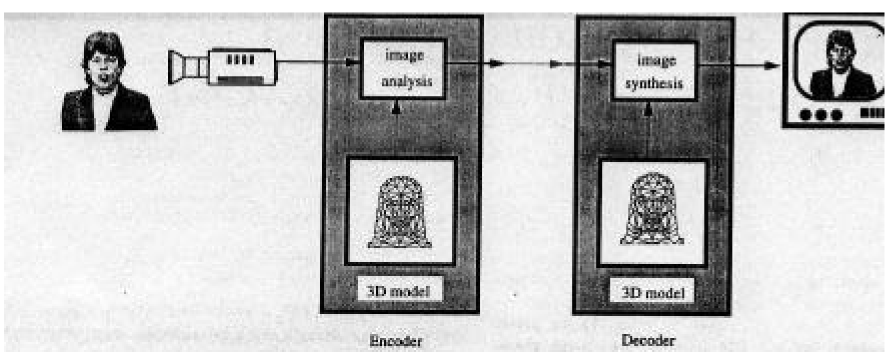
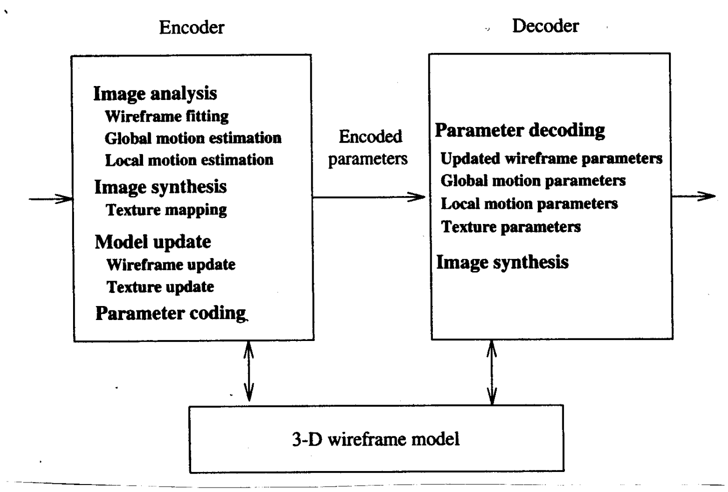
Lecture-20

Model-Based Image Coding

Model-Based Image Coding



Model-Based Image Coding



Candide Model

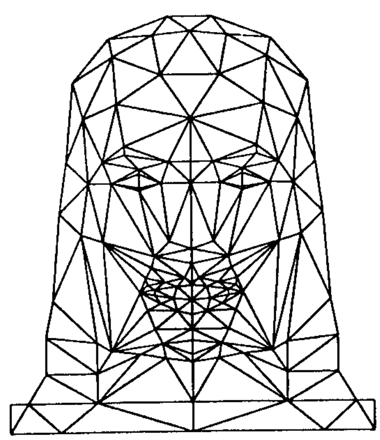
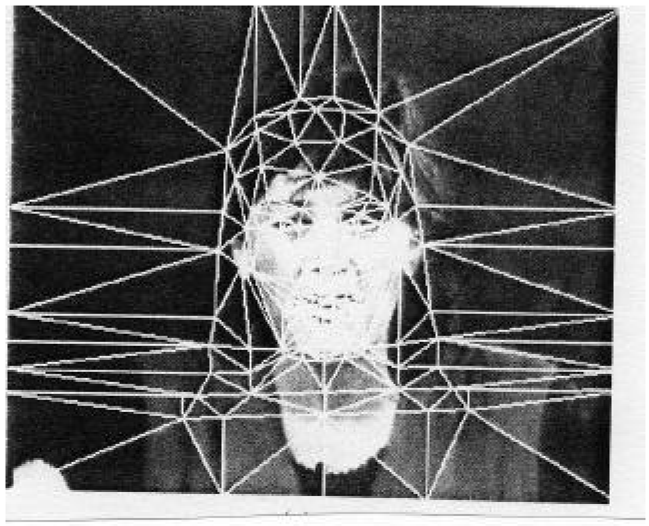


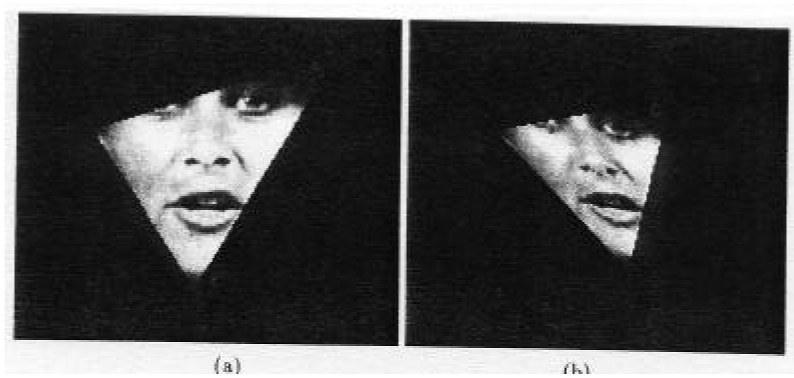
Fig. 2. Wire-frame model of the face.



Pose Estimation

Show the results

Texture Mapping



Optical Flow Constraint Eq

$$f_x u + f_y v + f_t = 0$$

$$f_x(f(\frac{V_1}{Z}+\Omega_2)-\frac{V_3}{Z}x-\Omega_3 y-\frac{\Omega_1}{f}xy+\frac{\Omega_2}{f}x^2)+f_y$$
$$(f(\frac{V_2}{Z}-\Omega_1)+\Omega_3 x-\frac{V_3}{Z}y+\frac{\Omega_2}{f}xy-\frac{\Omega_1}{f}y^2)+f_t=0$$

$$(f_x\frac{f}{Z})V_1+(f_y\frac{f}{Z})V_2+(\frac{f}{Z}(f_x x-f_y y)V_3+$$
$$(-f_x\frac{xy}{f}+f_y\frac{y^2}{f}-f_y f)\Omega_1+(f_x f+f_x\frac{x^2}{f}+f_y\frac{xy}{f})\Omega_2+$$
$$(f_x y+f_y x)\Omega_3=-f_t$$

$$(f_x\frac{f}{Z})V_1+(f_y\frac{f}{Z})V_2+(\frac{f}{Z}(f_x x-f_y y)V_3+$$
$$(-f_x\frac{xy}{f}+f_y\frac{y^2}{f}-f_y f)\Omega_1+(f_x f+f_x\frac{x^2}{f}+f_y\frac{xy}{f})\Omega_2+$$
$$(f_x y+f_y x)\Omega_3=-f_t$$

$$\mathbf{Ax}=\mathbf{b}$$ Solve by Least Squares

$$\mathbf{x}=(V_1,V_2,V_3,\Omega_1,\Omega_2,\Omega_3)$$

$$\mathbf{Ax} = \mathbf{b}$$

$$\begin{bmatrix} & & \vdots & & & \\ (f_x \frac{f}{Z}) & (f_y \frac{f}{Z}) & (\frac{f}{Z}(f_x x - f_y y)) & (-f_x \frac{xy}{f} + f_y \frac{y^2}{f} - f_y f) & (f_x f + f_x \frac{x^2}{f} + f_y \frac{xy}{f}) & (f_x y + f_y x) \\ & & \vdots & & & \end{bmatrix} \begin{bmatrix} V_1 \\ V_2 \\ V_3 \\ \Omega_1 \\ \Omega_2 \\ \Omega_3 \end{bmatrix} = \begin{bmatrix} \vdots \\ f_t \\ \vdots \end{bmatrix}$$

Li et al, IEEE PAMI, June 1993