Master Project ASL

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Chapter 1

Rectification

The following test was performed to verify the correctness of the pixel association process. The residuals of the original images I_1 and I_2 and of the rectified images I_1^{rect} and I_2^{rect} are given by

$$\Delta r_i = I_1(u_{1,i}) - I_2(w_{2,i}) \tag{1.1}$$

$$\Delta r_i^{rect} = I_1^{rect}(w_{1,i}) - I_2^{rect}(w_{2,i}), \quad \text{for } i = 1 \dots n, \tag{1.2}$$

where $u_{1,i}$, $u_{2,i}$ denote the pixels in the original image and $w_{1,i}$, $w_{2,i}$ denote the pixels in the rectified image.

If the rectified pixels are computed in accordance with the rectification process of the images, we have

$$\Delta r_i = \Delta r_i^{rect} + \epsilon_i \text{ for } i = 1 \dots n, \tag{1.3}$$

with ϵ_i the error arising solely from interpolation of the rectified image.

The pixels of the rectified image need to obey

$$w_{i,j} = P_j \begin{pmatrix} X_{i,j}^{rect} \\ 1 \end{pmatrix} \text{ for } j = 1, 2, \tag{1.4}$$

where $X_{i,j}^{rect}$ are computed such that $w_{i,j} = \tilde{u}_{i,j}$, with

$$\tilde{u}_{i,j} = K'(T_j(X_i)), \text{ with} \tag{1.5}$$

$$T_j(X_i) = \pi(C_{C_j M}(X_i - {}_M r_{MC_j})) \text{ and} \tag{1.6}$$

$$\pi(\big(x, y, z\big)^T) = \big(x/z, y/z, z\big)^T. \tag{1.7}$$

Remember that $u_{i,j}$ are given by

$$u_{i,j} = K_j(D_j(T(X_i))) \tag{1.8}$$

which concludes the above considerations.