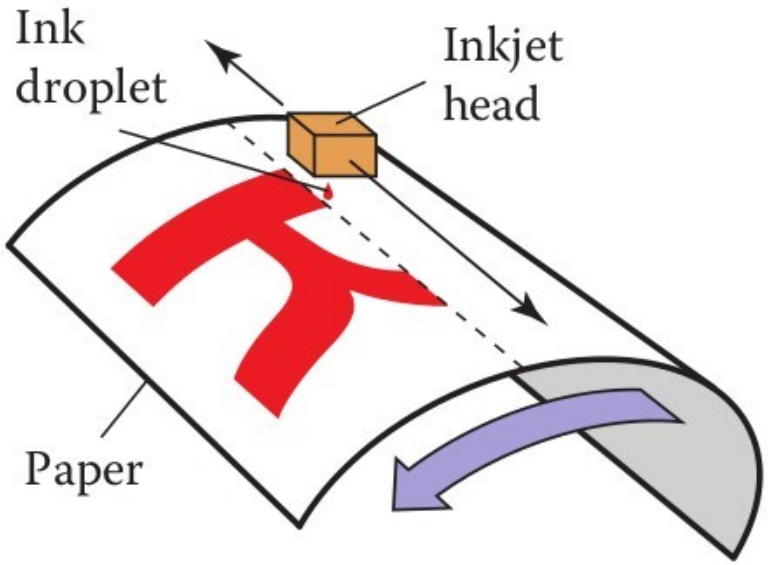

Figure: The operation of an ink-jet printer. Source: [1]

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Hardcopy devices

Dye transfer printer

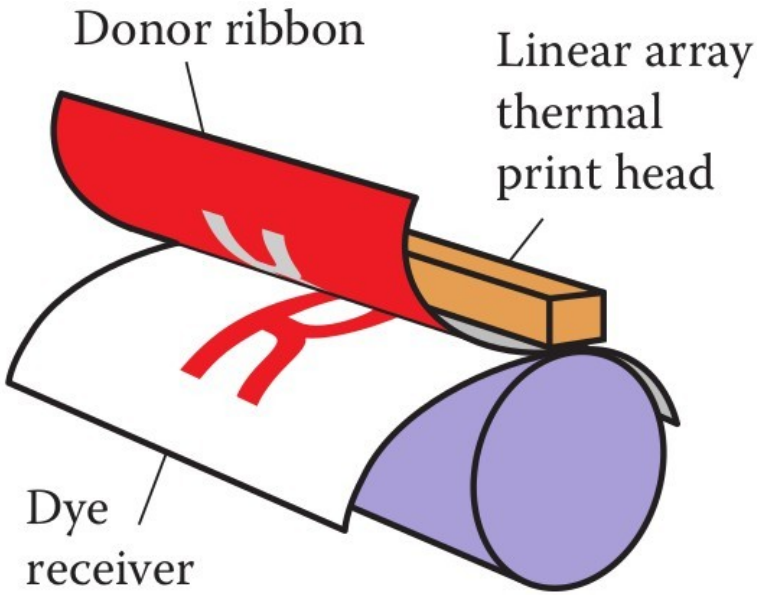

Figure: The operation of a thermal dye transfer printer. Source: [1]

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Hardcopy devices

Dye transfer printer

A digital camera is an example of a 2D array input device. The image sensor in a camera is a semiconductor device with a grid of light-sensitive pixels.

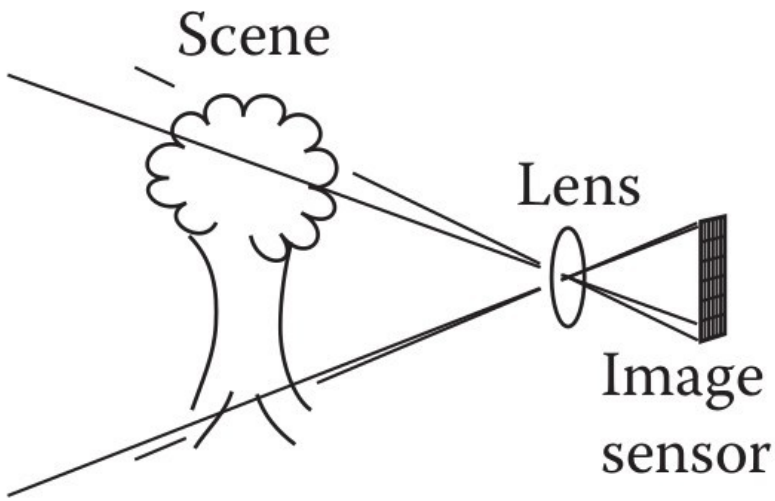

Figure: The operation of a digital camera. Source: [1]

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Images

Pixels

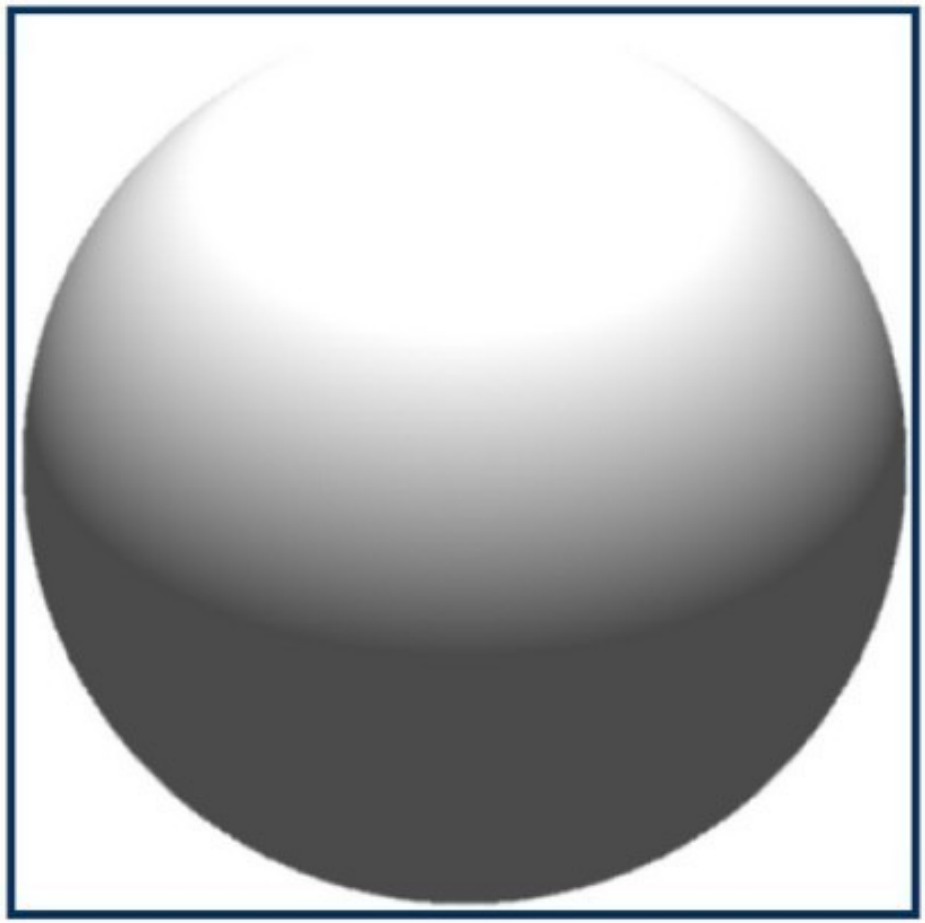

Figure: Image example.

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Images

Pixels

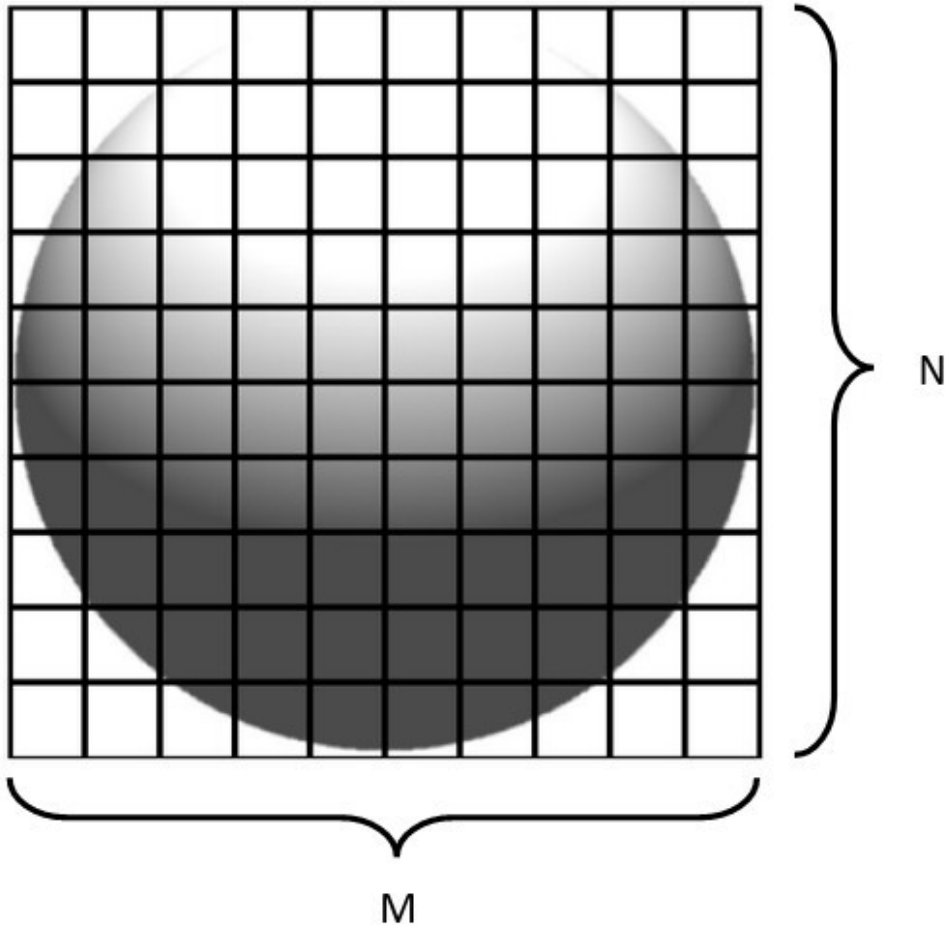

Figure: Image example.

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Images

Pixels

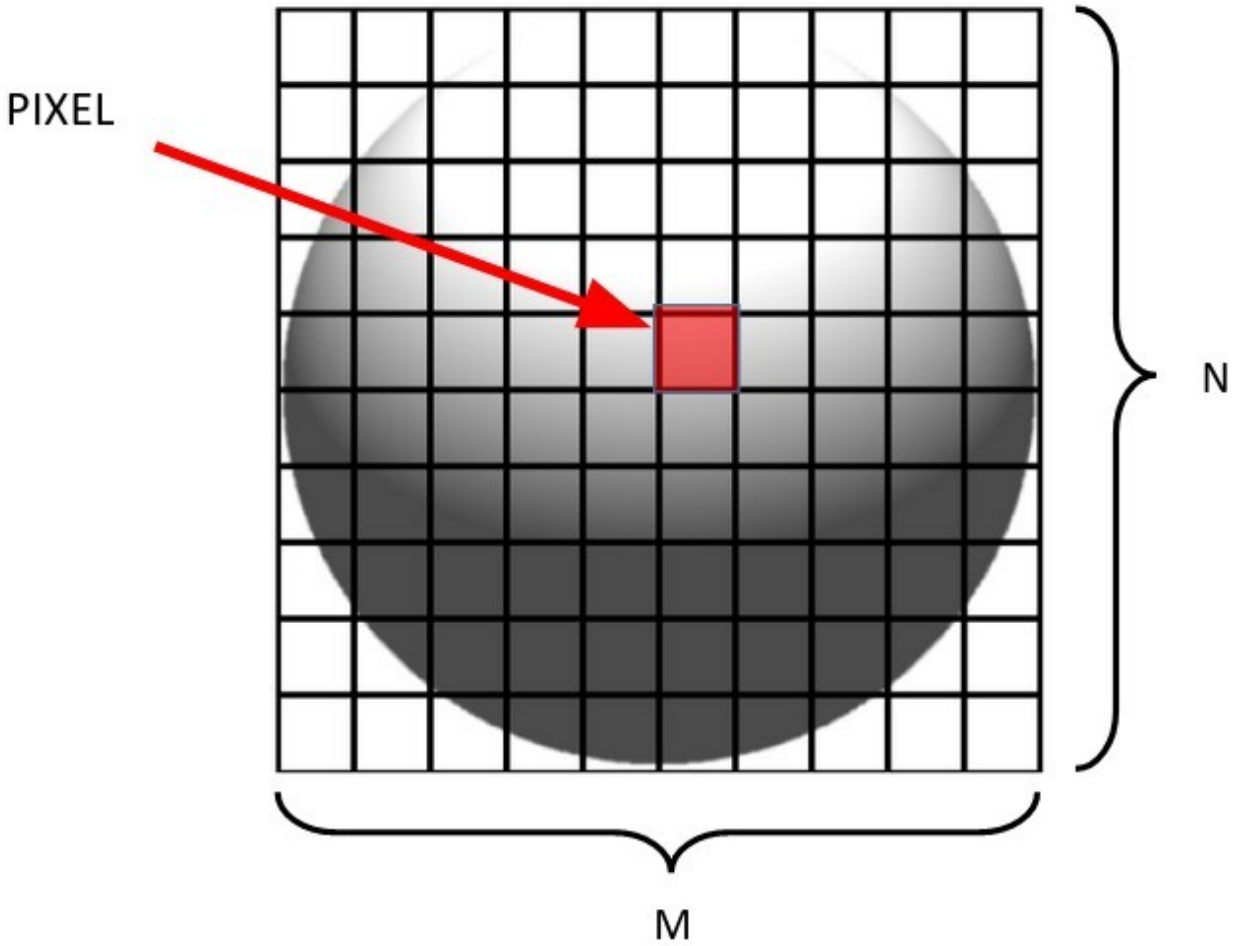

Figure: Image example.

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Images

Pixels

Figure: According to the numbers of bit, we could get different intensity colours.

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Images

Pixels

¿How many intensity we normally used in images?

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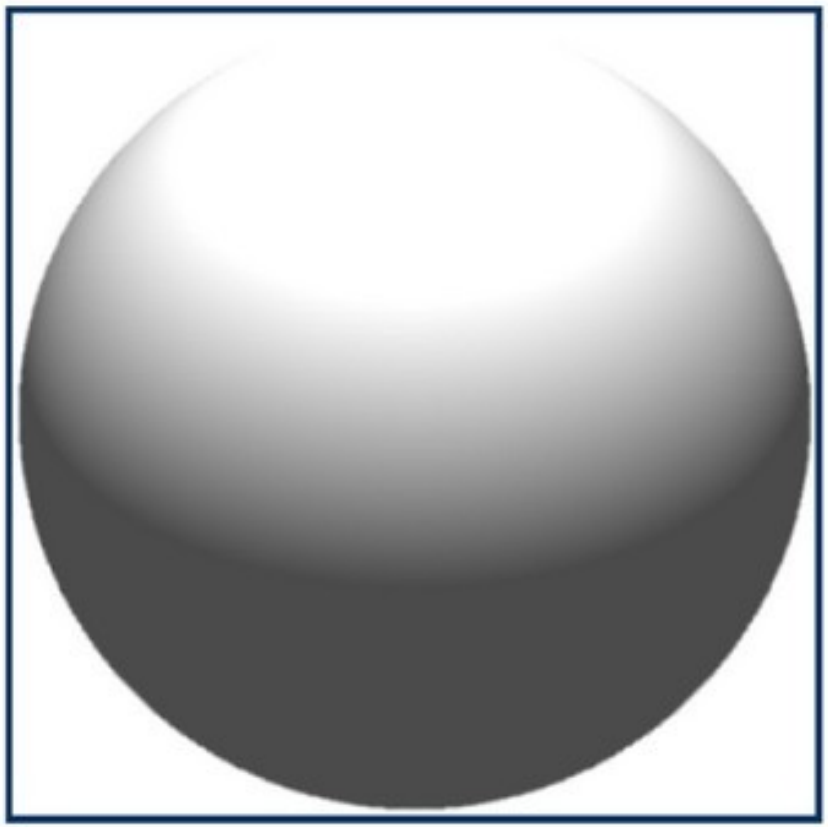
Images

Pixels



Original image

Figure: Image example in 256 gray levels.

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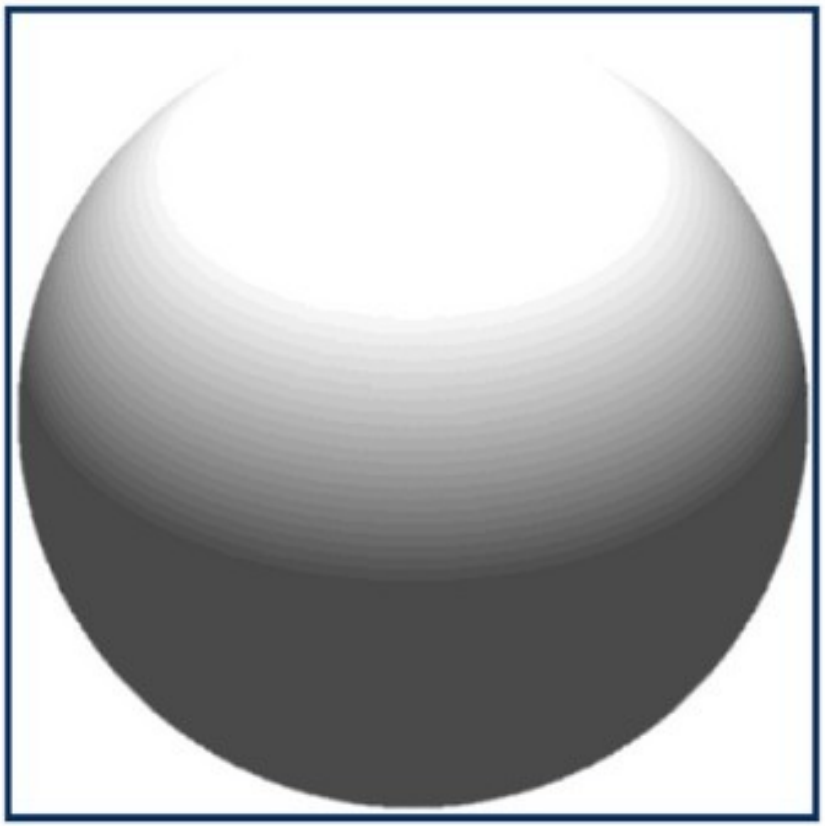
Images

Pixels



Original image
5-bits
32 gray levels

Figure: Image example in 32 gray levels.

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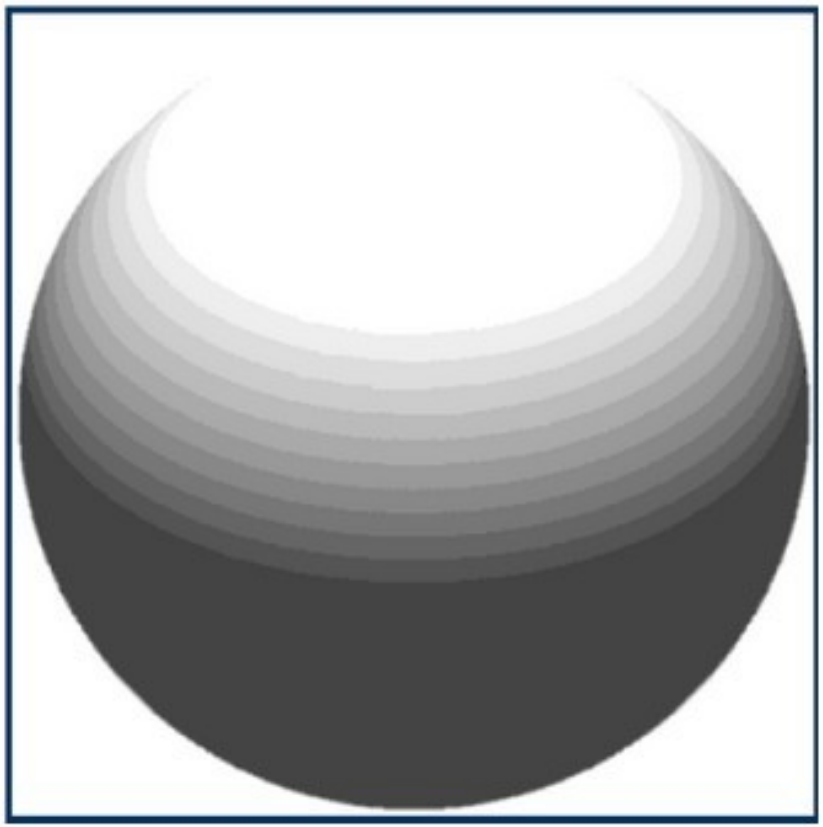
Images

Pixels



Original image
4-bits
16 gray levels

Figure: Image example in 16 gray levels.

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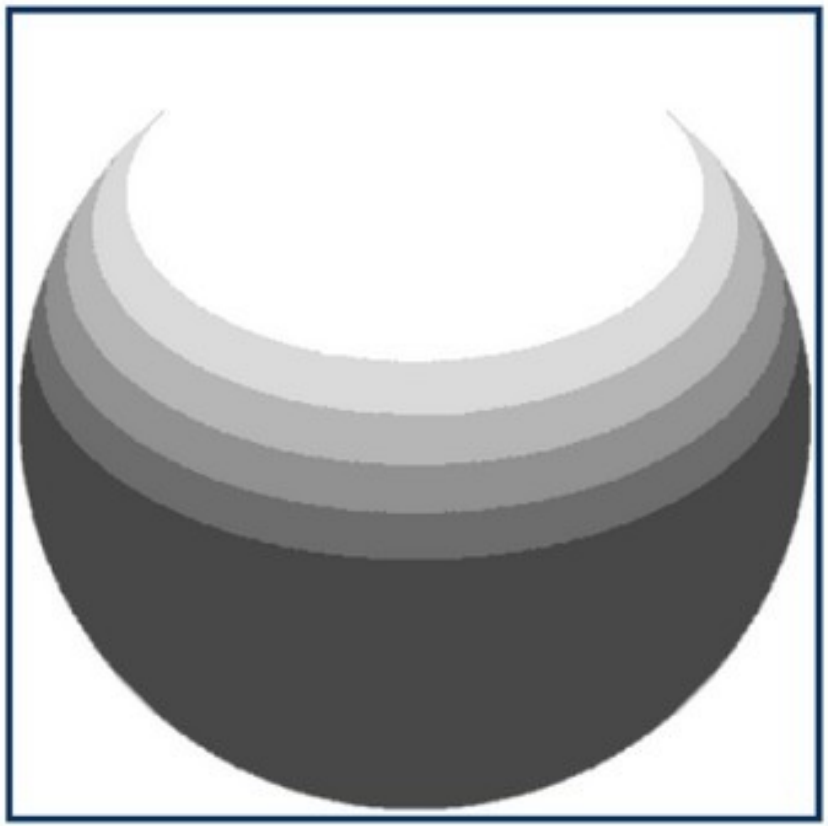
Images

Pixels



Original image
3-bits
8 gray levels

Figure: Image example in 8 gray levels.

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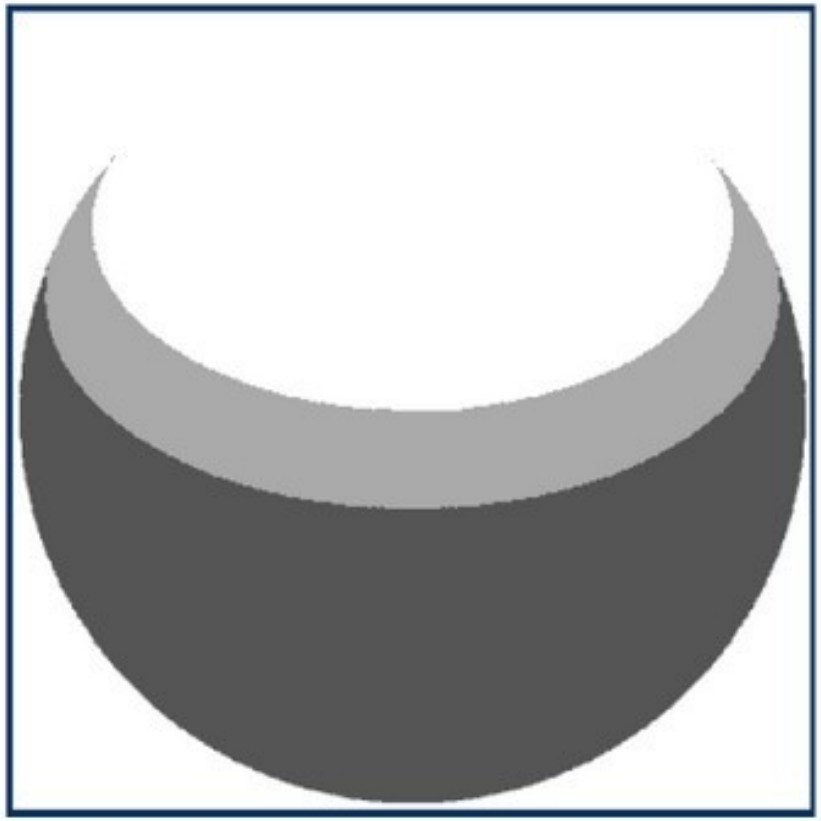
Images

Pixels



Original image
2-bits
4 gray levels

Figure: Image example in 4 gray levels.

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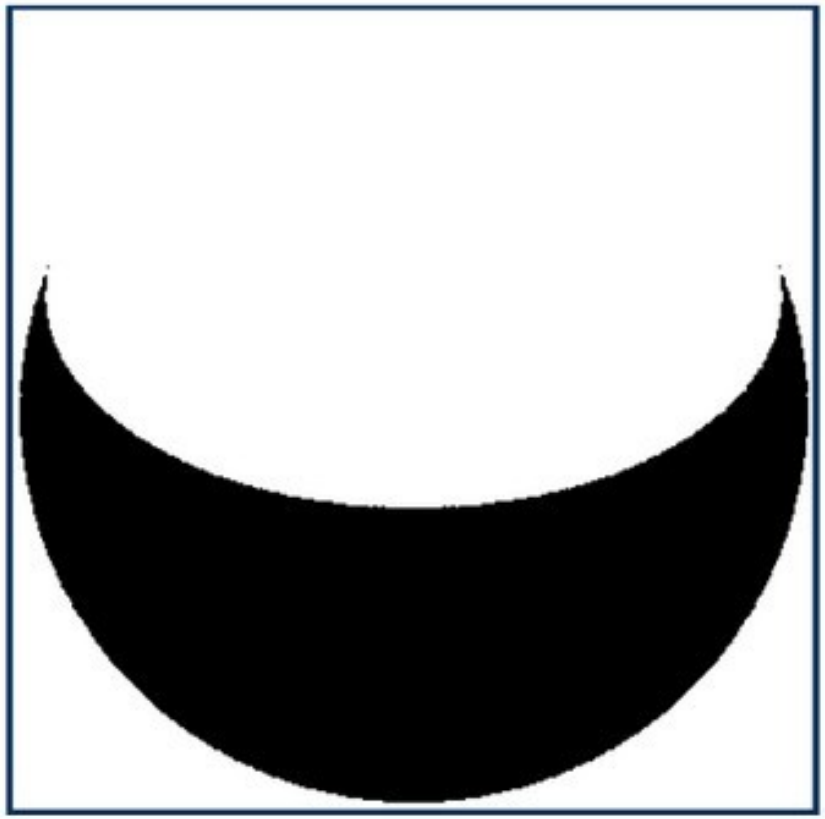
Images

Pixels



Original image
1-bits
2 gray levels

Figure: Image example in 2 gray levels.

vmachacaa@unsa.edu.pe

Questions

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vmachacaa@unsa.edu.pe

References I


S. Marschner and P. Shirley, *Fundamentals of computer graphics*. CRC Press, 2018.

vmachacaa@unsa.edu.pe

Questions?

vmachacaa@unsa.edu.pe