數位影像處理簡介

壹、數位影像處理之發展背景

貳、影像之構成與數位影像處理之定義

參、影像處理範疇分類

肆、影像處理技術之應用

伍、影像處理系統之基本架構

數位影像處理簡介

壹、數位影像處理之發展背景

一、影像處理起源於兩個主要應用領域：

１．影像視覺品質之改良。

２．自動化機器視覺之發展。

二、影像處理之發展歷史背景：

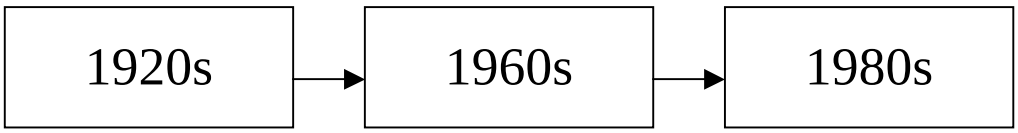


Figure 1.1 *A digital picture produced in 1921 from a coded tape by a telegraph printer with special type faces. (From McFarlane [1972].)*

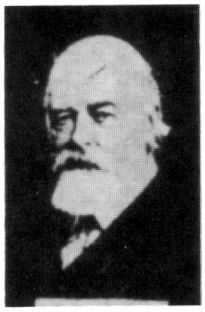
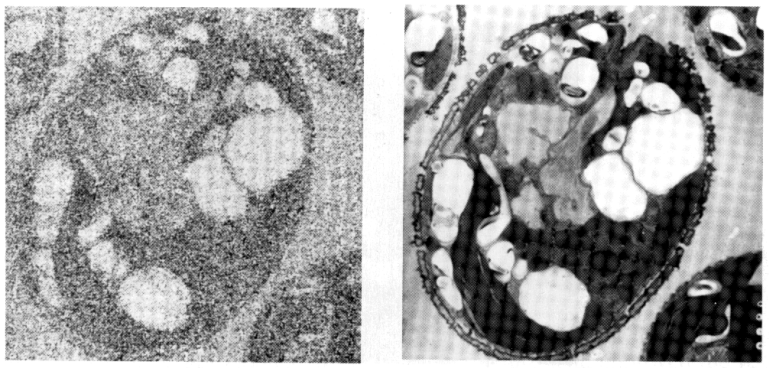
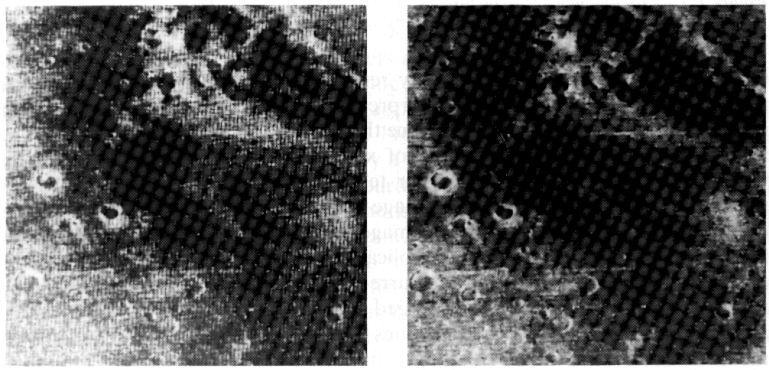


Figure 1.2 *A digital picture made in 1922 from a tape punched after the signals had crossed the Atlantic twice. Some errors are visible. (From McFarlane [1972].)*

Figure 1.3 *Unretouched cable picture of Generals Pershing and Foch, transmitted in 1929 by 15-tone equipment from London to New York. (From McFarlane [1972].)*

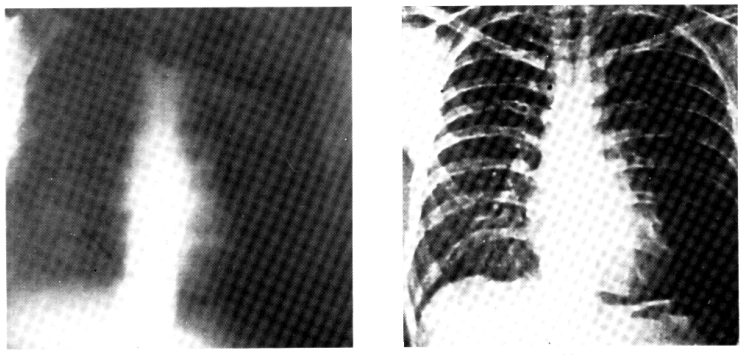


(a) (b)



(c) (d)

Figure 1.4 *Examples of digital image processing. Left column: original digital images. Right column: images after processing.*



(e) (f)

(g) (h)

Figure 1.4 *(Continued).*

貳、影像之構成與數位影像處理之定義

一、影像之構成與座標系統。

二、影像處理之定義：

１．以數位電腦處理二維影像之工作。

２．以數位電腦處理任何二維資料。

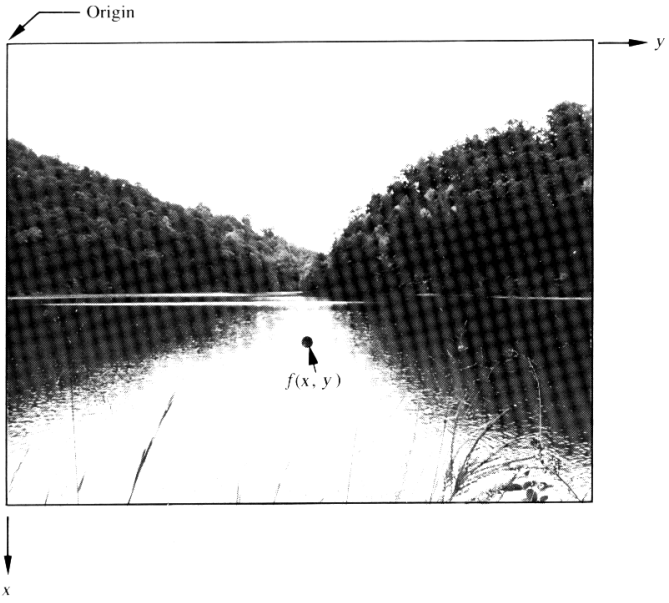
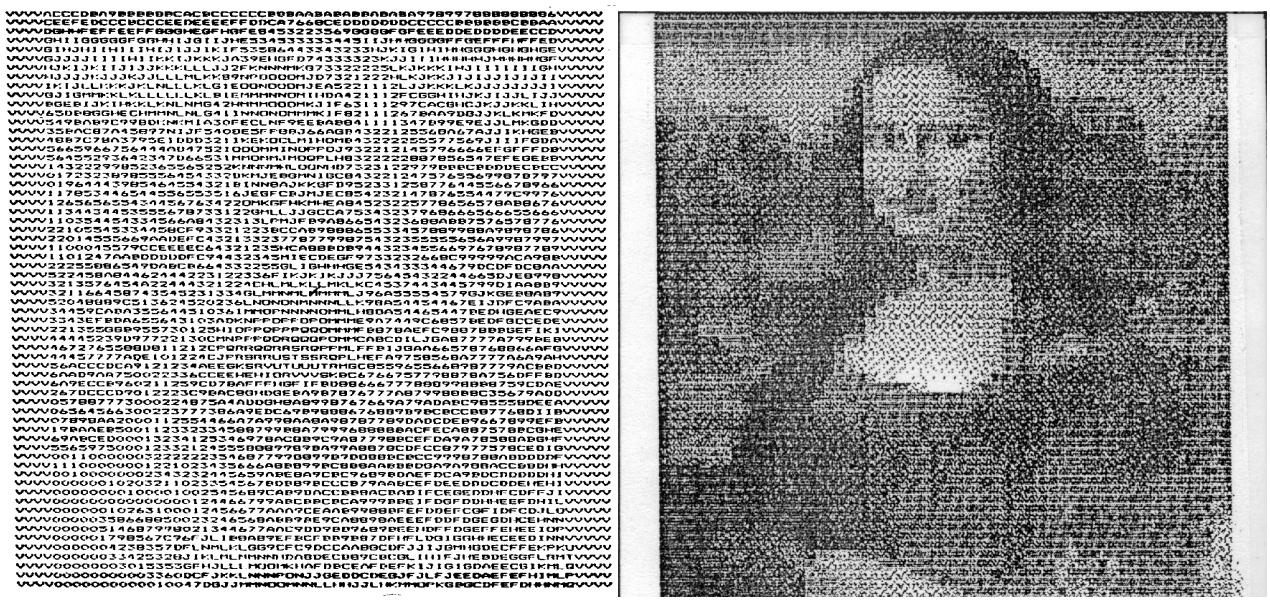


Figure 1.5 *Axis convention used for digital image representation.*



參、影像處理範疇分類

一、影像之表示與模式建立(Image Modeling)

二、影像之強化處理(Image Enhancement)

三、影像之復原(Image Restoration)

四、影像分析(Image Analysis)

五、影像重建(Image Reconstruction)

六、影像資料壓縮(Image Compression)

肆、影像處理技術之應用例

一、文字之自動辨認。

二、工廠機器人或自動化機具之產品檢視。

三、軍事目標之辨認。

四、氣象之預測。

五、農產品之選別。

六、微生物鑑定與計數。

七、植物工場自動化之應用。

八、電腦斷層攝影(Computerized Tomography)

九、指紋辨識。

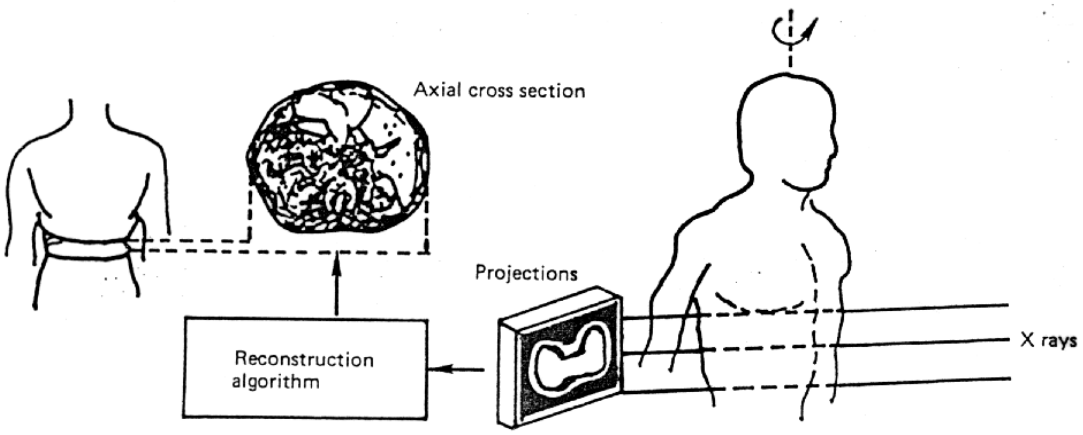
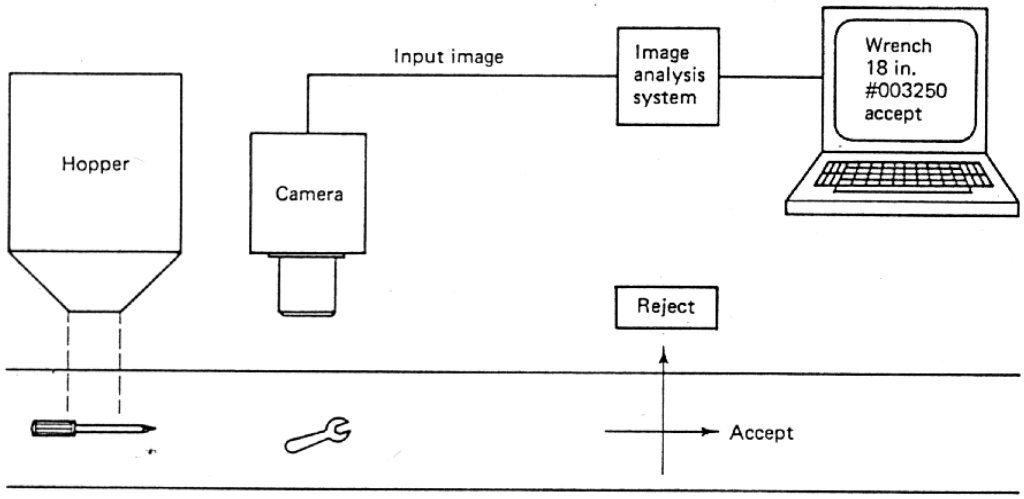
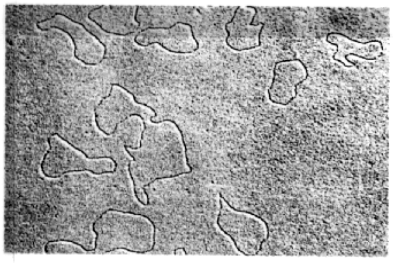


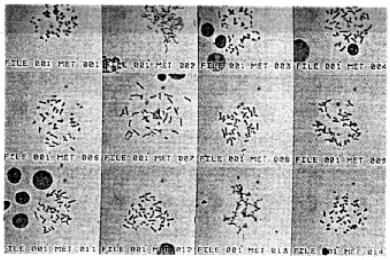
Image reconstruction using X-ray CT scanners.



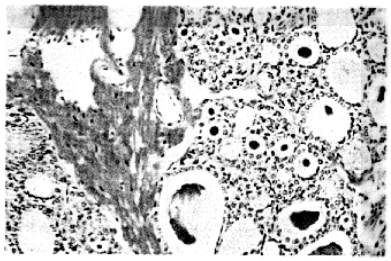
Parts inspection and sorting on an assembly line.



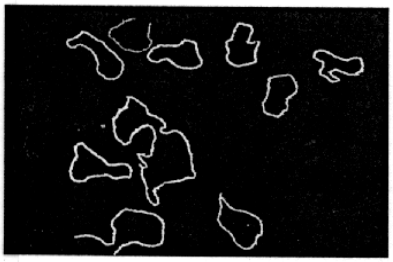
DNA measurement (high resolution TEM imaging)



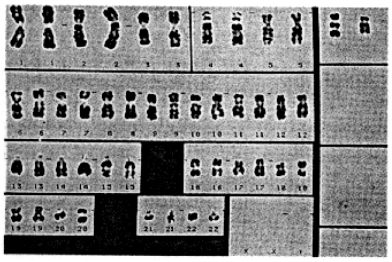
Chromosome analysis: automatic metaphase finding



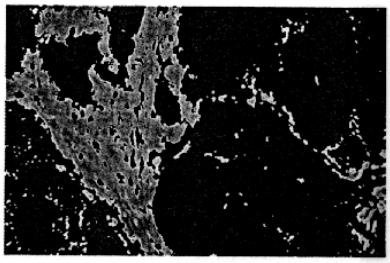
Stained specimen of thyroid gland



Detection of the DNA structure



System-aided caryotyping



Measurement of connective tissue by real color segmentation

伍、影像處理系統之基本架構

一、影像處理之基本步驟

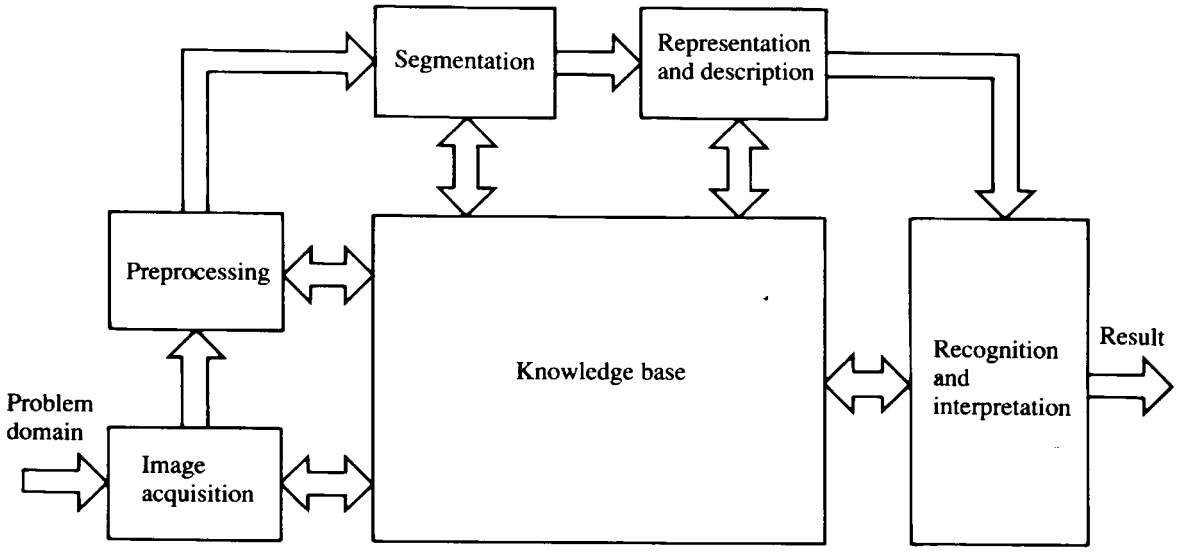


Figure 1.6 *Fundamental steps in digital image processing.*

二、影像處理系統之作業

1．影像擷取(Image Acquisition)

(1).掃描(Scanning)

(2).數位化(Digitizing)

Microdensitometer, Scanners, CCD Camera,

Vidicon camera, Image dissectors, Digital Camera

2．儲存(Storage)

(1).短期儲存

●Frame Buffer

(2).線上儲存(On-line Storage)

●Magnetic Disk,

●Magneto-optical (MO) Device

(3).長期儲存

●Magnetic Tape,

●Write-once-read-many (WORM) Disk

３．影像處理(Processing)

(1).影像處理器(Image Processor)

●Frame Grabber,

●Frame Buffer,

●ALU,

●Display circuit

(2).主電腦(Host Computer)

４．通訊(Communication)

５．顯示(Display)

CRT Monitor, Printer, Film

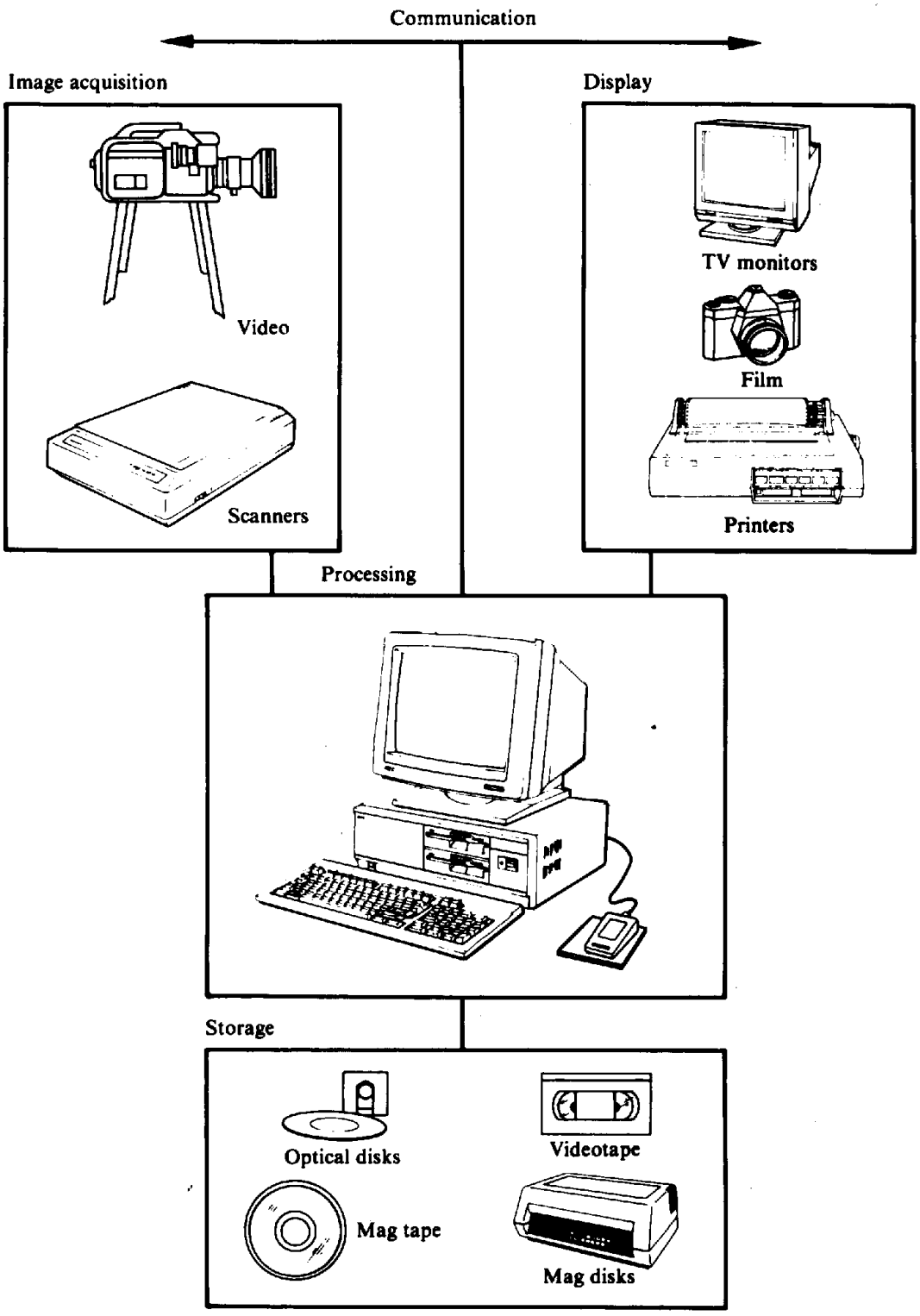


Figure 1.7 *Basic functional elements of an image processing system: acquisition, storage, processing, communication, and display. The components in each box are examples of devices used in such a system.*

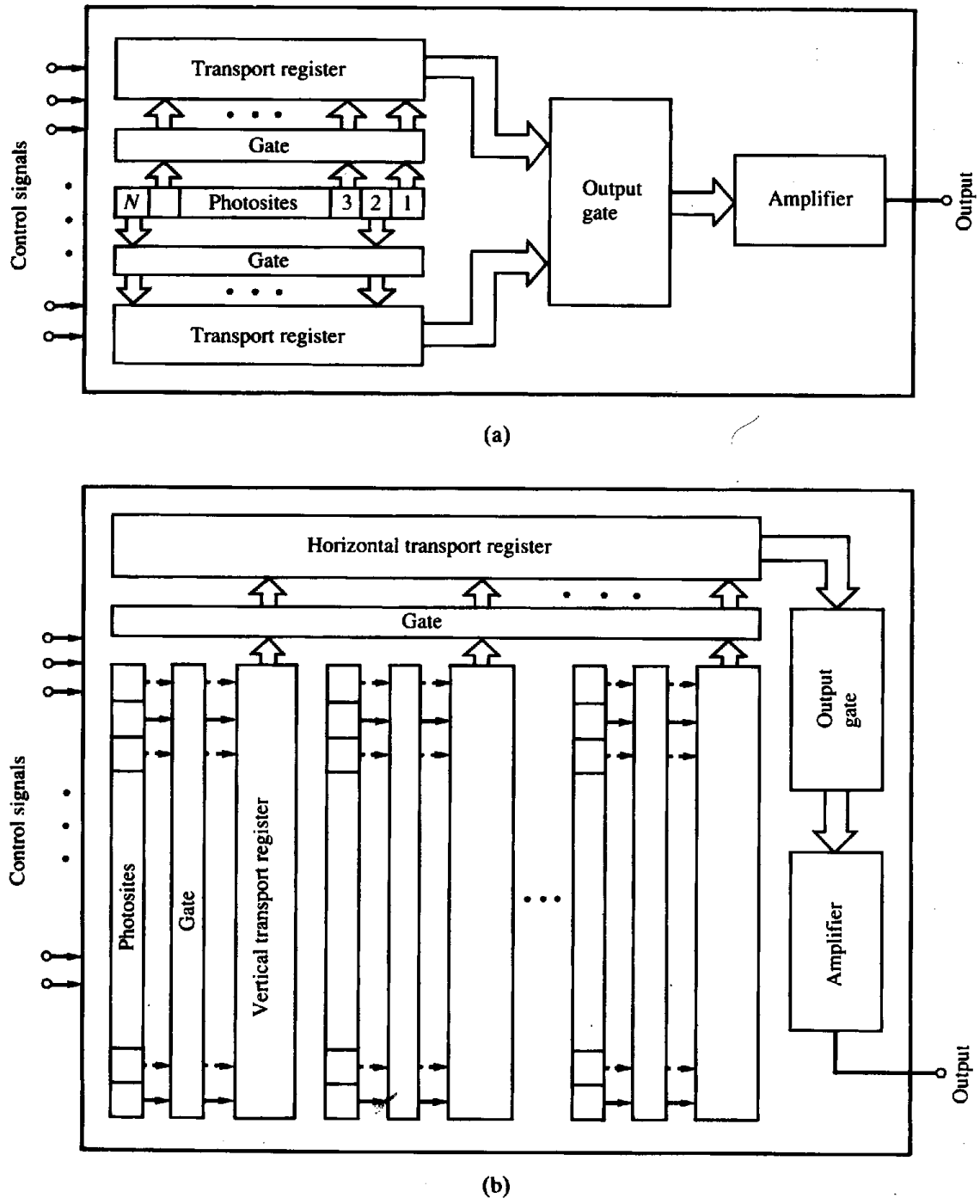
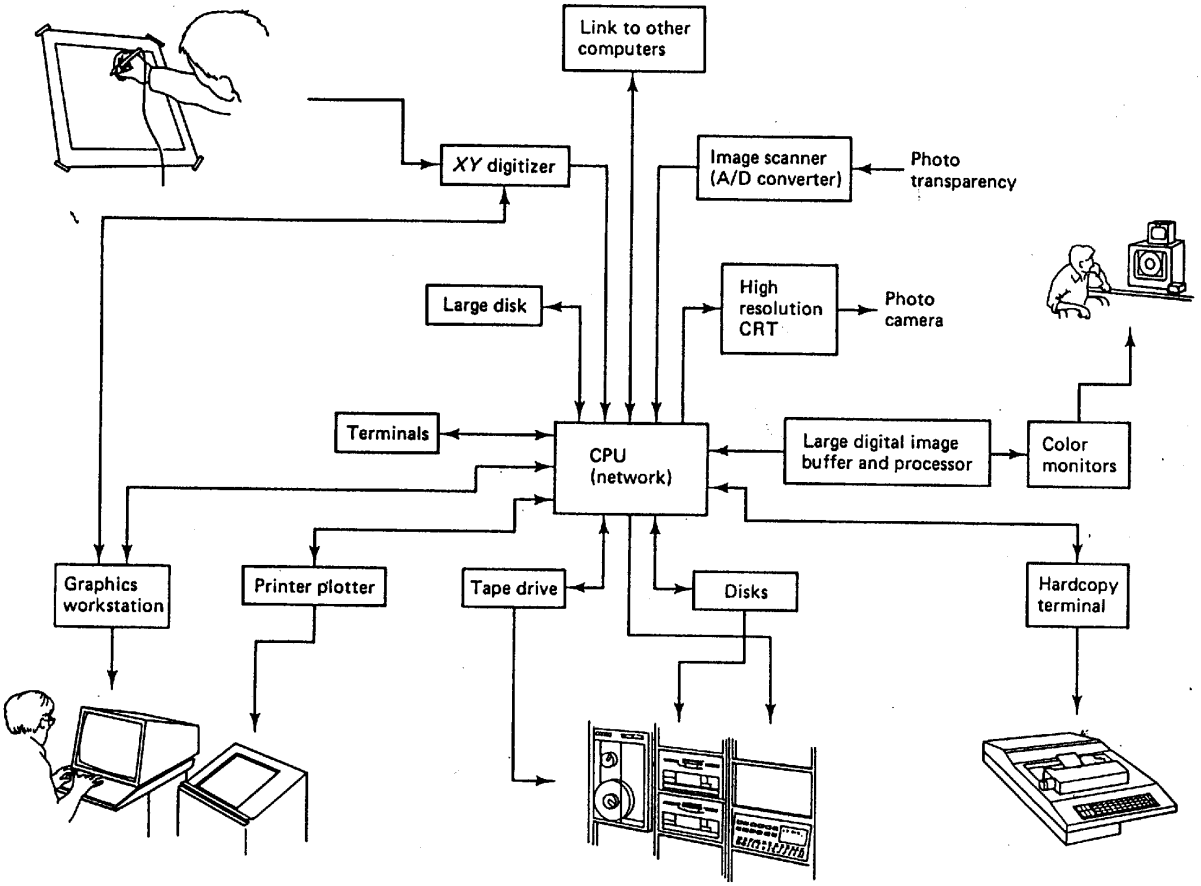
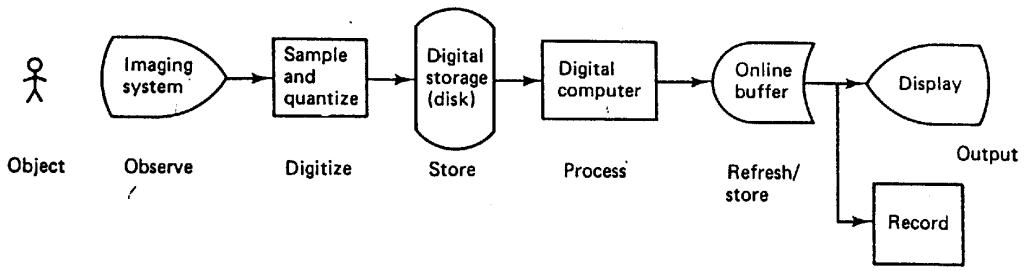


Figure 1.8 *(a) CCD line-scan sensor; (b) CCD area sensor.*



A digital image processing system (Signal and Image Processing Laboratory, University of California, Davis).



A typical digital image processing sequence.