

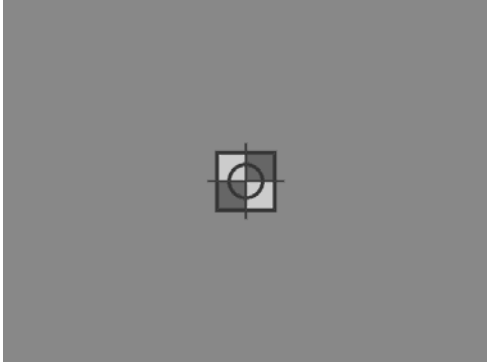
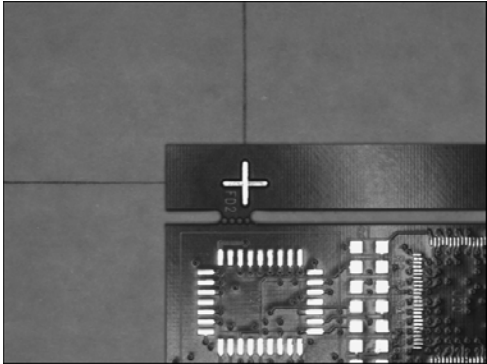


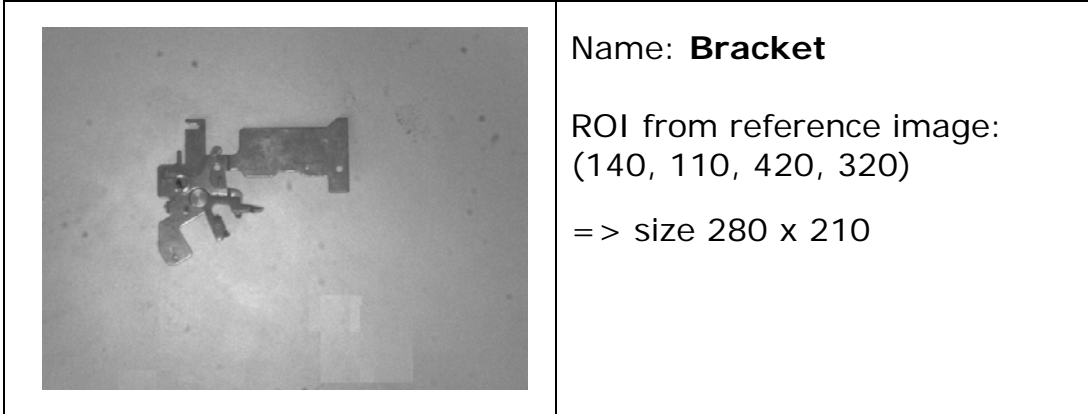
Sapera Essential Search Tool Benchmarks

This is a report of the DALSA Coreco search tool performance for area (correlation) and edge search. The system used for the benchmark is a P4 2.2 GHz with 512 MB of memory and running the Windows XP operating system.

The Reference Images

The benchmarks are made on the three reference images shown in the table below.

Reference Image	Template Image
	<p>Name: Fiducial</p> <p>ROI from reference image: (260, 180, 380, 300)</p> <p>= > size 120 x 120</p>
	<p>Name: Cross</p> <p>ROI from reference image: (280, 200, 360, 280)</p> <p>= > size 80 x 80</p>



The Tests

The tests are done on a series of target images generated by applying different software transformations as described below.

Test 1: Horizontal shifting

The reference image is horizontally shifted by an amount of 0.007 pixel on a width of 4 pixels (approx. 550 steps). We measure the execution time and the horizontal accuracy.

Test 2: Vertical shifting

The reference image is vertically shifted by an amount of 0.007 pixel on a height of 4 pixels (approx. 550 steps). We measure the execution time and the vertical accuracy.

Test 3: Horizontal / vertical shifting

The reference image is horizontally and vertically shifted by an amount of 0.17 pixel on a square of 4 x 4 pixels (approx. 550 steps). We measure the execution time and the accuracy in both axes.

Test 4: Horizontal / vertical shifting and rotation

The reference image is shifted as in test 3 and then rotated by an amount of 0.11 degree each step. The rotation range is -30 to 30 degrees. We measure the execution time and the accuracy in any directions.

The Results

The table below shows the results of all the tests for both the area-based (correlation) and edge-based (geometric) search methods.

Test #	Area Search			Edge Search		
	Fiducial	Cross	Bracket	Fiducial	Cross	Bracket

1	X: 0.036 (4.81 ms)	X: 0.018 (4.51 ms)	X: 0.027 (15.3 ms)	X: 0.021 (6.81 ms)	X: 0.027 (12.8 ms)	X: 0.030 (6.05 ms)
2	Y: 0.030 (4.81 ms)	Y: 0.021 (4.53 ms)	Y: 0.033 (15.3 ms)	Y: 0.021 (6.77 ms)	Y: 0.072 (12.8 ms)	Y: 0.030 (5.95 ms)
3	X : 0.042 Y : 0.033 (4.73 ms)	X: 0.039 Y: 0.024 (4.37 ms)	X : 0.042 Y : 0.036 (15.6 ms)	X : 0.021 Y : 0.021 (6.84 ms)	X: 0.024 Y: 0.069 (13.1 ms)	X: 0.030 Y: 0.027 (6.07 ms)
4	X: 0.036 Y: 0.024 A: 0.444 (34.2 ms)	X: 0.042 Y: 0.027 A: 0.465 (51.77 ms)	X: 0.084 Y: 0.330 A: 0.441 (161 ms)	X: 0.282 Y: 0.165 A: 0.012 (8.39 ms)	X: 0.273 Y: 0.138 A: 0.030 (18.9 ms)	X: 0.270 Y: 0.171 A: 0.015 (7.73 ms)

Note 1

The values (X, Y and A) represent the accuracy of the horizontal position, vertical position and angle respectively. The accuracy is calculated as 3 sigma points (three times the standard deviation).

Note 2

For the **area-based** algorithm the default parameters were used except the following:

- Sub-pixel 64 (1 / 64th pixel)
- Rotation -30 to 30 with step of 1.
- Scaling 0.85 to 1.15 with step of 0.05.

For the **edge-based** algorithm the default parameters were used except the rotation range set to -30 to 30 to improve speed.



7075 Place Robert-Joncas, #142
St. Laurent, Québec, Canada H4M 2Z2

Canada T : +1-514-333-1301
US T : 978-670-2000
E-mail : info@dalsa-coreco.com

DALSA Coreco, all rights reserved CODS-1211, 2006