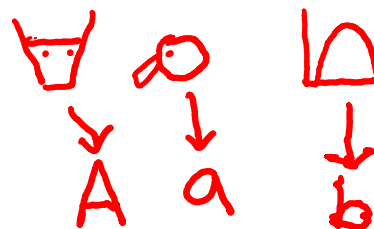


VII. Data Compression (A)

◆ 壓縮的通則：

利用資料的一致性



資料越一致的資料，越能夠進行壓縮

[References]

- 酒井善則，吉田俊之原著，原島博監修，白執善編譯，“影像壓縮術”，全華印行, 2004.
- 戴顯權，“資料壓縮 Data Compression,” 旗標出版社, 2007.
- I. Bocharova, *Compression for Multimedia*, Cambridge, UK, Cambridge University Press, 2010.
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◎ 7-A 壓縮的哲學：

(1) 利用資料的一致性，規則性，與可預測性

(exploit redundancies and predictability, find the compact or sparse representation)

(2) 通常而言，若可以用比較精簡的自然語言來描述一個東西，那麼也就越能夠對這個東西作壓縮

Q: 最古老的壓縮技術是什麼？

entropy (亂度; 熵)

(3) 資料越一致，代表統計特性越集中

$$\text{coding length for each input} = \frac{\text{entropy}}{\log 2}$$

包括 Fourier transform domain, histogram, eigenvalue 等方面的

集中度 $\text{entropy} = \sum_{i=1}^S -P_i \log P_i$ P_1, P_2, \dots, P_S the probability for each case

(i) When $P_1 = 1$, $S = 1$, $\text{entropy} = 0$

(ii) When $P_1 = 0.5$, $P_2 = 0.5$, $\text{entropy} = -0.5 \log(0.5) - 0.5 \log 0.5 = 0.5 \times \log 2 \times 2 = \log 2 = 0.6931$

(iii) When $P_1 = P_2 = P_3 = P_4 = 0.25$, $\text{entropy} = 4 \times (-0.25 \log 0.25) = \log 4 = 2 \log 2 = 1.3862$

Data type	Compression technique	Compression rate
Audio 1D	MP3 (MPEG3) 一部分 *.mp3	1/3
Image 2D	JPEG *.jpg	gray : 1/10 color : 1/20
Video 3D	MPEG4 *.mpg *.mpeg (H.264) *.mp4 *.avi H.265, AVI... *.wmv *.mov	gray : 1/30 color : 1/60

For a video, there are 30 frames per second 視覺暫留 1/24
 60 (木良)
 without compression background : still
 foreground : motion vector (移動速度)
 $90_{\text{min}} \times 60 \times 30 \times 1M \times 3 \times 8 / 8$ (bytes)
 $= 486G$
 $486G / 60 = 8.1G$