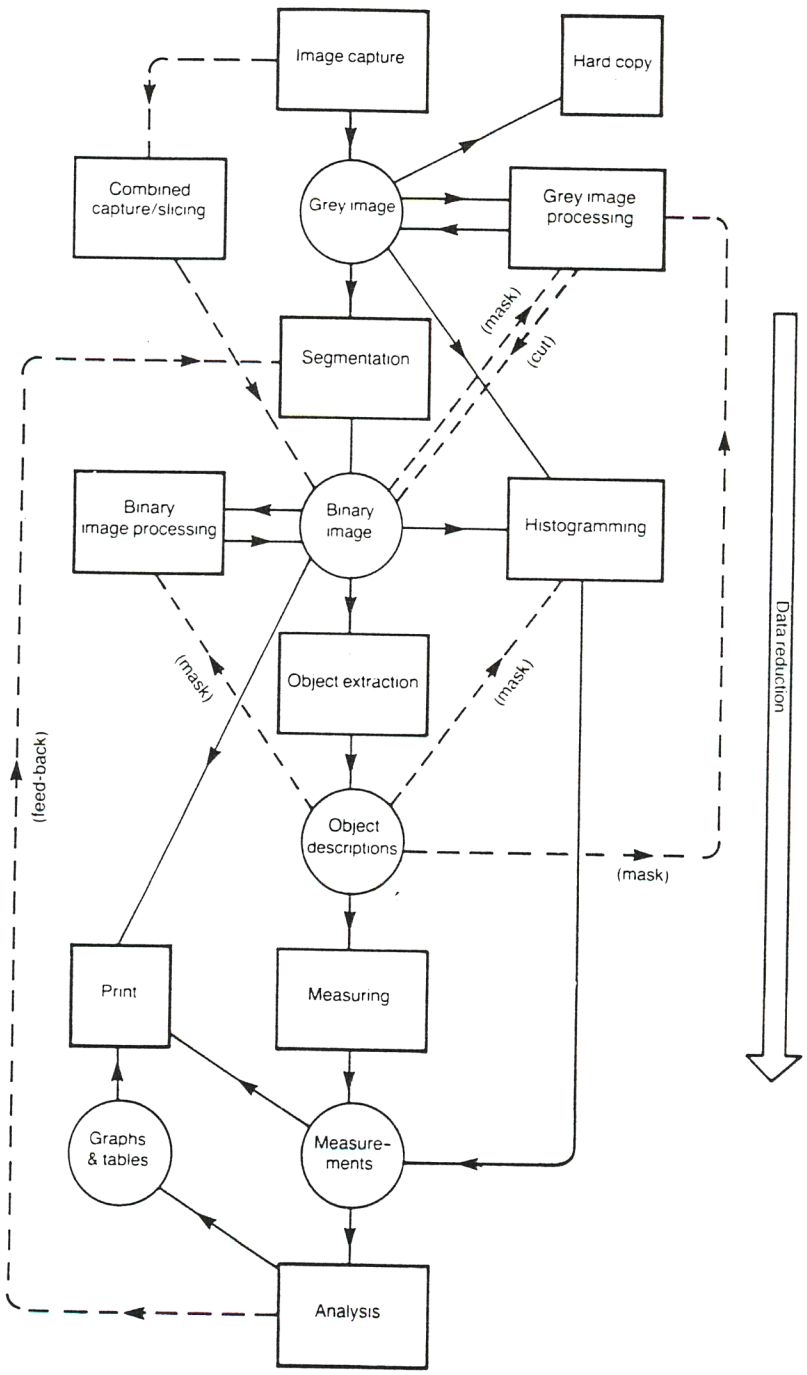

Figure 2.2 The principal stages of image analysis

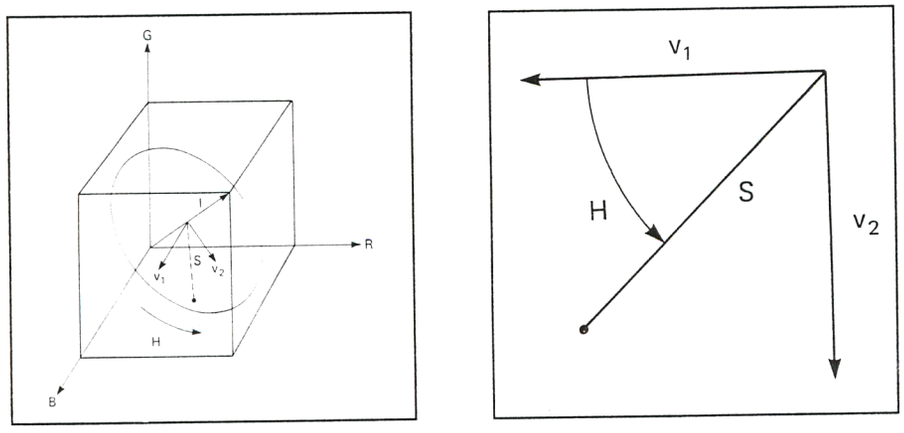

Figure 31. IHS coordinates within the RGB cube: (a) The I, v_1, and v_2 axes in the RGB cube, and (b) converting from v_1, and v_2 to H and S.

$$\begin{pmatrix} I \\ v_1 \\ v_2 \end{pmatrix} = \begin{pmatrix} 1/3 & 1/3 & 1/3 \\ -1/\sqrt{6} & -1/\sqrt{6} & 2/\sqrt{6} \\ 1/\sqrt{6} & -2/\sqrt{6} & 0 \end{pmatrix} \begin{pmatrix} R \\ G \\ B \end{pmatrix} \qquad [2.2]$$

v_1 and v_2 are converted to a polar coordinate system giving H and S to complete the transformation:

$$H = \tan^{-1}\left(\frac{v_2}{v_1}\right) \text{ in the range 0 to 360} \quad \text{and} \quad S = \sqrt{v_1^2 + v_2^2}$$

To use the IHS coordinates for display, it is the inverse transform that is required. In matrix form, this is given by:

$$\begin{pmatrix} R \\ G \\ B \end{pmatrix} = \begin{pmatrix} 1 & -0.204124 & 0.612372 \\ 1 & -0.204124 & -0.612372 \\ 1 & 0.408248 & 0 \end{pmatrix} \begin{pmatrix} I \\ v_1 \\ v_2 \end{pmatrix}$$

where

$$v_1 = S \cos 2\pi H \quad \text{and} \quad v_2 = S \sin 2\pi H$$