This document analyses and collects performances of algorithms in level 3 (feature extraction/matching), ORB, SIFT, SURF.

Feature point extraction algorithm comparison:

|  |  |  |  |
| --- | --- | --- | --- |
| Image No# | SIFT | SURF | ORB |
| 0 | 2414 | 4126 | 500 |
| 1 | 4295 | 8129 | 500 |
| 2 | 3404 | 4784 | 500 |
| 3 | 1639 | 2802 | 500 |
| 4 | 1510 | 1484 | 497 |
| 5 | 10572 | 8309 | 500 |
| 6 | 191 | 187 | 295 |
| 7 | 3352 | 4706 | 500 |
| 8 | 165 | 403 | 374 |
| 9 | 4899 | 7523 | 500 |
| 10 | 1979 | 4212 | 500 |
| 11 | 3599 | 3294 | 500 |
| 12 | 163 | 168 | 287 |
| 13 | 1884 | 2413 | 500 |
| 14 | 2509 | 5055 | 500 |
| 15 | 9177 | 4773 | 500 |
| 16 | 3332 | 3217 | 500 |
| 17 | 5446 | 6611 | 500 |
| 18 | 4592 | 6033 | 500 |
| 19 | 266 | 509 | 459 |
| 20 | 2087 | 2786 | 500 |
| 21 | 2582 | 3651 | 500 |
| 22 | 2509 | 4237 | 500 |
| 23 | 1236 | 4545 | 500 |
| 24 | 1311 | 2606 | 500 |
| 25 | 237 | 387 | 500 |
| 26 | 968 | 1418 | 488 |
| Time Cost | 21.52 | 17.4 | 0.97 |

The above is the time measured by some picture sets alone, and then the total time cost (seconds) spent by looking at the feature detect and the composite feature descriptor through a pair of pictures:

|  |  |  |  |
| --- | --- | --- | --- |
| Image pair | SIFT | SURF | ORB |
| eiffel-1, 13.jpg | 2.77 | 3.22 | 0.11 |

So, you can see that the overhead of the descriptor is still quite high, there are only two images here, so the main thing to start with is the descriptor, the extraction is very fast.

Below, the matching effects of these algorithms are seen through two images. 1639-1311-697 means that images 1 and 2 extract 1639 and 1311 key points respectively, among which 697 are matched.

|  |  |  |  |
| --- | --- | --- | --- |
| **Image pair** | **SIFT** | **SURF** | **ORB** |
| eiffel-1, 13.jpg | 1639/1311/697 | 2802/2606/1243 | 500/500/251 |

After numerous trials and reading some researches, we got conclusion that:

* Computational speed: ORB>>SURF>>SIFT
* Robustness of rotation：SURF>ORB~SIFT (similar)
* Fuzzy robustness：SURF>ORB~SIFT
* Robustness of Scale transformation: SURF>SIFT>ORB（ORB unsupported）