

An image is a function  $\Omega$  to  $\mathbb{R}$ .

A matrix is a discrete function.

Let  $u$  be an image,  $f$  the observed image.

The data fidelity/discrepancy function is (page ...)

$$F(u) = \frac{1}{2} \|u - f\|_2^2 \quad (1)$$

The regularisation term is (page 14)

$$\text{TGV}_\alpha^2(u) = \max \left\{ \langle u, \text{div}_h v \rangle_U \mid \begin{array}{l} (v, w) \in V \times W, \text{div}_h w = v, \\ \|w\|_\infty \leq \alpha_0, \|v\|_\infty \leq \alpha_1 \end{array} \right\} \quad (2)$$

where  $\langle u, \text{div}_h v \rangle_U$  is ...

The total generalized variation (TGV) functional is defined as (page ...)

$$\min_{u \in L^p(\Omega)} F(u) + \text{TGV}_\alpha^2(u) \quad (3)$$

The  $x$  and  $y$  forward finite difference operators are (page ...)

$$(\partial_x^+ u)_{i,j} = \begin{cases} u_{i+1,j} - u_{i,j} & \text{for } 1 \leq i < N_1, \\ 0 & \text{for } i = N_1, \end{cases} \quad (4)$$

$$(\partial_y^+ u)_{i,j} = \begin{cases} u_{i,j+1} - u_{i,j} & \text{for } 1 \leq j < N_2, \\ 0 & \text{for } j = N_2, \end{cases} \quad (5)$$