

Universidad Peruana de Ciencias
Aplicadas Escuela de Ingeniería de
Sistemas y Computación Carrera de
Ciencias de la Computación

CC53 Procesamiento de Imágenes

Introducción al procesamiento de Imágenes

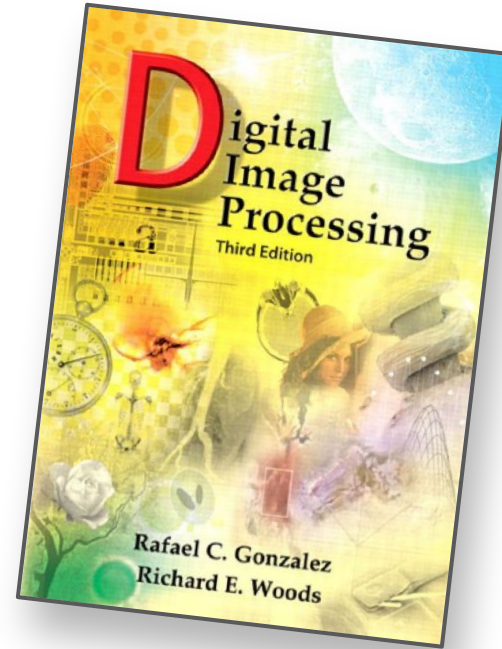
Prof. Peter Montalvo

Agenda

- ¿Qué es procesamiento de imágenes?
- Origen
- Imágenes digitales
- Muestreo y cuantización
- Filtro
- Componentes de un sistema de procesamiento de imágenes

Nota

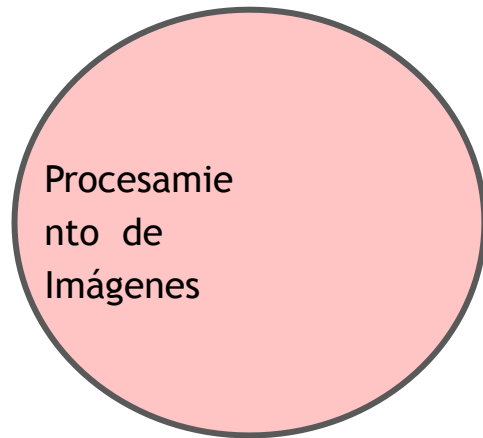
- Esta sesión está basada en el libro “Digital Image Processing” 3ra edición de Rafael C. González y Richard E. Woods. En especial el capítulo 1 y 2.



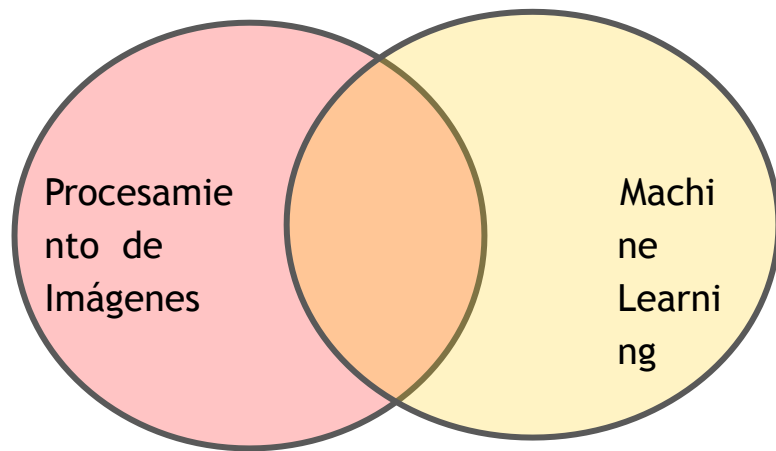
¿Qué es procesamiento de imágenes?

- No hay un límite claro con otras áreas: Computer Vision, Machine Learning, Análisis de Imágenes
- Tipos de procesamiento:
 - Bajo nivel
 - Nivel Medio
 - Alto nivel

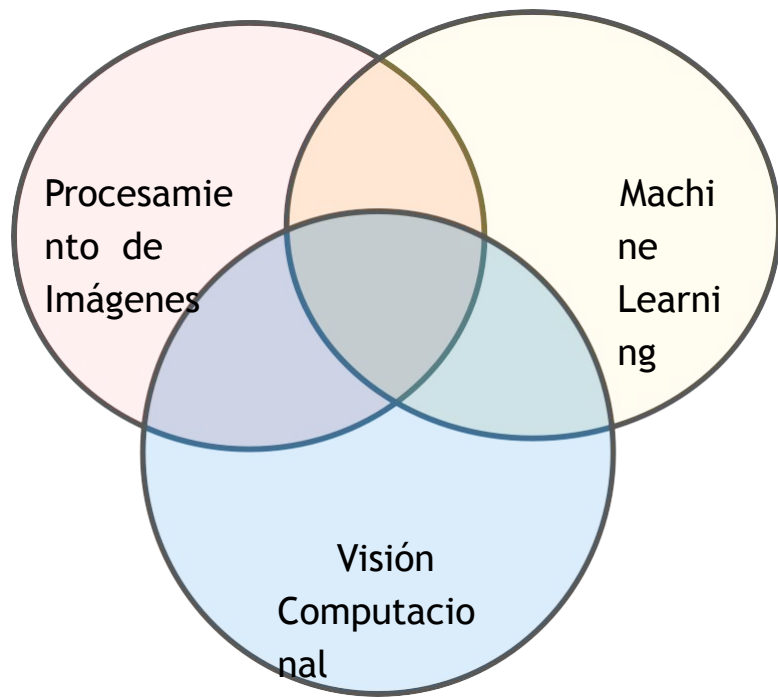
Análisis de Imágenes



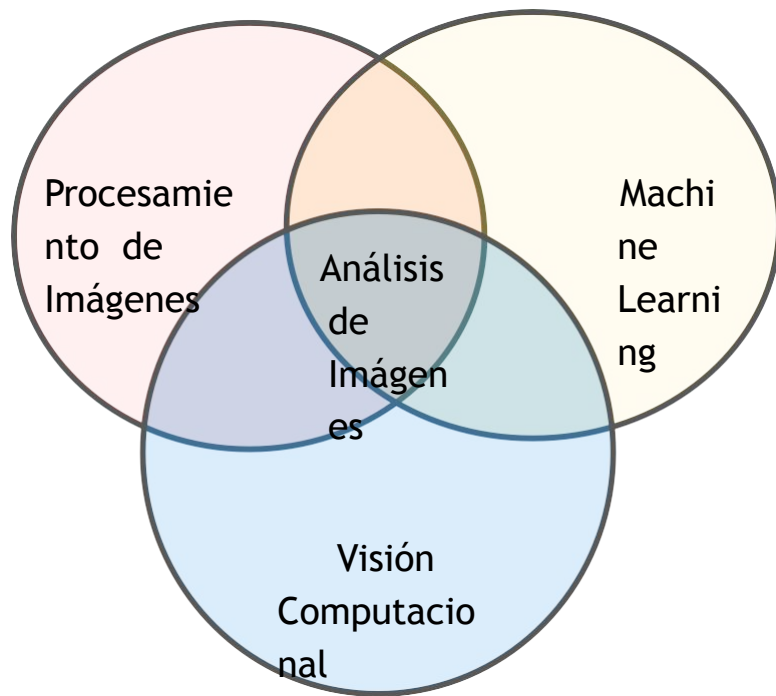
Análisis de Imágenes



Análisis de Imágenes

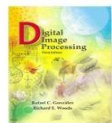


Análisis de Imágenes



Orígenes del Procesamiento de Imágenes

- Una de las primeras aplicaciones fue el envío de fotos por cable, en la industria de periódicos (en 1920)
- 5 niveles de gris originalmente
- 15 niveles en 1929



Digital Image Processing, 3rd ed.

Gonzalez & Woods

www.ImageProcessingPlace.com

Chapter 2

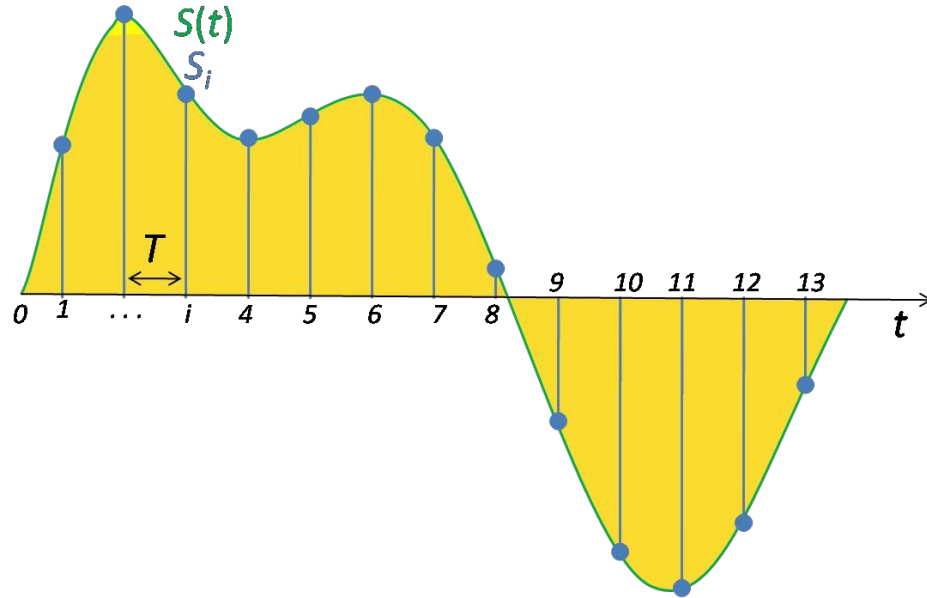
Digital Image Fundamentals

FIGURE 1.1 A digital picture produced in 1921 from a coded tape by a telegraph printer with special type faces. (McFarlane.[†])

Representando Imágenes digitales

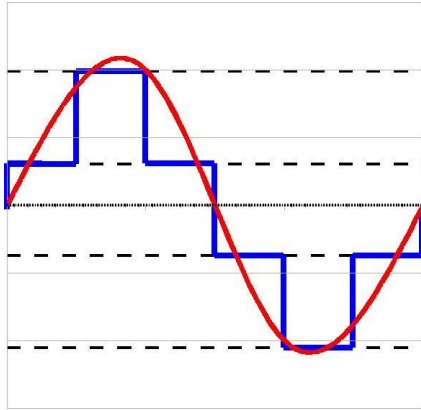
- Sea $f(s,t)$ una imagen continua de dos variables s y t donde $f(s,t)$ es el nivel de intensidad
- Convertimos esta función en una imagen digital al **muestrear** y **cuantizar**

Muestreo



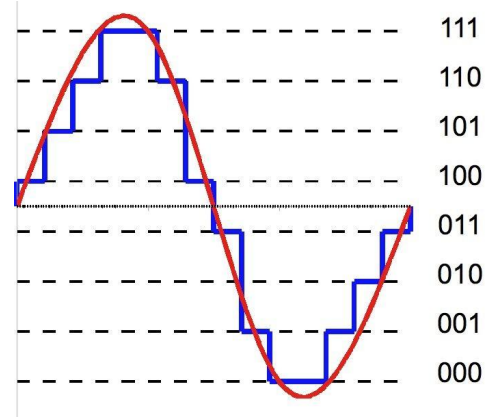
[https://en.wikipedia.org/wiki/Sampling_\(signal_processing\)](https://en.wikipedia.org/wiki/Sampling_(signal_processing))

Cuantización



11
10
01
00

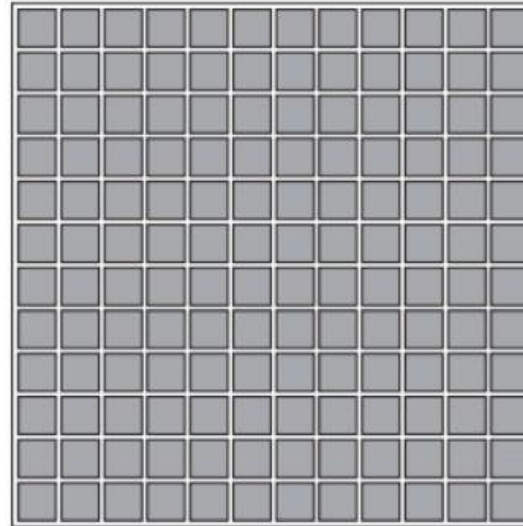
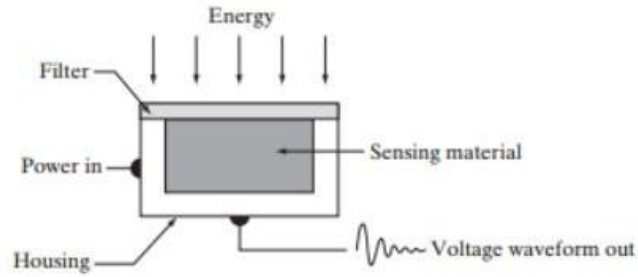
Con 2
bits



111
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Con 3
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Sensores



a
b
c

FIGURE 2.12
(a) Single imaging sensor.
(b) Line sensor.
(c) Array sensor.



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Imagen continua -> Arreglo de sensores



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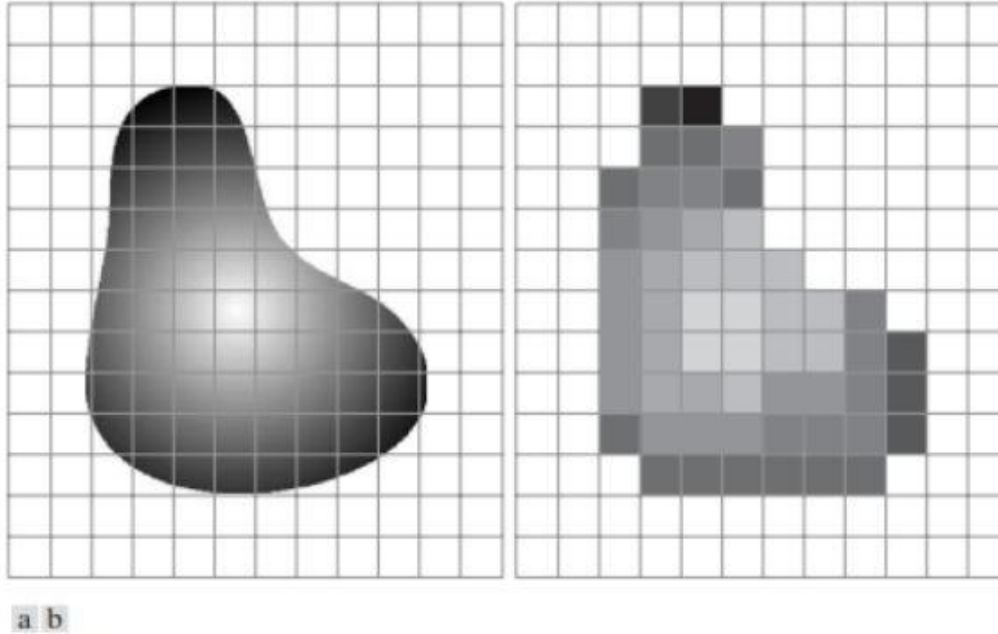
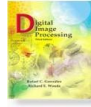


FIGURE 2.17 (a) Continuous image projected onto a sensor array. (b) Result of image sampling and quantization.

Formación de imágenes



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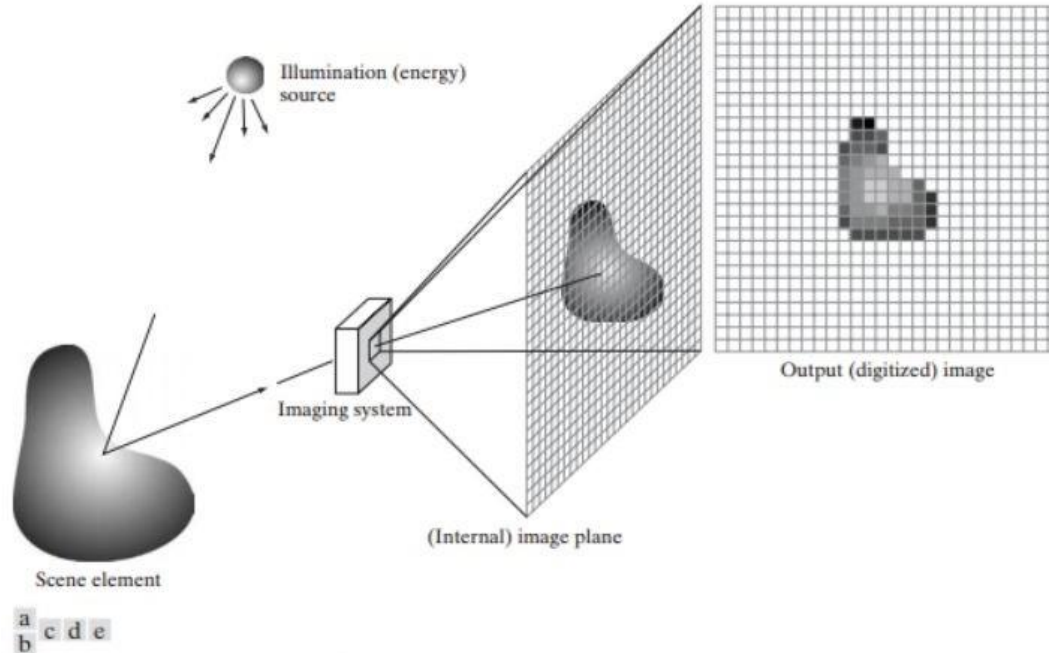
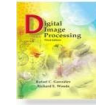
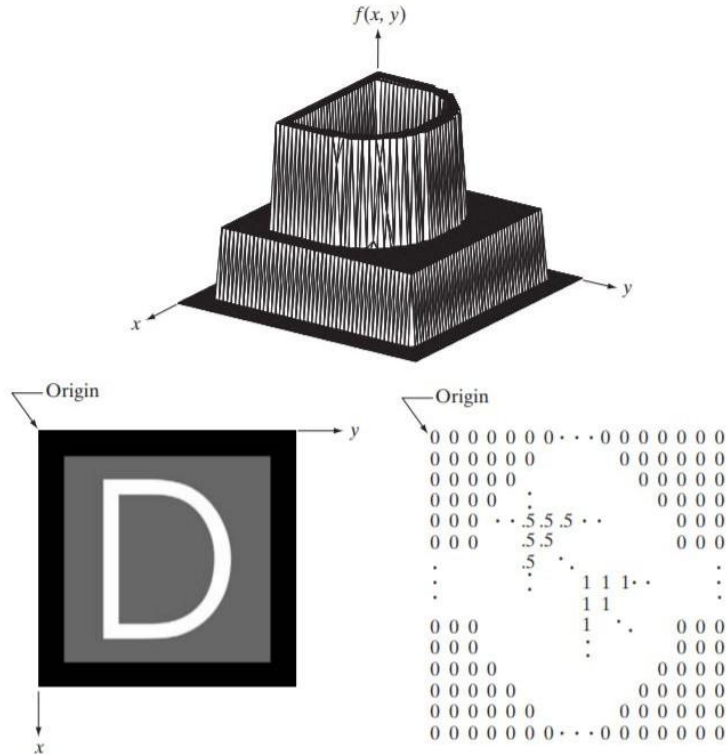


FIGURE 2.15 An example of the digital image acquisition process. (a) Energy (“illumination”) source. (b) An element of a scene. (c) Imaging system. (d) Projection of the scene onto the image plane. (e) Digitized image.

Representando imágenes digitales



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a
b c

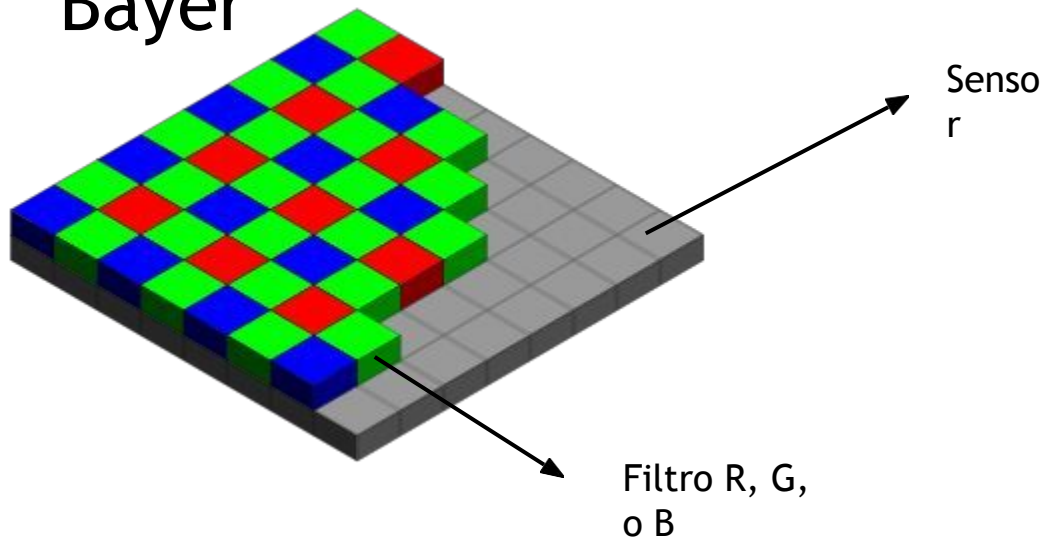
FIGURE 2.18

(a) Image plotted as a surface.

(b) Image displayed as a visual intensity array.

(c) Image shown as a 2-D numerical array (0, .5, and 1 represent black, gray, and white, respectively).

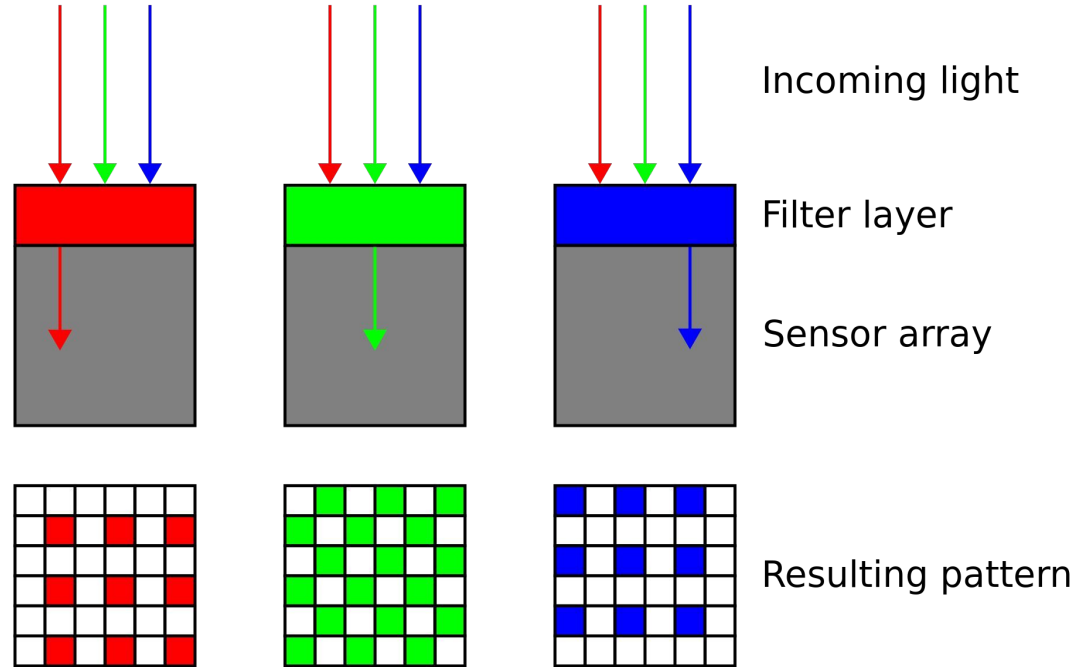
Filtro Bayer



By en:User:Cburnett - Own work, CC BY-SA 3.0,
<https://commons.wikimedia.org/w/index.php?curid=1496858>

Filtro Bayer

- El filtro funciona al dejar pasar solo una longitud de onda (o color) a cada elemento de la grilla del sensor
- Se interpola para los valores faltantes



Filtro Bayer: notas

- El filtro tiene
 - 50% verde -- *para simular la fisiología del ojo humano*
 - 25% rojo
 - 25% azul
- Patente de Bryce E. Bayer (Eastman Kodak)
- Año 1975

[54] COLOR IMAGING ARRAY

[75] Inventor: Bryce E. Bayer, Rochester, N.Y.

[73] Assignee: Eastman Kodak Company,
Rochester, N.Y.

[22] Filed: Mar. 5, 1975

[21] Appl. No.: 555,477

[52] U.S. CL. 358/41; 350/162 SF;
350/317; 358/44

[51] Int. Cl.² H04N 9/24

[58] Field of Search 358/44, 45, 46, 47,
358/48; 350/317, 162 SF; 315/169 TV

[56] References Cited

UNITED STATES PATENTS

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2,884,483	4/1959	Ehrenhaft et al.	358/44
3,725,572	4/1973	Kurokawa et al.	358/46

Primary Examiner—George H. Libman

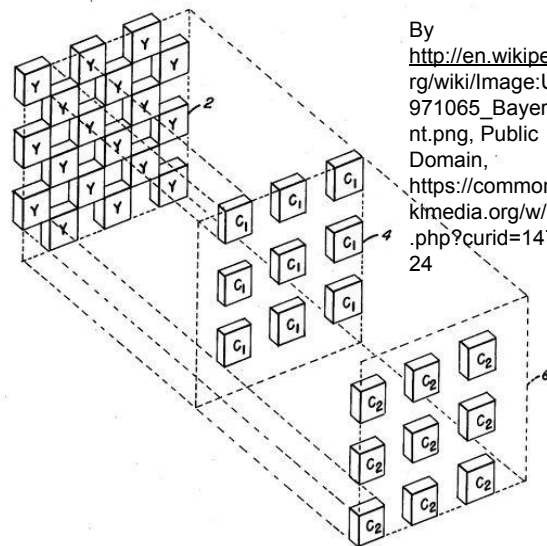
Attorney, Agent, or Firm—George E. Grosser

[57] ABSTRACT

A sensing array for color imaging includes individual luminance- and chrominance-sensitive elements that are so intermixed that each type of element (i.e., according to sensitivity characteristics) occurs in a repeated pattern with luminance elements dominating the array. Preferably, luminance elements occur at every other element position to provide a relatively high frequency sampling pattern which is uniform in two perpendicular directions (e.g., horizontal and vertical). The chrominance patterns are interlaid therewith and fill the remaining element positions to provide relatively lower frequencies of sampling.

In a presently preferred implementation, a mosaic of selectively transmissive filters is superposed in registration with a solid state imaging array having a broad range of light sensitivity, the distribution of filter types in the mosaic being in accordance with the above-described patterns.

11 Claims, 10 Drawing Figures



By
http://en.wikipedia.org/wiki/Image:US03_971065_Bayer_Front.png, Public Domain,
<https://commons.wikimedia.org/w/index.php?curid=147368>
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Componentes de un sistema de Procesamiento de Imágenes

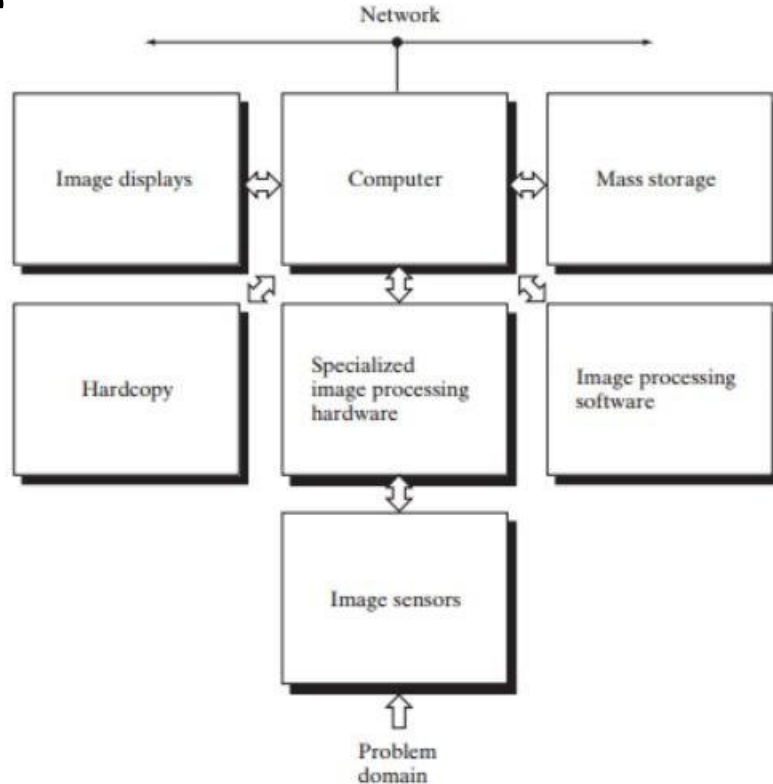
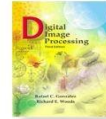


FIGURE 1.24
Components of a
general-purpose
image processing
system.



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Ver más:

<https://youtu.be/LWxu4rkZBLw>

