



112-1數位影像處理課程(1)

Advanced Computer Programming

亞大資工系

課程大綱

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- W2-Python圖像處理
- W3-影像增強、邊緣檢測和特徵提取
- W4-Photoshop 基本工具和介面
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數位影像處理的定義

- 數位影像處理是一種使用電腦和數學技術來處理和分析數位影像的領域。
- 在醫學、機器視覺、媒體處理、地理信息系統、安全監控等各個領域都有廣泛的應用。

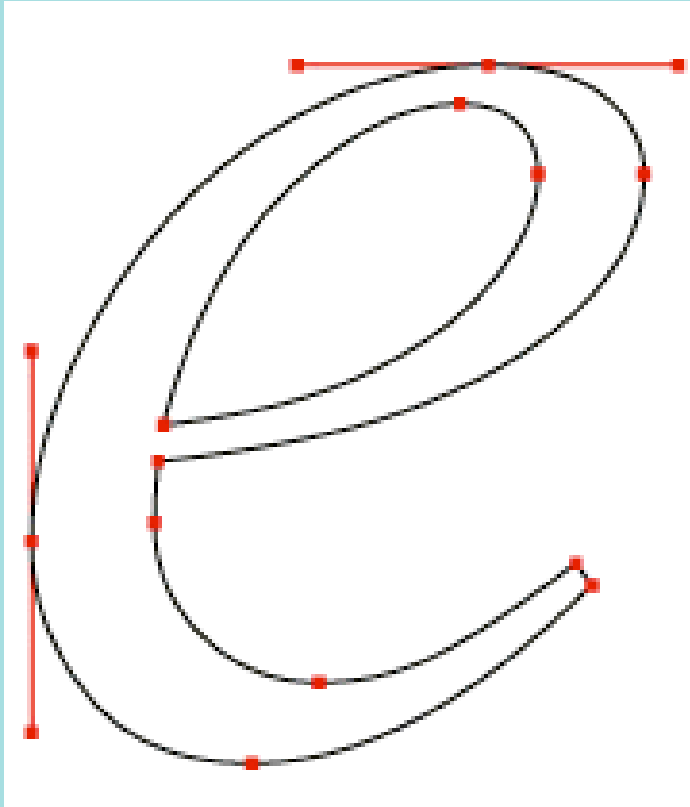


影像處理

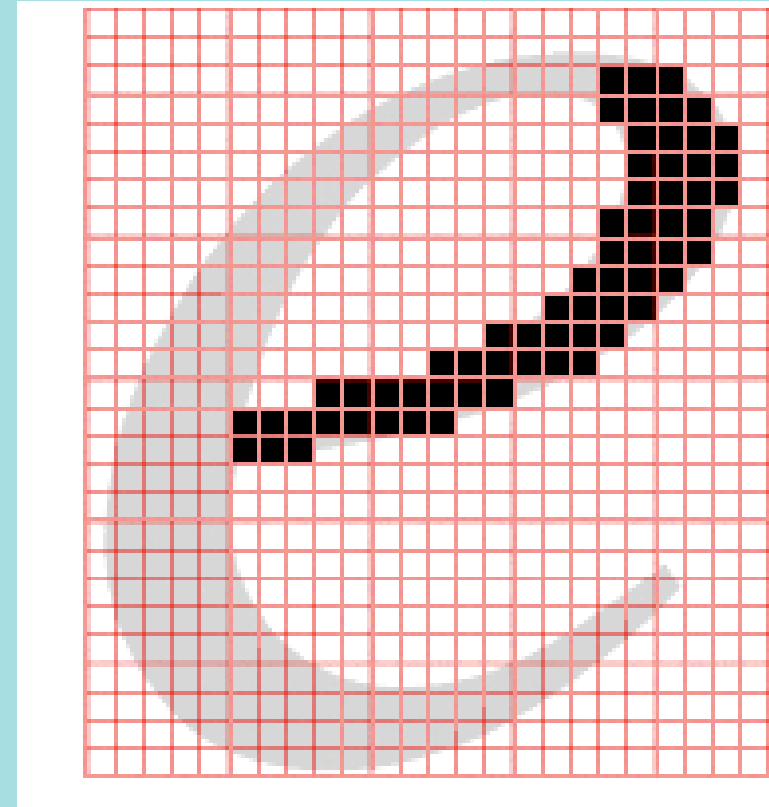
- **影像增強**：常見的增強技術包括調整對比度、亮度、色彩平衡、降噪等。
- **特徵擷取**：特定特徵，例如邊緣、物體、文字、人臉等。
- **圖像壓縮**：影像壓縮技術用於減小數位圖像的文件大小，同時盡量保持圖像質量。
- **物體識別與分類**：識別和分類數位影像中的物體、場景或模式。應用範圍包括自動駕駛、醫學影像分析、安全監控等。
- **影像重建**：在醫學影像學中，數位影像處理可用於重建缺失或損壞的影像，例如CT掃描、MRI或超聲波。
- **圖像分析**：影像處理技術分析衛星影像以檢測土地使用變化。
- **影像合成**：將不同角度的攝像頭圖像合成為全景圖。



圖的種類 Vector vs Bitmap



向量圖



點陣圖



Color modes

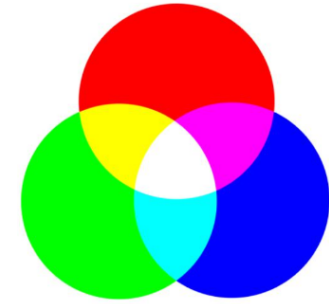
- RGB (Red, Green, Blue)
- CMYK (Cyan, Magenta, Yellow and Black)
- HSV (Hue, Saturation and Value)
- YIQ



RGB

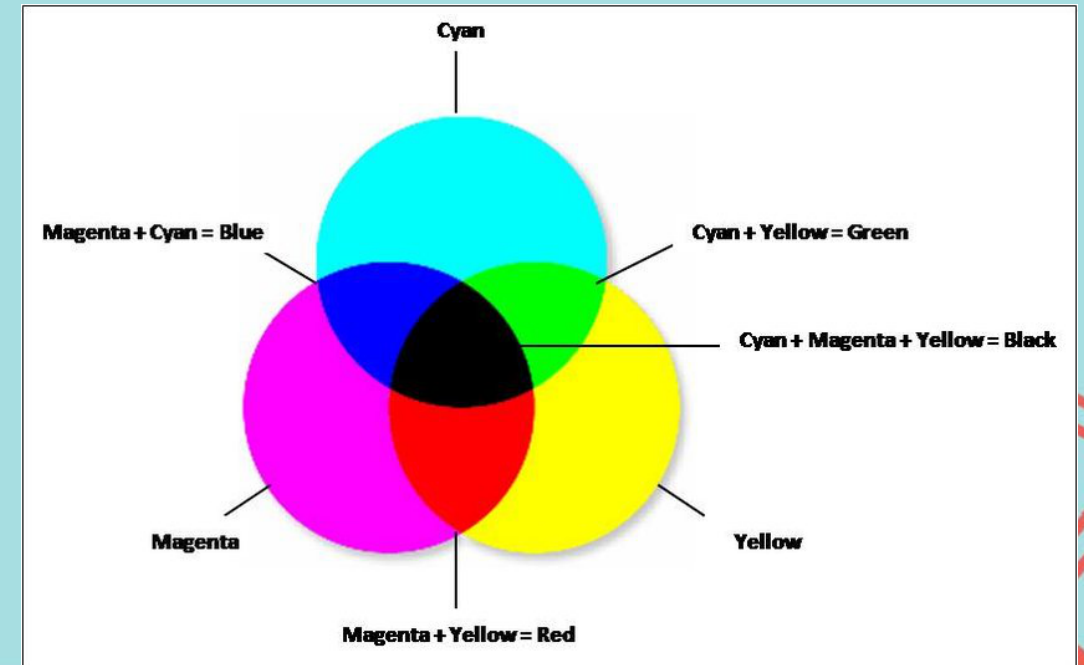
- Colour combination:
- $\text{Green}(255) + \text{Red}(255) = \text{Yellow}$
- $\text{Green}(255) + \text{Blue}(255) = \text{Cyan}$
- $\text{Red}(255) + \text{Blue}(255) = \text{Magenta}$
- $\text{Red}(255) + \text{Green}(255) + \text{Blue}(255) = \text{White}$

RGB - Red Green Blue



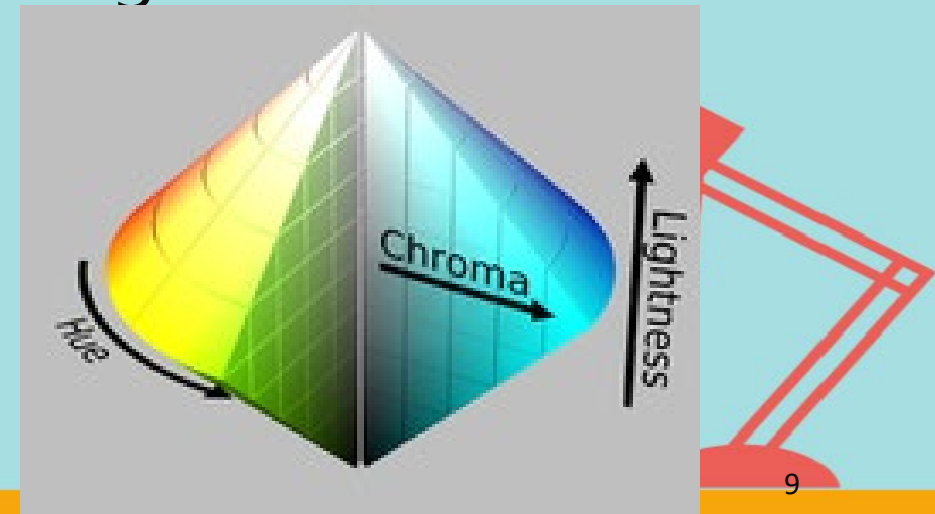
CMYK

- CMYK colour model is widely used in printers. It stands for Cyan, Magenta, Yellow and Black.
(青色)、(洋紅色)、(黃色) 和 (黑色)



HSV

- Red colour falls between 0 and 60 degrees in the HSV cone.
- Yellow colour falls between 61 and 120 degrees in the HSV cone.
- Green colour falls between 121 and 180 degrees in the HSV cone.
- Cyan colour falls between 181 and 240 degrees in the HSV cone.
- Blue colour falls between 241 and 300 degrees in the HSV cone.
- Magenta colour falls between 301 and 360 degrees in the HSV cone.



YIQ

- YIQ is the most widely colour model used in Television broadcasting. Y stands for luminance part and IQ stands for chrominance part. In the black and white television, only the luminance part (Y) was broadcast.



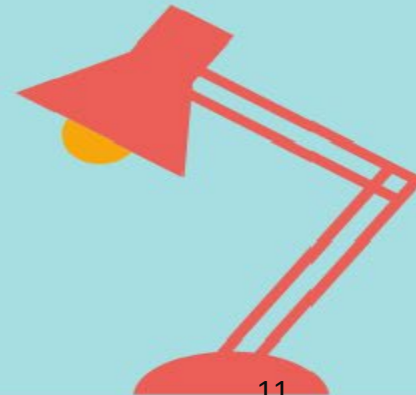
RGB \Leftrightarrow YIQ

From RGB to YIQ

$$\begin{bmatrix} Y \\ I \\ Q \end{bmatrix} \approx \begin{bmatrix} 0.299 & 0.587 & 0.114 \\ 0.5959 & -0.2746 & -0.3213 \\ 0.2115 & -0.5227 & 0.3112 \end{bmatrix} \begin{bmatrix} R \\ G \\ B \end{bmatrix}$$

From YIQ to RGB

$$\begin{bmatrix} R \\ G \\ B \end{bmatrix} = \begin{bmatrix} 1 & 0.956 & 0.619 \\ 1 & -0.272 & -0.647 \\ 1 & -1.106 & 1.703 \end{bmatrix} \begin{bmatrix} Y \\ I \\ Q \end{bmatrix}$$



Types of an image

1. **BINARY IMAGE**– The binary image as its name suggests, contain only two pixel elements i.e 0 & 1, where 0 refers to black and 1 refers to white. This image is also known as Monochrome.
2. **BLACK AND WHITE IMAGE**– The image which consist of only black and white color is called BLACK AND WHITE IMAGE.
3. **8 bit COLOR FORMAT**– It is the most famous image format. It has 256 different shades of colors in it and commonly known as Grayscale Image. In this format, 0 stands for Black, and 255 stands for white, and 127 stands for gray.
4. **16 bit COLOR FORMAT**– It is a color image format. It has 65,536 different colors in it. It is also known as High Color Format. In this format the distribution of color is not as same as Grayscale image.
 - **24 bit COLOR FORMAT**
 - **32 bit COLOR FORMAT**

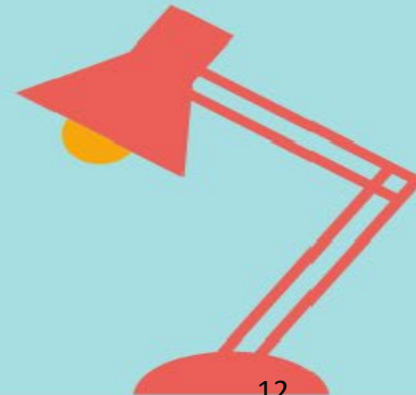


Image as a Matrix

$$f(x,y) = \begin{bmatrix} f(0,0) & f(0,1) & f(0,2) & \dots & f(0,N-1) \\ f(1,0) & f(1,1) & f(1,2) & \dots & f(1,N-1) \\ \cdot & \cdot & \cdot & & \cdot \\ \cdot & \cdot & \cdot & & \cdot \\ \cdot & \cdot & \cdot & & \cdot \\ f(M-1,0) & f(M-1,1) & f(M-1,2) & \dots & f(M-1,N-1) \end{bmatrix}$$





Thanks! Q&A

