

Results of parameter setting test

Note that 120 pairs of randomly selected images from datasets 1~6 (20 pairs per dataset) were used for this parameter setting test. During experiment, we modify the tested parameter while keeping the other parameters unchanged, as shown in Table 1. And the results of this experiment are listed in Table 2~6.

Table 1 The details of parameter settings.

| parameter | variable | Fixed parameters |
|--|------------------------|--------------------|
| N_O (the number of filter bank orientations) | $N_O = [4, 6, 8, 10]$ | $N_S = 4, r = 42$ |
| N_S (the number of filter bank scales) | $N_S = [2, 3, 4, 5]$ | $N_O = 6, r = 42$ |
| r (the feature descriptor radius) | $r = [30, 36, 42, 48]$ | $N_O = 6, N_S = 4$ |

Table 2 The performance of OFM-G1StF under different parameter settings.

| Parameter setting | | | NCM (pairs) | Precision (%) | Recall (%) | Inlier ratio (%) | RMSE (pixels) | SR (%) |
|-------------------|-------|-----|-------------|---------------|------------|------------------|---------------|--------|
| N_O | N_S | r | | | | | | |
| 6 | 4 | 30 | 303.73 | 69.92 | 80.61 | 10.38 | 1.86 | 82.50 |
| 6 | 4 | 36 | 319.25 | 69.07 | 80.75 | 11.33 | 1.77 | 84.16 |
| 6 | 4 | 42 | 335.65 | 71.53 | 80.58 | 13.24 | 1.83 | 90.00 |
| 6 | 4 | 48 | 349.51 | 70.78 | 79.13 | 13.41 | 1.94 | 85.83 |
| 4 | 4 | 42 | 300.78 | 68.62 | 78.66 | 13.81 | 1.86 | 81.66 |
| 8 | 4 | 42 | 341.10 | 71.08 | 79.98 | 13.48 | 1.88 | 84.16 |
| 10 | 4 | 42 | 344.36 | 70.05 | 79.44 | 13.29 | 1.87 | 79.16 |
| 6 | 2 | 42 | 318.51 | 69.79 | 79.79 | 13.13 | 1.82 | 82.50 |
| 6 | 3 | 42 | 336.46 | 70.86 | 79.99 | 13.53 | 1.77 | 85.00 |
| 6 | 5 | 42 | 349.31 | 70.13 | 79.65 | 13.45 | 1.81 | 80.00 |

Table 3 The performance of OFM-G2StF under different parameter settings.

| Parameter setting | | | NCM (pairs) | Precision (%) | Recall (%) | Inlier ratio (%) | RMSE (pixels) | SR (%) |
|-------------------|-------|-----|-------------|---------------|------------|------------------|---------------|--------|
| N_O | N_S | r | | | | | | |
| 6 | 4 | 30 | 170.71 | 67.94 | 81.72 | 8.94 | 1.92 | 65.00 |
| 6 | 4 | 36 | 237.91 | 69.72 | 79.97 | 10.92 | 1.97 | 55.83 |
| 6 | 4 | 42 | 269.78 | 72.13 | 80.38 | 11.89 | 1.93 | 67.50 |
| 6 | 4 | 48 | 275.85 | 70.79 | 79.03 | 12.58 | 2.05 | 57.50 |
| 4 | 4 | 42 | 218.34 | 67.78 | 77.74 | 11.82 | 2.01 | 57.50 |
| 8 | 4 | 42 | 273.66 | 70.82 | 81.84 | 11.96 | 1.98 | 65.00 |
| 10 | 4 | 42 | 277.12 | 70.63 | 80.79 | 12.64 | 1.98 | 55.83 |
| 6 | 2 | 42 | 221.72 | 68.62 | 78.84 | 11.88 | 2.01 | 50.00 |
| 6 | 3 | 42 | 265.81 | 69.91 | 80.12 | 11.21 | 1.93 | 66.66 |
| 6 | 5 | 42 | 261.73 | 67.67 | 78.32 | 11.44 | 1.99 | 54.16 |

Table 4 The performance of OFM-H2StF under different parameter settings.

| Parameter setting | | | NCM (pairs) | Precision (%) | Recall (%) | Inlier ratio (%) | RMSE (pixels) | SR (%) |
|-------------------|-------|-----|-------------|---------------|------------|------------------|---------------|--------|
| N_o | N_s | r | | | | | | |
| 6 | 4 | 30 | 310.54 | 73.09 | 81.94 | 11.11 | 1.63 | 87.53 |
| 6 | 4 | 36 | 330.44 | 71.24 | 80.06 | 14.10 | 1.78 | 88.33 |
| 6 | 4 | 42 | 359.48 | 73.07 | 80.84 | 16.01 | 1.69 | 90.83 |
| 6 | 4 | 48 | 372.84 | 71.67 | 80.49 | 16.13 | 1.73 | 83.33 |
| 4 | 4 | 42 | 319.85 | 70.53 | 79.78 | 15.28 | 1.79 | 81.66 |
| 8 | 4 | 42 | 367.68 | 73.85 | 81.65 | 15.54 | 1.71 | 89.16 |
| 10 | 4 | 42 | 368.97 | 71.19 | 79.61 | 15.46 | 1.80 | 82.50 |
| 6 | 2 | 42 | 336.73 | 72.15 | 80.87 | 15.05 | 1.71 | 77.50 |
| 6 | 3 | 42 | 347.64 | 72.74 | 81.40 | 16.02 | 1.71 | 89.16 |
| 6 | 5 | 42 | 356.44 | 70.92 | 79.51 | 15.39 | 1.81 | 83.33 |

Table 5 The performance of OFM-GoF under different parameter settings.

| Parameter setting | | | NCM (pairs) | Precision (%) | Recall (%) | Inlier ratio (%) | RMSE (pixels) | SR (%) |
|-------------------|-------|-----|-------------|---------------|------------|------------------|---------------|--------|
| N_o | N_s | r | | | | | | |
| 6 | 4 | 30 | 263.01 | 74.86 | 83.86 | 11.20 | 1.67 | 71.66 |
| 6 | 4 | 36 | 296.14 | 73.52 | 81.93 | 13.25 | 1.68 | 75.83 |
| 6 | 4 | 42 | 318.65 | 76.14 | 84.12 | 13.55 | 1.65 | 82.50 |
| 6 | 4 | 48 | 336.15 | 73.69 | 82.58 | 14.42 | 1.66 | 79.16 |
| 4 | 4 | 42 | 269.36 | 72.83 | 82.35 | 13.86 | 1.72 | 69.16 |
| 8 | 4 | 42 | 332.07 | 73.24 | 82.11 | 12.57 | 1.70 | 73.33 |
| 10 | 4 | 42 | 334.25 | 71.16 | 81.13 | 12.53 | 1.72 | 74.16 |
| 6 | 2 | 42 | 264.94 | 73.16 | 82.12 | 12.96 | 1.74 | 54.16 |
| 6 | 3 | 42 | 305.95 | 73.51 | 81.91 | 12.90 | 1.81 | 75.00 |
| 6 | 5 | 42 | 318.35 | 73.04 | 81.92 | 13.38 | 1.67 | 63.33 |

Table 6 The performance of OFM-LGoF under different parameter settings.

| Parameter setting | | | NCM (pairs) | Precision (%) | Recall (%) | Inlier ratio (%) | RMSE (pixels) | SR (%) |
|-------------------|-------|-----|-------------|---------------|------------|------------------|---------------|--------|
| N_o | N_s | r | | | | | | |
| 6 | 4 | 30 | 238.87 | 73.98 | 81.70 | 10.19 | 1.68 | 76.66 |
| 6 | 4 | 36 | 273.74 | 73.58 | 81.06 | 12.16 | 1.67 | 80.83 |
| 6 | 4 | 42 | 294.62 | 73.84 | 81.69 | 12.48 | 1.66 | 83.33 |
| 6 | 4 | 48 | 300.07 | 73.62 | 81.54 | 13.49 | 1.64 | 78.33 |
| 4 | 4 | 42 | 248.23 | 72.29 | 80.12 | 12.85 | 1.73 | 75.00 |
| 8 | 4 | 42 | 296.71 | 73.58 | 81.61 | 12.59 | 1.72 | 82.50 |
| 10 | 4 | 42 | 299.02 | 72.43 | 79.82 | 12.14 | 1.78 | 76.66 |
| 6 | 2 | 42 | 262.63 | 73.26 | 81.07 | 12.41 | 1.66 | 57.50 |
| 6 | 3 | 42 | 288.73 | 73.97 | 82.74 | 14.02 | 1.68 | 75.83 |
| 6 | 5 | 42 | 291.05 | 73.29 | 81.93 | 12.38 | 1.65 | 72.50 |