

BACKGROUND & KEY IDEA (1)

- SIFT-based forensic analysis is used to detect image forgeries e.g. the copy move forgery
- Counter forensic techniques (aka anti-forensic methods) to fool the forensic analyst by concealing traces of manipulation have been developed
- For SIFT-based forensic analysis, various keypoint removal techniques have been introduced to counter copy move forgery detection techniques
- Keypoint removal approaches include global and local smoothing, collage attacks, and removal with minimal distortion (and combinations of these)

Key idea

- The attacker removes SIFT keypoints to disguise the copy-move forgery
- In doing so, she/he assumes that the forensic analyst uses SIFT keypoint in her/his analysis
- However, this is not necessarily the case !!
- The forensic analyst can resort to a different type of keypoints in her/his analysis.

→ Intuitively, those alternative keypoints should be situated far away from the SIFT keypoints to avoid their erosion during the attackers keypoint removal process. Which ones to choose ?

EXPERIMENTAL RESULTS (5)

So far, detailed results for selected settings suggest advantages for BRISK. What is the general trend ?

# Kp.	CA			LS			GS+LS		
	Prec.	Rec.	F1	Prec.	Rec.	F1	Prec.	Rec.	F1
50	0	9	9	3	4	4	4	9	7
100	0	6	5	12	8	9	12	3	9
200	1	9	7	8	10	10	12	4	8

Table 1: Comparison of keypoint removal techniques in terms of precision, recall, and F1-score: Number of settings (out of 12 in each category), where value(BRISK) > value(SIFT).

MOTIVATING EXAMPLE (2)

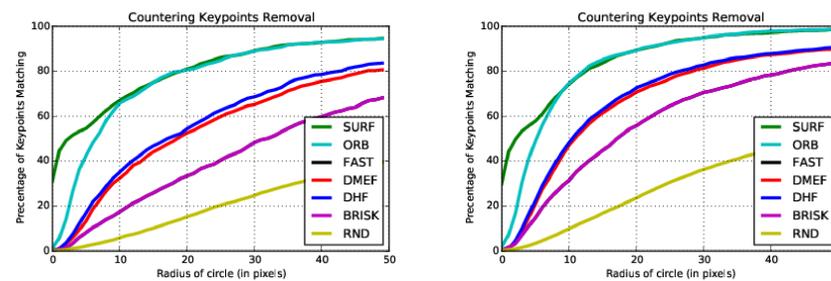


Figure 1: Draw circle around each SIFT keypoint and measure the share of other keypoints contained in these circles.

→ Using BRISK keypoints for forensic analysis after SIFT keypoint removal is a natural choice !

DATA (3)



Figure 2: 50 Forged images to estimate TP and FN.



Figure 3: 50 Original images with repeated structures to estimate FP and TN.

RESULTS: COPY MOVE FORGERY DETECTION (4)

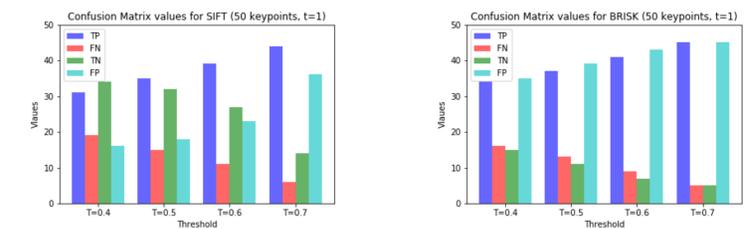


Figure 4: Confusion matrices for copy move forgery detection WITHOUT keypoint removal.

→ BRISK results in slightly higher TP rates at the cost of significantly higher FP rates for the (challenging) original images.

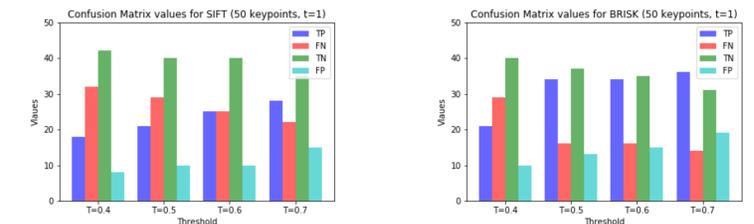


Figure 5: Confusion matrices for copy move forgery detection after *local smoothing* keypoint removal.

→ BRISK results in clearly higher TP rates at the cost of slightly higher FP rates for the (challenging) original images.

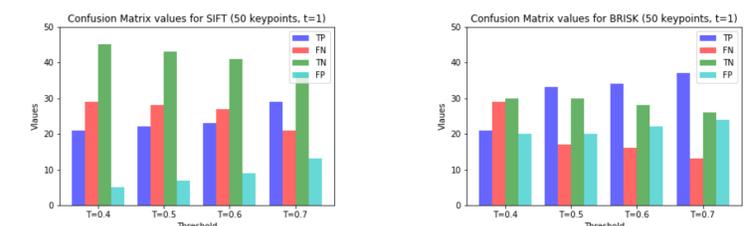


Figure 6: Confusion matrices for copy move forgery detection after *collage attack* keypoint removal.

→ BRISK results in clearly higher TP rates at the cost of (slightly) higher FP rates for the (challenging) original images.