$$\nabla^2 H = 0$$

$$\nabla^2 f = \sum_{i=1}^{n} \frac{\partial^2 f}{\partial x_i^2}$$

$$\nabla^2 f(x,y) \approx f(x-1,y) + f(x+1,y) + f(x,y-1) + f(x,y+1) - 4f(x,y)$$

$$K = \begin{pmatrix} 0 & 1 & 0 \\ 1 & -4 & 1 \\ 0 & 1 & 0 \end{pmatrix}$$

$$-4u_{i,j} + u_{i+1,j} + u_{i-1,j} + u_{i,j+1} + u_{i,j-1} = 0$$

$$U^T H_v = b$$

$$\nabla^2 H = div(G)$$

$$G = \nabla S$$

$$\nabla^2 H = div(\nabla S)$$

$$-4u_{i,j} + u_{i+1,j} + u_{i-1,j} + u_{i,j+1} + u_{i,j-1} \approx \nabla^2 S(i,j)$$

$$U^T H_v = b$$

$$\frac{d}{dx}(U) = D_x$$
$$\frac{d}{dy}(U) = D_y$$

$$S_x = \begin{pmatrix} -1 & 0 & 1 \\ -2 & 0 & 2 \\ -1 & 0 & 1 \end{pmatrix}$$

$$S_y = \begin{pmatrix} -1 & -2 & -1 \\ 0 & 0 & 0 \\ 1 & 2 & 1 \end{pmatrix}$$

$$-u_{i-1,j-1} - 2u_{i-1,j} - u_{i-1,j+1} + u_{i+1,j+1} + 2u_{i+1,j} + u_{i,j+1} = D_x(i,j)$$
$$-u_{i-1,j-1} - 2u_{i,j-1} - u_{i+1,j+1} + u_{i-1,j-1} + 2u_{i,j+1} + u_{i+1,j+1} = D_y(i,j)$$

$$\nabla^2 I = div(\nabla I)$$

$$\nabla I(i,j) = (D_x(i,j), D_y(i,j))$$

$$\nabla I^2(i,j) = \frac{\partial D_x(i,j)}{\partial x} + \frac{\partial D_y(i,j)}{\partial y}$$

$$\begin{pmatrix} 0 & 1 & 0 \\ 1 & -4 & 1 \\ 0 & 1 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 \\ 0 & -1 & 1 \\ 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 1 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 \\ -1 & 1 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & -1 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$