ELEC 546 Assignment #3 Edge Detection

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1 Harris Corner Detector Implementation

The original image is shown below.

Figure 1: Chessboard

The result of Harris corner detection on 'chessboard.jpg' is shown below.

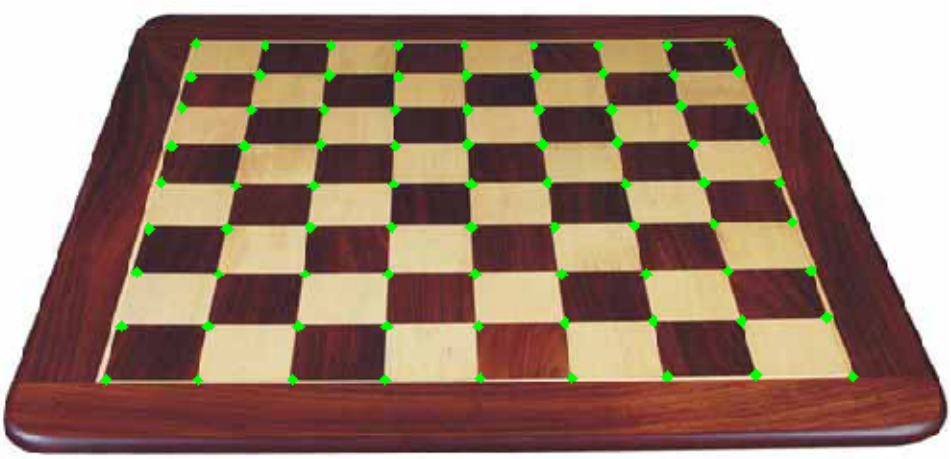

Figure 2: Caption

2 Rotation and Scaling

2.1 Rotate the image by 30 degree

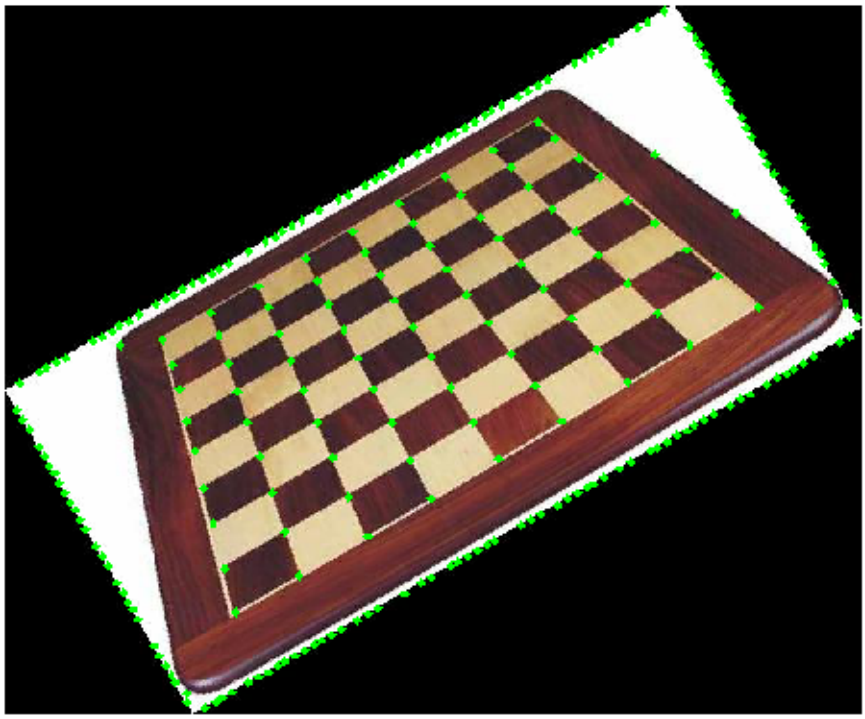

Figure 3: After rotation

2.2 Resize the image by 4 times

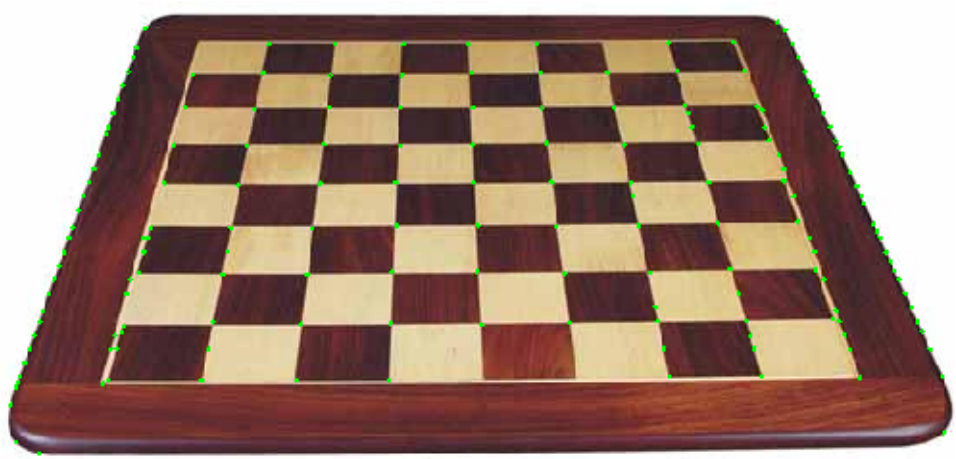

Figure 4: After resizing

As we can see, there are a lot of noise detection points when the image is rotated and resized.

3 SURF

In paper, the author presents a scale- and rotation-invariant interest point detector and descriptor. What SURF improved is using Hessian matrix to calculate detector. It relies on integral images to reduce the computation time and it is called 'Fast-Hessian' detector.
As for 'Fast-Hessian' detector, it is chosen because of good performance in computation time and accuracy. Scale spaces are usually implemented as image pyramids. The scale space for SURF is from 9 * 9 filter which Gaussian derivatives with 1.2. Then filter with bigger filters which sizes are 9 * 9, 15 * 15, 21 * 21, 27 * 27, etc. And Gaussian derivative scale accordingly.
As for SURF descriptor, there are two steps. The first step consists of fixing a reproducible orientation based on information from a circular region around the interest point. The second step is to construct a square region aligned to the selected orientation.
To conclude, the detector has good speed and accuracy in different scale and rotation situation. The descriptor is easily extendable for the description of affine invariant regions.