

Project 4

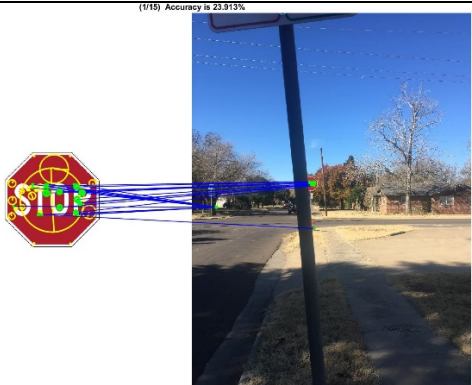

ECE 5367, Fall 2019

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

Both SIFT and SURF methods were used to match a reference stop sign image to a similar stop sign in various images. Accuracy was measured by taking the ratio of matched features to the total number of features in the reference image.

$$\% \text{ Accuracy} = \frac{\# \text{ of matched features}}{\# \text{ of reference features}} \times 100 \%$$

This measure of accuracy does have its flaws, as matched features are not always correct. However, comparing the relative accuracies of SIFT and SURF provides a good baseline measure for performance. SIFT displayed better matching capabilities with this image set than SURF. Both methods performed poorly with perspective transforms that warped the stop sign significantly.

	Deformation	SIFT Matched Features	SIFT Accuracy	SURF Matched Features	SURF Accuracy
1.	Scale with Occlusion		23.91 %		3.60 %

2.	Scale/Perspective	<div>(3/15) Accuracy is 34.056%</div> 	34.05%	<div>(3/15) SURF Accuracy is 10.8116%</div> 	10.81 %
3.	Perspective	<div>(4/15) Accuracy is 36.2319%</div> 	36.23%	<div>(4/15) SURF Accuracy is 34.2342%</div> 	34.23 %
4.	Scale/Perspective	<div>(5/15) Accuracy is 11.5942%</div> 	11.59%	<div>(5/15) SURF Accuracy is 2.7027%</div> 	2.70 %

5.	Perspective with shadows	<div><div></div><div></div></div>	43.47%		
6.	Scale/Perspective	<div><div></div><div></div></div>	5.79%		
7.	Scale	<div><div></div><div></div></div>	63.76%		

8.	Scale/Perspective with Occlusion	<div><div></div><div></div></div> <div><small>(B110) SIFT Accuracy is 34.05%</small></div>	34.05%	<div><div></div><div></div></div> <div><small>(B110) SURF Accuracy is 12.61%</small></div>	12.61 %
9.	Scale	<div><div></div><div></div></div> <div><small>(B110) SIFT Accuracy is 57.97%</small></div>	57.97%	<div><div></div><div></div></div> <div><small>(B110) SURF Accuracy is 16.22%</small></div>	16.22 %
10.	Scale/Perspective	<div><div></div><div></div></div> <div><small>(B110) SIFT Accuracy is 30.43%</small></div>	30.43%	<div><div></div><div></div></div> <div><small>(B110) SURF Accuracy is 11.71%</small></div>	11.71 %

11.	Scale/Perspective	<div><div></div><div><small>(10/15) SIFT Accuracy is 28.980%</small></div></div>	28.98%	<div><div></div><div><small>(10/15) SURF Accuracy is 8.1081%</small></div></div>	8.11 %
12.	Scale/Rotation/Perspective	<div><div></div><div><small>(10/15) SIFT Accuracy is 34.060%</small></div></div>	34.06 %	<div><div></div><div><small>(10/15) SURF Accuracy is 18.9181%</small></div></div>	18.92 %
13.	Scale/Rotation/Perspective	<div><div></div><div><small>(10/15) SIFT Accuracy is 50%</small></div></div>	50 %	<div><div></div><div><small>(10/15) SURF Accuracy is 9.9091%</small></div></div>	9.91 %

14.	Rotation/Perspective	<div><div>10416: SIFT Accuracy is 42.7536%</div></div>	42.75 %	<div><div>10416: SURF Accuracy is 10.8105%</div></div>	10.81 %
15.	Scale/Rotation/Perspective	<div><div>10516: SIFT Accuracy is 20.2994%</div></div>	20.29 %	<div><div>10516: SURF Accuracy is 18.0184%</div></div>	18.018 %