Affine Subspace Representation for Feature Description

Supplemental Material

Zhenhua Wang, Bin Fan and Fuchao Wu
National Laboratory of Pattern Recognition, Chinese Academy of Sciences
{wzh, bfan, fcwu}@nlpr.ia.ac.cn

In this document, we present the detailed comparison of ASIFT [1] to several local descriptors, include our proposed ASR. The used dataset is the famous Oxford's image matching benchmark [2,3]. For ASIFT, we used the implementation supplied in the authors' website, and the matching threshold is set to 0.8. For other methods, namely local descriptors, we combined them with DoG detector [4] for image matching. The NNDR matching threshold is set to 0.8 too. For each test image pair, we recorded the number of total matches and matching precision as shown in Table 1. Given a pair of matching points, if one point transformed by the groundtruth homography is within 2 pixels of its matching point, this pair is considered to be a correct match. It can be found that the accuracy of ASIFT is lower than that of ASR, although it could obtain much more matches.

Table 1 Matching results of different methods on the Oxford dataset. The results are reported in terms of (#total matches, precision).

Bikes						
	1V2	1V3	1V4	1V5	1V6	Ave Pre.
Bikes						
ASIFT	(6536, 97.5%)	(6310, 96.4%)	(5255, 93.7%)	(4338, 87.6%)	(3357, 65.4%)	88.1%
SIFT	(390, 94.9%)	(361, 90.6%)	(256, 88.3%)	(193, 85.0%)	(136, 52.2%)	82.2%
DAISY	(418, 94.0%)	(386, 90.4%)	(266, 88.0%)	(203, 85.7%)	(152, 53.3%)	82.3%
ASR-naive	(320, 99.1%)	(262, 97.7%)	(156, 97.4%)	(101, 96.0%)	(57, 82.4%)	94.5%
ASR-fast	(313, 98.7%)	(270, 95.2%)	(158, 94.9%)	(109, 94.5%)	(68, 77.9%)	92.3%
Boat						
ASIFT	(5373, 65.2%)	(2871, 49.7%)	(1230, 10.6%)	(753, 9.6%)	(140, 7.1%)	28.4%
SIFT	(411, 89.5%)	(356, 90.2%)	(165, 52.7%)	(107, 42.1%)	(52, 5.8%)	56.1%
DAISY	(462, 86.1%)	(392, 88.0%)	(177, 53.1%)	(119, 41.2%)	(63, 4.8%)	54.6%
ASR-naive	(322, 96.9%)	(275, 97.1%)	(90, 72.2%)	(38, 52.6%)	(4, 25.0%)	68.8%
ASR-fast	(311, 96.8%)	(272, 95.2%)	(90, 68.9%)	(32, 53.1%)	(10, 30%)	68.8%
Graf						
ASIFT	(3770, 61.3%)	(2723, 38.2%)	(1963, 36.4%)	(1075, 26.5%)	(646, 20.9%)	36.7%
SIFT	(318, 87.4%)	(176, 52.8%)	(53, 17.0%)	(26, 3.8%)	(18, 0%)	32.2%
DAISY	(310, 87.7%)	(168, 56.5%)	(37, 35.1%)	(13, 7.7%)	(7, 0%)	37.4%
ASR-naive	(241, 96.3%)	(67, 85.1%)	(7, 71.4%)	(1, 100%)	(1, 0%)	70.6%
ASR-fast	(225, 96.9%)	(39, 71.8%)	(8, 37.5%)	(8, 12.5%)	(3, 0%)	43.7%

Wall						
ASIFT	(9328, 66.8%)	(7141, 80.3%)	(4181, 49.7%)	(2584, 38.8%)	(1031, 34.8%)	54.1%
SIFT	(582, 75.6%)	(479, 92.1%)	(308, 65.3%)	(127, 41.7%)	(17, 17.6%)	58.5%
DAISY	(598, 76.1%)	(490, 92.2%)	(329, 66.3%)	(158, 46.8%)	(17, 17.6)	59.8%
ASR-naive	(490, 80.4%)	(317, 97.8%)	(130, 61.5%)	(24, 29.2%)	(0, 0%)	53.8%
ASR-fast	(490, 80.6%)	(318, 97.2%)	(112, 64.3%)	(15, 40%)	(0, 0%)	56.4%
Leuven						
ASIFT	(4405, 93.2%)	(3405, 92.7%)	(2744, 86.7%)	(2016, 84.1%)	(1397, 79.6%)	87.2%
SIFT	(251, 92.0%)	(204, 88.2%)	(155, 86.5%)	(120, 80.8%)	(85, 76.5%)	84.8%
DAISY	(258, 94.6%)	(218, 90.8%)	(167, 88.0%)	(130, 83.1%)	(95, 76.8%)	86.7%
ASR-naive	(200, 99.0%)	(156, 98.7%)	(114, 98.2%)	(78, 100%)	(43, 97.7%)	98.7%
ASR-fast	(196, 99.0%)	(156, 97.4%)	(115, 94.8%)	(85, 97.6%)	(53, 96.2%)	97.0%
Ubc						
ASIFT	(9321, 99.4%)	(9430, 98.7%)	(8622, 96.4%)	(6559, 88.9%)	(4666, 75.3%)	91.7%
SIFT	(575, 99.5%)	(496, 97.8%)	(399, 94.5%)	(268, 82.1%)	(176, 72.7%)	89.3%
DAISY	(594, 99.0%)	(505, 97.2%)	(439, 93.2%)	(301, 82.7%)	(209, 74.2%)	89.3%
ASR-naive	(499, 100%)	(397, 100%)	(299, 99.3%)	(172, 95.3%)	(94, 97.9%)	98.5%
ASR-fast	(497, 100%)	(411, 98.5%)	(306, 98.4%)	(191, 92.7%)	(112, 88.4%)	95.6%

References

[1] Morel, J.M., Yu, G.: Asift: A new framework for fully affine invariant image comparison. SIAM Journal on Imaging Sciences pp. 438–469 (2009)

[2] http://www.robots.ox.ac.uk/ vgg/research/affine/

[3] Mikolajczyk, K., Schmid, C.: A performance evaluation of local descriptors. PAMI 27(10), 1615–1630 (2005)

[4] Lowe, D.: Distinctive image features from scale-invariant keypoints. IJCV 60(2), 91–110(2004)