Surface Geometry

$$e = -\frac{\partial h_{uu}}{\sqrt{(1 + h_u^2 + h_v^2)}}$$

$$f = -\frac{\partial h_{uv}}{\sqrt{(1 + h_u^2 + h_v^2)}}$$

$$g = -\frac{\partial h_{vv}}{\sqrt{(1 + h_u^2 + h_v^2)}}$$

$$E = 1 + h_u^2$$

$$F = h_u h_v$$

$$G = 1 + h_v^2$$

$$\overline{N} = \frac{(-h_u, -h_v, 1)^T}{\sqrt{(1 + h_u^2 + h_v^2)}}$$

$$d\overline{N}(\overline{t}) = \begin{bmatrix} e\ f \\ f\ g \end{bmatrix} \begin{bmatrix} E\ F \\ F\ G \end{bmatrix}^{-1}$$

$$H = \frac{Eg + Ge - 2Ff}{2(EG - F^2)}$$

$$K = \frac{eg - f^2}{EG - F^2}$$

$$k_1 = H + \sqrt{H^2 - K}$$

$$k_2 = H - \sqrt{H^2 - K}$$