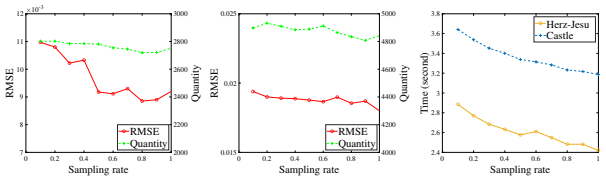
A. The number of tie points

To explore the influence of the number of tie points, we sampled the tie points in each image, and then evaluated the performance of ELSR with the Herz-Jesu and Castle datasets.

Fig. 1 shows the performance. With the increase of the sampling rate, the quantity, the error, and the run time decreased, because the point helped to control the false positive and reduce the searching. In addition, the results demonstrated that ELSR was workable when the number of tie points was not enough.



(a) Herz-Jesu (b) Castle (c) Run time

Figure 1. The evaluation with different number of tie points

B. The influence of t_{pos}, t_{ove}, and t_{int}

We have not shown the impacts of the position distance (t_{pos}), the overlap rate (t_{ove}), and the intersection distance (t_{int}) in the paper. Thus, we used the Castle dataset to evaluate their impacts.

As shown in Fig. 2, t_{pos} strongly controlled the accuracy; 2-pixel was a common-used value and it was appropriate because it achieved a good quantity and accuracy. The line quantity dramatically decreased when t_{ove} reached to 1 because 2D line segments is indistinct in endpoints. A bigger t_{int} brought about more correct 3D lines, but it might take more time since the pairwise lines for validation are increased.

C. The local homography

Finally, we give more details about the local homography with figures and experiments.

Fig. 3 shows how t_{int} constrains the pairwise lines. The matches of these pairwise lines induce the homography about the scene planes (see Fig. 4). It is inevitable to obtain

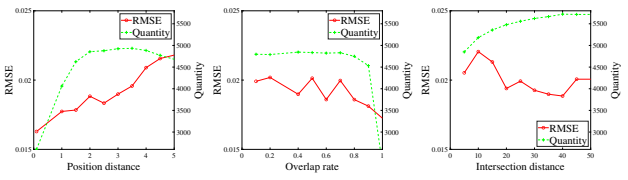


Figure 2. The evaluation with different hyper-parameters.

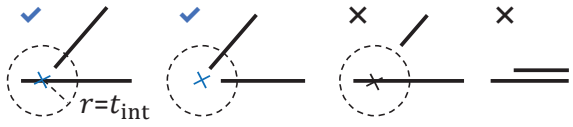
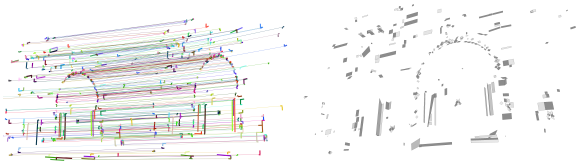


Figure 3. The distance constraint for pairwise lines.



(a) Pairwise line matches (b) The 3D planes.

Figure 4. The local scene planes are reconstructed from the pairwise line matches.

incorrect homographies because only the angular similarity is used for fast validation. However, the guided matching with a voting can suppress the negative impact of these incorrect homographies. As shown in Tab. 1, finding the local homography is quite efficient, and the run time is closely related to the image size and the number of the pairwise lines.

Dataset	PL	LH	Time (ms)
Herz-Jesu	1928	480	4
Castle	5569	1277	25
Dublin	16778	6017	57
Guangzhou	12513	3386	277
Ningbo	17802	3535	205

Table 1. The statistics of finding the local homography. "PL" is the average number of the pairwise lines for each image. "LH" is the average number of the local homographies for each image pair.