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A comparison of SIFT, PCA-SIFT and SURF

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KEYWORDS

SIFT, , PCA-SIFT,, SURF,, robust detectors

ABSTRACT

This paper compares three robust feature detection methods, they are, Scale Invariant Feature Transform (SIFT), Principal Component Analysis (PCA) -SIFT and Speeded Up Robust Features (SURF). Lowe presented SIFT [1], which was successfully used in recognition, stitching and many other applications because of its robustness. Yan Ke [2] gave a change of SIFT by using PCA to normalize the gradient patch instead of histogram. H. Bay [3] presented a faster method for SURF, which used Fast-Hessian detector. The performance of the three methods is compared for scale changes, rotation, blur, illumination changes and affine transformations, all of which uses repeatability as an evaluation measurement. Additionally, RANSAC is used to reject the inconsistent matches [4]. SIFT presents its stability in most situation except rotation and illumination changes. SURF is the fastest one with good performance as the same as SIFT, PCA-SIFT shows its advantages in rotation, blur and illumination changes.

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ABSTRACTING & INDEXING

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- 6 iSEEK
- 7 Socol@r

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- 9 Bielefeld Academic Search Engine (BASE)
- 10 OpenJ-Gate
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- 16 MENDELEY Research Networks

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A comparison of SIFT, PCA-SIFT and SURF. International Journal of ImageProcessing, 3 (4), 143-152. [10] Younes, L., Romaniuk, B., Bittar, E. (2012). A comprehensive and comparative survey of the SIFT algorithm - feature detection, description, and characterization. In Proceedings of the International Conference on Computer Vision Theory and Applications (VISAPP). SciTePress, Vol. 1, 467-474. [11] Ke, Y., Sukthankar, R. (2004). PCA-SIFT: A more distinctive representation for local image descriptors. In Computer Vision and Pattern Recognition (CVPR2004), 27 June - 2 July 2004. IEEE, Vol. 2, 506-51 SIFT presents its stability in most situations although it's slow. SURF is the fastest one with good performance as the same as SIFT. PCA-SIFT show its advantages in rotation and illumination changes. Do you want to read the rest of this article? Request full-text. In descriptors, SIFT is good performance compare to other descriptors. The proposed SURF descriptor is based on similar properties. The first step consists of fixing a reproducible orientation based on information from a circular region around the interest point. And second construct a square region aligned to the selected orientation, and extract the SURF descriptor from it. In order to be invariant to rotation, it calculate the Haar-wavelet responses in x and y direction shown in figure 3. EXPERIMENTAL RESULTS. Luo Juan, and Oubong Gwun, "A Comparison of SIFT, PCA-SIFT and SURF", International Journal of Image Processing (IJIP), Vol. 3, Issue 4, pp. 143-152. Herbert Bay, Tinne Tuytelaars, and Luc Van Gool, "SURF: Speeded Up Robust Features", pp. 1-14.

The standard SIFT representation outperforms PCA-SIFT only when extremely high false positives rates can be tolerated. Figure 3: A comparison between SIFT and PCA-SIFT ($n=20$) on some challenging real-world images taken from different viewpoints. (A) is a photo of a cluttered coffee table; (B) is a wall covered in graffiti from the INRIA Graffiti dataset. The top ten matches are shown for each algorithm: solid white lines denote correct matches while dotted black lines show incorrect ones. Download Citation on ResearchGate | A comparison of sift, pca-sift and surf | This paper summarizes the three robust feature detection methods: ScaleInvariant Feature Transform (SIFT), Principal Component Analysis (PCA)-SIFT and Speeded Up Robust Features (SURF). This paper uses KNN (K-NearestNeighbor) and Random Sample Consensus (RANSAC) to the three... Previous evaluations and comparison [31,34] demonstrate the excellent performance of SIFT; nevertheless, a comparison to other approaches is beyond the scope of this research. A SIFT-Based DEM Extraction Approach Using GEOEYE-1 Satellite Stereo Pairs. Article.