Comparison of different Features Detectors and Descriptors in the Cut-Copy Forgery scenario

Sibelius Seraphini, Larissa Teixeira

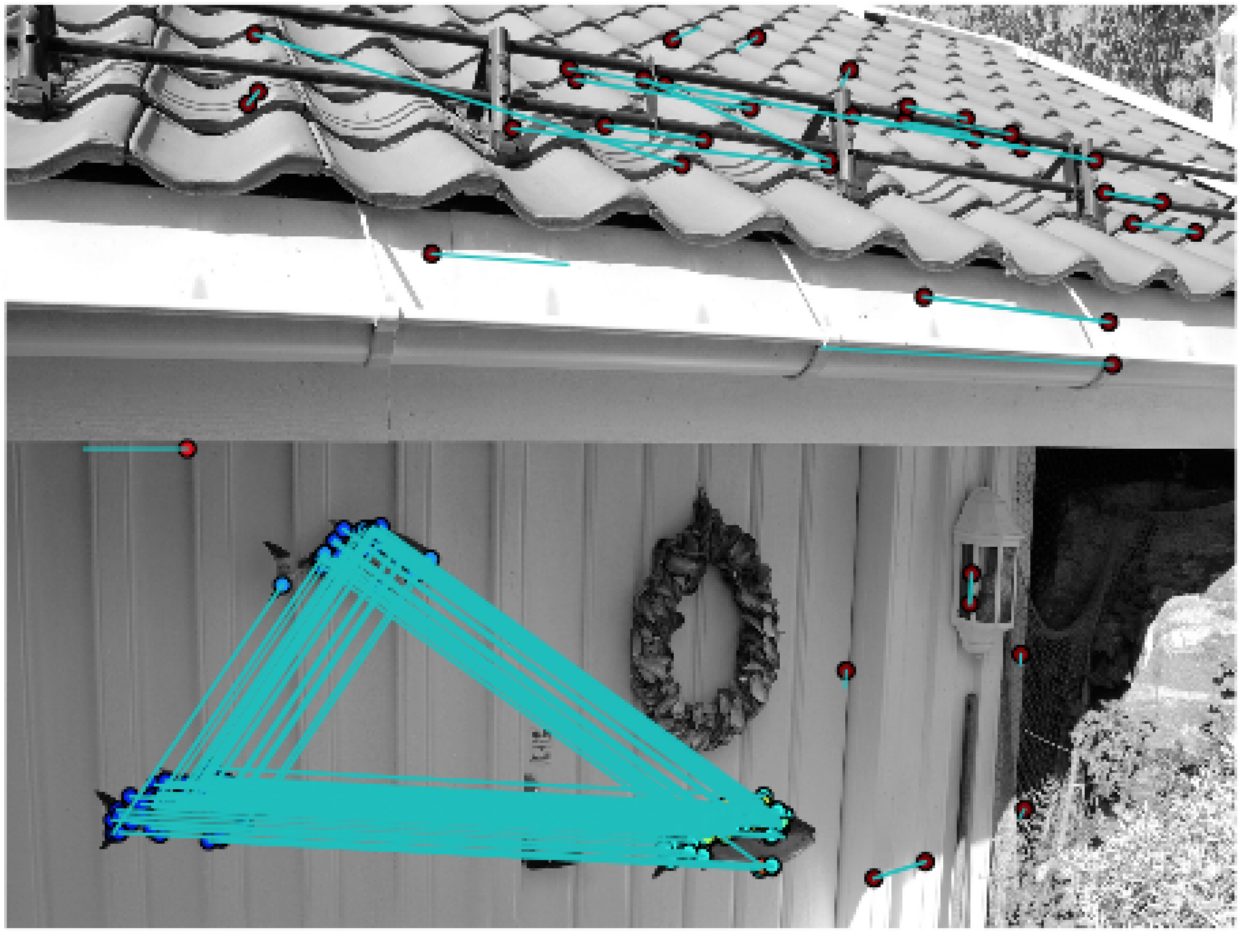
CSI 445 - Digital Image Forensics

Introduction

- Copy-move attacks

Motivation

- What is the feature that better perform?
  - What is the best KeyPoint detector?
  - What is the best KeyPoint descriptor?



Methods

- Resource

Methods

- Resource
  - Python

Methods

- Resource
  - Python
  - Numpy

Methods

- Resource
  - Python
  - Numpy
  - Matlab

Methods

- Resource
  - Python
  - Numpy
  - Matlab
  - Opencv

Methods

- Resource
  - Python
  - Numpy
  - Matlab
  - Opencv
- Feature Detector

Methods

- Resource
  - Python
  - Numpy
  - Matlab
  - Opencv
- Feature Detector
  - SIFT, SURF, STAR, ORB

Methods

- Resource
  - Python
  - Numpy
  - Matlab
  - Opencv
- Feature Detector
  - SIFT, SURF, STAR, ORB
  - BRIEF, BRISK, FREAK

Method

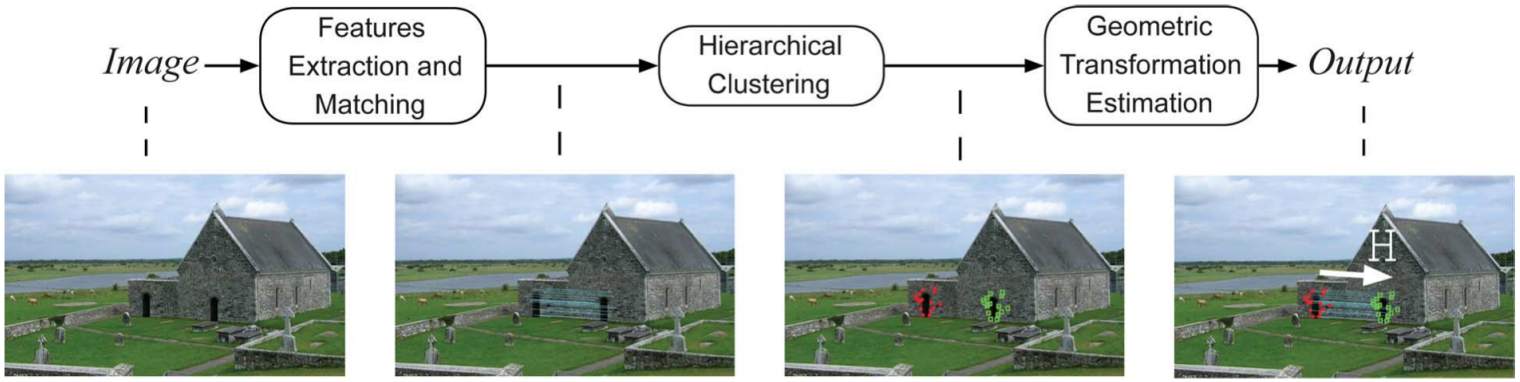
- Database - MICC-F220
  - 220 images
  - 82 tampered
  - 83 original

Related Work

- Features detection and matching
- Clustering and Forgery Detection
- Geometric Transformation Estimation

Process

- Using a combination of each keypoint detector and descriptor

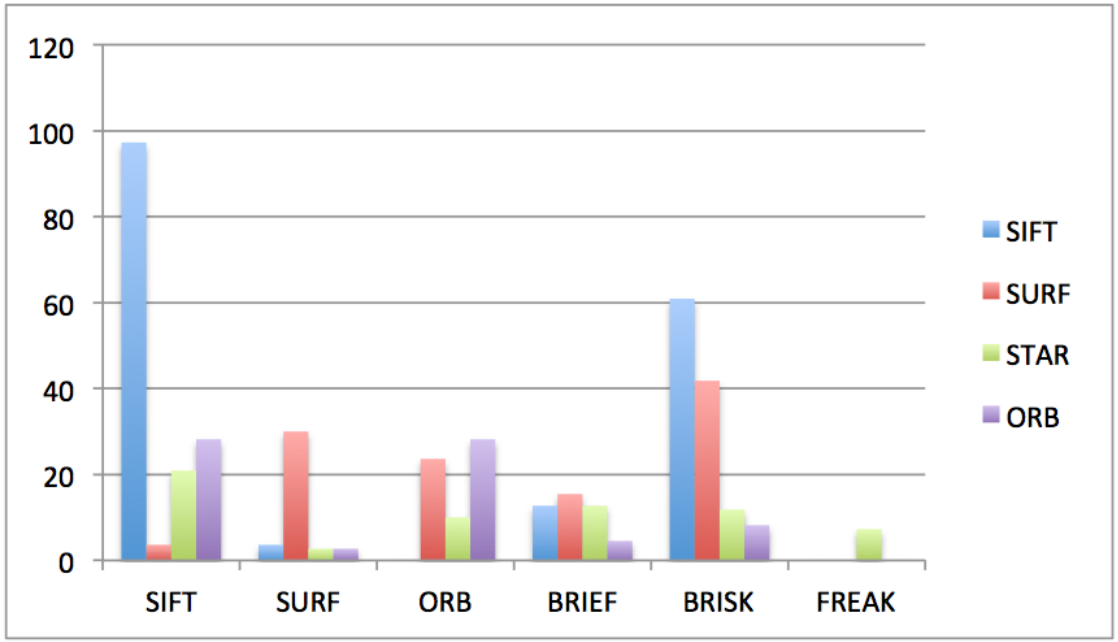


Results

- Table of Results

TPR Table

Detector\Descriptor	SIFT	SURF	ORB	BRIEF	BRISK	FREAK
SIFT	97.27	3.63	Error	12.727273	60.909091	0
SURF	3.636364	30	23.636364	15.454545	41.818182	0
STAR	20.909091	2.727273	10	12.727273	11.818182	7.272727
ORB	28.181818	2.727273	28.181818	4.545455	8.181818	0

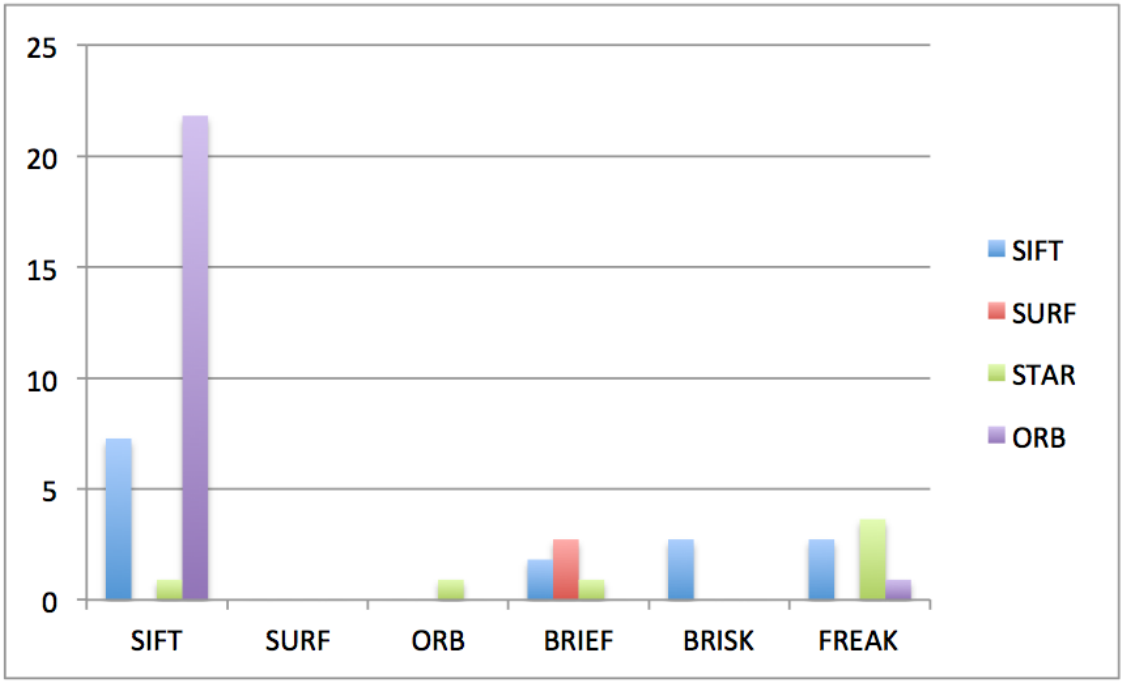


Results

- Table of Results

FPR Table

Detector\Descriptor	SIFT	SURF	ORB	BRIEF	BRISK	FREAK
SIFT	7.272727	0	error	1.818182	2.727273	2.727273
SURF	0	0	0	2.727273	0	0
STAR	0.909091	0	0.909091	0.909091	0	3.636364
ORB	21.818182	0	0	0	0	0.909091



Results

- Table of Results

Detector	Descriptor	Computational time:	TPR	FPR
SIFT	SIFT	175.920598 s	97.272727	7.272727
SIFT	SURF	111.364744 s	3.636364	0
SIFT	ORB	OpenCV Error: Assertion fai SIFT,ORB error		
SIFT	BRIEF	88.582210 s	12.727273	1.818182
SIFT	BRISK	117.328338 s	60.909091	2.727273
SIFT	FREAK	114.325807 s	0	2.727273
SURF	SIFT	337.700676 s	3.636364	0
SURF	SURF	65.819744 s	30	0
SURF	ORB	32.632679 s	23.636364	0
SURF	BRIEF	33.883959 s	15.454545	2.727273
SURF	BRISK	40.830445 s	41.818182	0
SURF	FREAK	32.106823 s	0	0
STAR	SIFT	55.722815 s	20.909091	0.909091
STAR	SURF	13.102975 s	2.727273	0
STAR	ORB	8.930317 s	10	0.909091
STAR	BRIEF	8.635003 s	12.727273	0.909091
STAR	BRISK	9.962728 s	11.818182	0
STAR	FREAK	10.173545 s	7.272727	3.636364
ORB	SIFT	105.603456 s	28.181818	21.818182
ORB	SURF	38.269514 s	2.727273	0
ORB	ORB	7.907254 s	28.181818	0

Rerefences

[1] Alahi, A., Ortiz, R., & Vandergheynst, P. (2012, June). Freak: Fast retina keypoint. In Computer Vision and Pattern Recognition (CVPR), 2012 IEEE Conference on (pp. 510-517). IEEE.
[2] Amerini, I., Ballan, L., Caldelli, R., Del Bimbo, A., & Serra, G. (2011). A SIFT-based forensic method for copy?move attack detection and transformation recovery. Information Forensics and Security, IEEE Transactions on, 6(3), 1099-1110.
[3] Bay, H., Tuytelaars, T., & Van Gool, L. (2006). Surf: Speeded up robust features. In Computer Vision?ECCV 2006 (pp. 404-417). Springer Berlin Heidelberg.
[4] Christlein, V., Riess, C., Jordan, J., & Angelopoulou, E. (2012). An evaluation of popular copy-move forgery detection approaches. Information Forensics and Security, IEEE Transactions on, 7(6), 1841-1854.
[5] Lowe, D. G. (2004). Distinctive image features from scale-invariant keypoints.International journal of computer vision, 60(2), 91-110.
[6] Rublee, E., Rabaud, V., Konolige, K., & Bradski, G. (2011, November). ORB: an efficient alternative to SIFT or SURF. In Computer Vision

Questions ?