

## Elaboration of the design of the raster elements on securities

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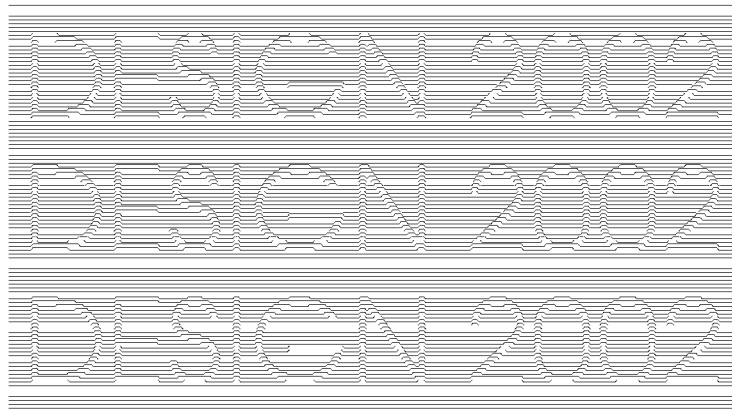
*Keywords: line raster, security printing*

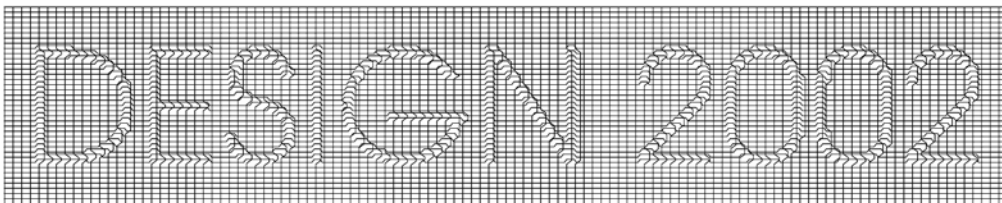
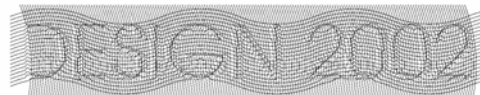
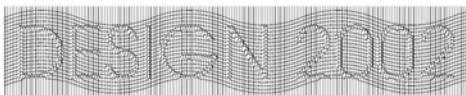
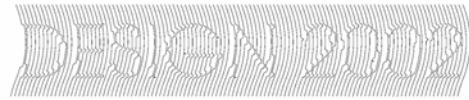
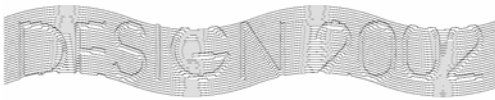
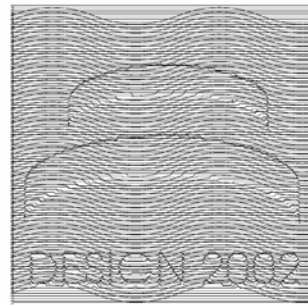
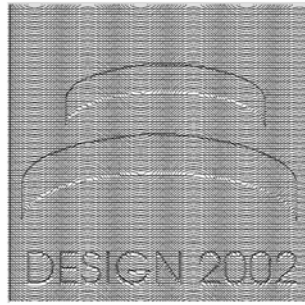
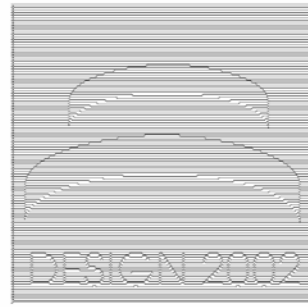
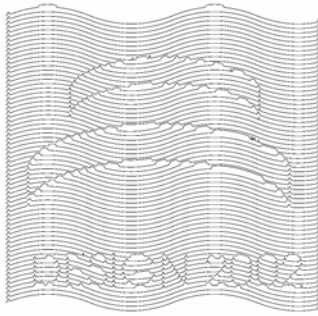
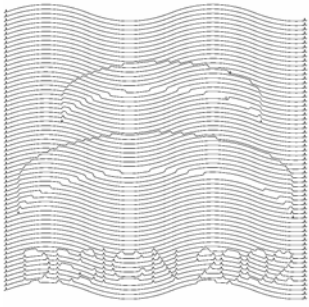
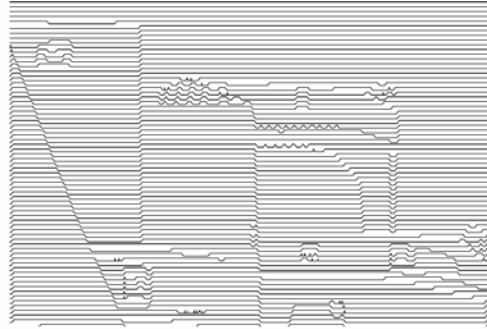
### 1. Introduction

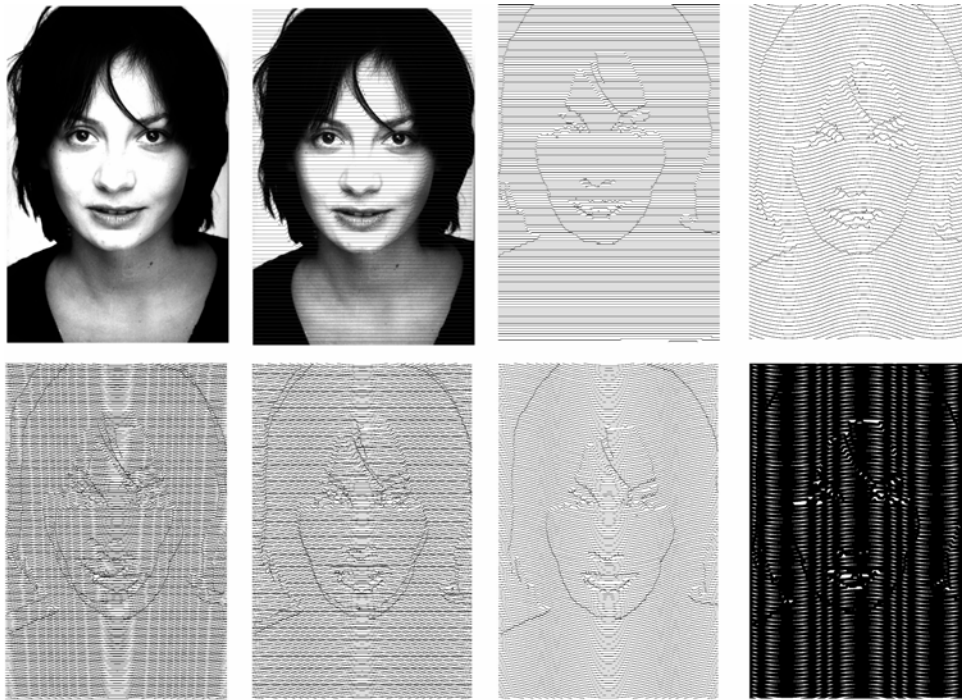
The raster elements in documents and securities are designed with vector graphics. Images, the bases for the illustration, derive from pixel graphics. In our laboratory a method has been developed to carry out a transformation from pixelisation to linear graphics. Graphics of this kind are simultaneously complete protection and a depiction of the image primarily memorized in the computer via pictorial elements. The solutions provided make possible parametric control of the density and blackness of the leading direction of the lineature. The results of this research have been applied in the creation of securities. In additional research, the results achieved with iris printing are given.

### 2. Elaboration of the task

The design of specialised printed matters seeks new technical forms of rastering. The thickness of dots with which darkening is simulated, the standard interpretation of the image, is replaced with lines. Vector graphics are composed of lines of equal thickness that change direction and it is through their angle that a greater or lesser degree of darkness is achieved. An addition to this discussion is the transformation of the directions of advancement of a line that can be achieved by some mathematically defined rule. We have achieved good results with sinus direction carriers (Figures 1, 3, 4). A multi-layer interpretation has several directions. This is particularly important when patterns in colour are being designed. The picture has to be broken down into channels of process or spot colours and then, for each channel, a special linear level has to be created. The input parameters are single coloured images in pixel graphics. The programming is done in PostScript.







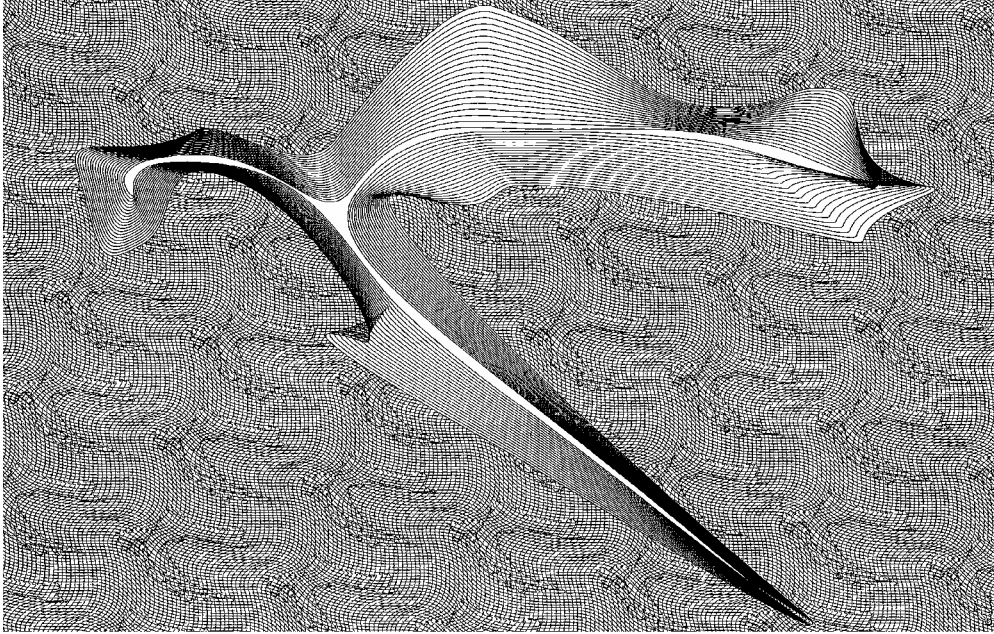
## 2.1 Colour and linear rastering

Security printing can be found on documents and securities. Although it is not emphasised, the main detail is the originality of the drawing and the graphic solutions. Coloured linear rasters cannot be scanned because with the naked eye it can be seen that the advancement of the lines takes on a jagged structure, which is typical of pixel graphics. Spot colours are usually interpreted with at most two tones, which in process separation can be done with four colours. Line drawing has an advantage in the selection of the angles. While dotted rasters have trouble with dealing with four angles, linear rasters, for the same quality, will tolerate as many as eight angles. This is emphasised because there is then a large range of solutions for the use of only two colours. For this reason, individualisation is possible, that is, for each occasion, a new solution of the mutual angles. Also interesting are the small angles (Figures 2, 4) which form the moiré. This kind of design cannot be controlled in process separation. In vector interpretation this is just the accentuation of a special, unrepeatable solution. Thus it provides graphics meant for security printing with a new system of rastering that could previously only be done with hand work.

## 2.2. Interruption of the advancement of the line

The development of a programme started off with the parametrical determination of the angle of the line at the moment a greater degree of darkening is required. In practice we have good experience (tram tickets, bus tickets, tickets for sporting events, elements on share certificates) with an angle of from 40 to 70 degrees, which depends on the thickness of the line and the degree to which it is present in the darkening. Two or three colours on the image need to have lesser angles of knee while lines that interpret the drawing in one colour can be done with an angle of more than sixty degrees. The angles are sharply interrupted. Rounded transitions do not provide solutions of adequate contrast. For multi-coloured cases, an equal angle is recommended for all colours, with an equal gap between the lines. Otherwise that kind of moiré is created that recalls errors, for large light-dark periods are created.

The parameter that determines the distance between the lines depends on the kind of printing, paper and colour.



### **3. Conclusion**

New ways of rastering with line graphics that have an individual carrier of advancement and knee angle of darkening are proposed. This is a unique system in which a change in darkening is not achieved by thicker or thinner lines, rather by the angle. This kind of mutual contact among the lines reduces the white surface between them, increases the length per unit of area, and hence the darkening. This creates a trap for scanners, who in this way will interpret the rastering as a visible moiré. The aim of the research is thus achieved, which is to find a new way of getting into the area of security printing that cannot be reproduced if the parameters of the line graphics and the system of the original drawing are not known.

**Drawings:** For additional discussions of original drawings, please refer to the author.

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