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Extracting cancellation marks from stamps using image processing

Armijn Hemel

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Abstract

Stamps have been collected for as long as they have been used. Apart from regular stamp collecting (whole series, themes, etc.) there is also an interest in cancellation marks. Some stamps are more valuable in stamped condition than in mint condition, especially if the stamps are clear and still readable. Extracting cancellation marks to make it available for further inspection is therefore interesting.

Keywords

stamps, cancellation marks, philately, collecting, image processing, opencv

Steps

Extracting a cancellation mark would essentially be a form of computing a so called “visual difference”. To extract the cancellation mark from a stamped stamp two images are needed:

1. a reference image of the stamp without a cancellation mark or, if not available, only a very light cancellation mark (for example, just a small corner)
2. the image of the stamp the cancellation mark should be extracted from

For best result these images should either be made on the same scanner, or made with the same camera, or made with a scanner or camera that has been calibrated. This is to avoid that colour differences caused by differently calibrated devices interfere with computing the visual difference.

The first step is to align the images. This can be done using standard functionality from OpenCV and the homography. The homography can be computed using corresponding features which can be extracted using for example the ORB feature detector, as described at https://www.learnopencv.com/image-alignment-feature-based-using-opencv-c-python/ [i]

Figure 1: Reference image with light cancellation mark

Figure 2: Image cancellation mark needs to be extracted from

Figure 3: Aligned image

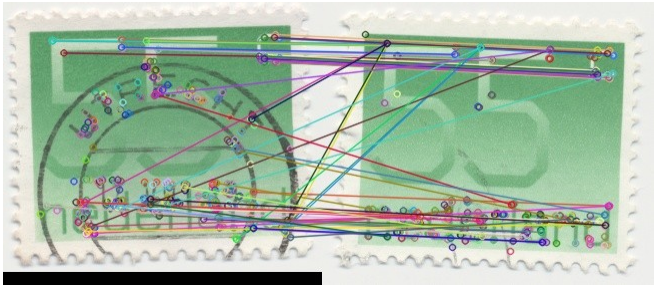

Figure 4: Detected features used for alignment

OpenCV provides standard functionality for that in the form of the findHomography() function[ii].

After the image has been aligned the reference image and the aligned image can be compared. Using the OpenCV absdiff() functionality[iii] the difference between the two images can be computed. When converted to an image that looks as follows:

Figure 5: Difference computed between the reference image and aligned image

The parts of the image that are the same are black. The cancellation stamp can be clearly seen in green. To make it clearer and make it look more like an actual cancellation mark it first needs to be converted to greyscale:

Figure 6: Difference computed between reference image and aligned image converted to greyscale

and then inverted:

Figure 7: Difference computed between reference image and aligned image converted to greyscale and then inverted

1. align image that the cancellation mark needs to be extracted from with a reference image using ORB or another algorithm present in OpenCV, and OpenCV's findHomography functionality

2. compute the difference between the two aligned image from step 1 and the reference image using OpenCV's absdiff functionality
3. convert the difference to greyscale
4. invert the difference found
5. write to disk, or display

There are a few tricks to reduce the noise in the final image and to get a better cancellation stamp image:

1. callibrate cameras or scanners or always use the same devices
2. try to scan or photograph the stamp with the same orientation, or as much as possible, to avoid that images need to be rotated much
3. use a clean reference image (stamp in mint condition)

i http://web.archive.org/web/20180313135536/https://www.learnopencv.com/image-alignment-feature-based-using-opencv-c-python/
ii http://web.archive.org/web/20190714161831/https://docs.opencv.org/3.4/d9/d0c/group__calib3d.html
iii http://web.archive.org/web/20190714170418/https://docs.opencv.org/3.4/d2/de8/group__core__array.html