

Software detection of banknote images

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Central banks are increasingly concerned that inexpensive home and office equipment can produce passable counterfeit banknotes. The number of small-scale counterfeiting operations have increased accordingly.

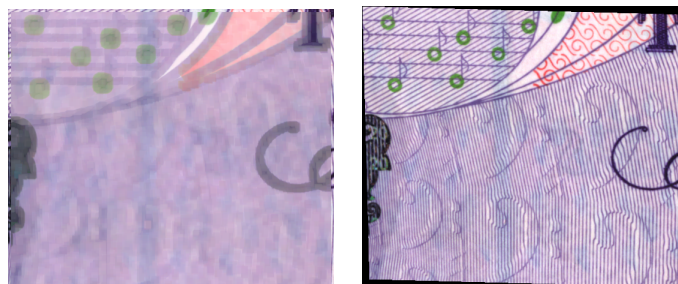
Banknotes are carefully designed to show aliasing patterns when a low-resolution copy is made. However, this is ineffective against modern high-resolution copying equipment:

The way this system works is not publicly known, but by testing different images, we can learn more about what features it detects. For example, this figure shows which cropped areas are detected on their own:



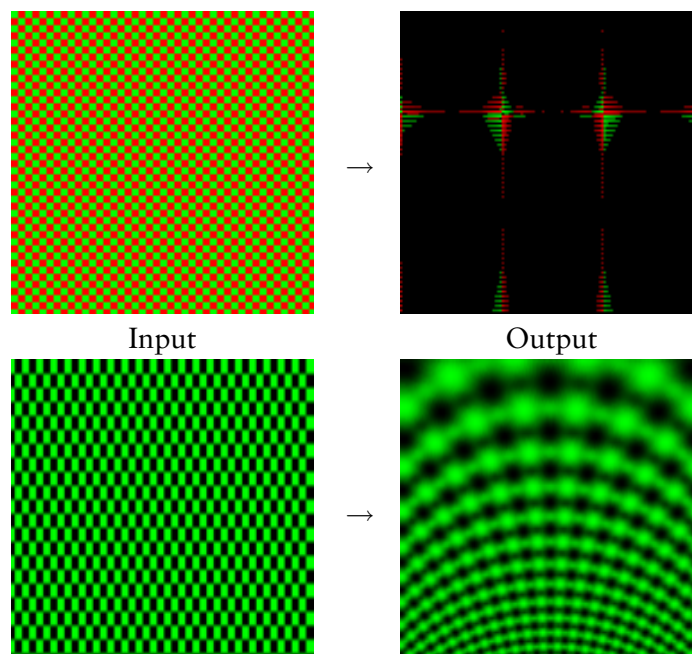
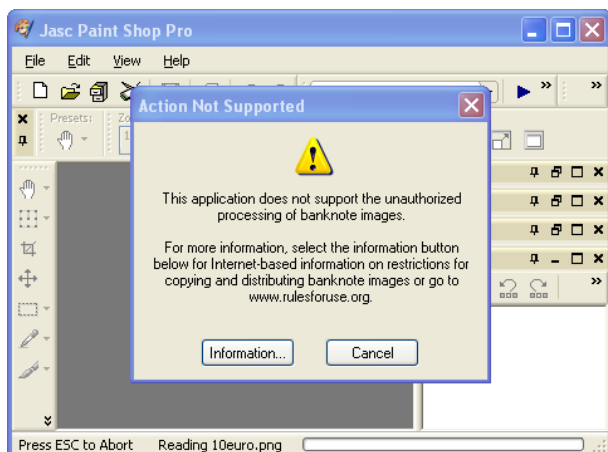
Next, a feature was added to colour photocopiers, to stop them printing banknotes if they detect the *EURion constellation*, a pattern of small circles that has been added to many countries' banknotes:

Some minor image manipulations prevent the recognition of currency:



More recently, imaging software, such as *Jasc Paint Shop Pro* and *Adobe Photoshop*, and home inkjet printers and scanners implemented a new system to prevent banknotes being scanned, or their images being processed:

Experimenting with parameter thresholds gives clues about the detection algorithms used; as does observation of intermediate computation results, extracted through debugging tools:



For more information see <http://www.cl.cam.ac.uk/users/sjm217/projects/currency/>