Hybrid moiré-free screening technique

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The urgency of screening algorithms studying

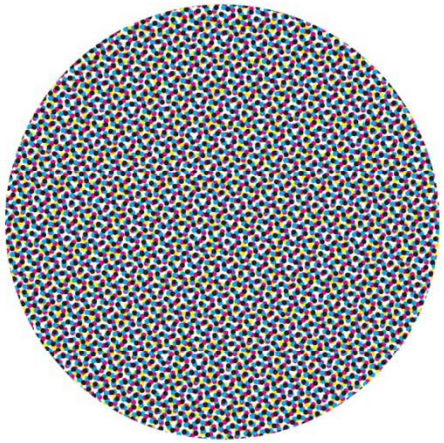
- Why is it necessary to study screening technologies?
- What can new screening algorithms provide?
- Why shouldn’t we use traditional screens?

What are the main purposes of this research?

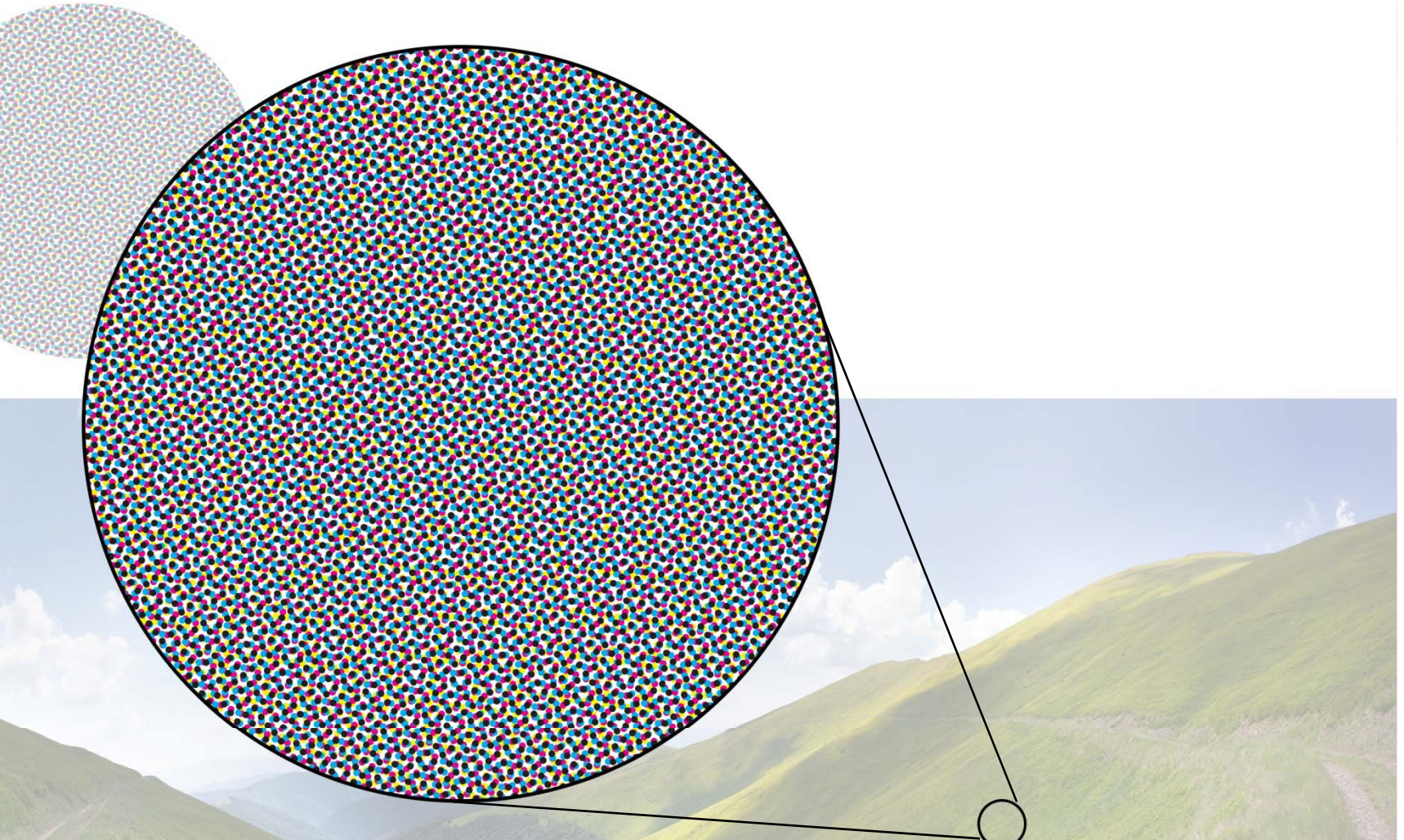
Analysis of traditional screening algorithms.
Identification of their merits and demerits,
for the purpose of these methods combination
for providing the best quality prints.

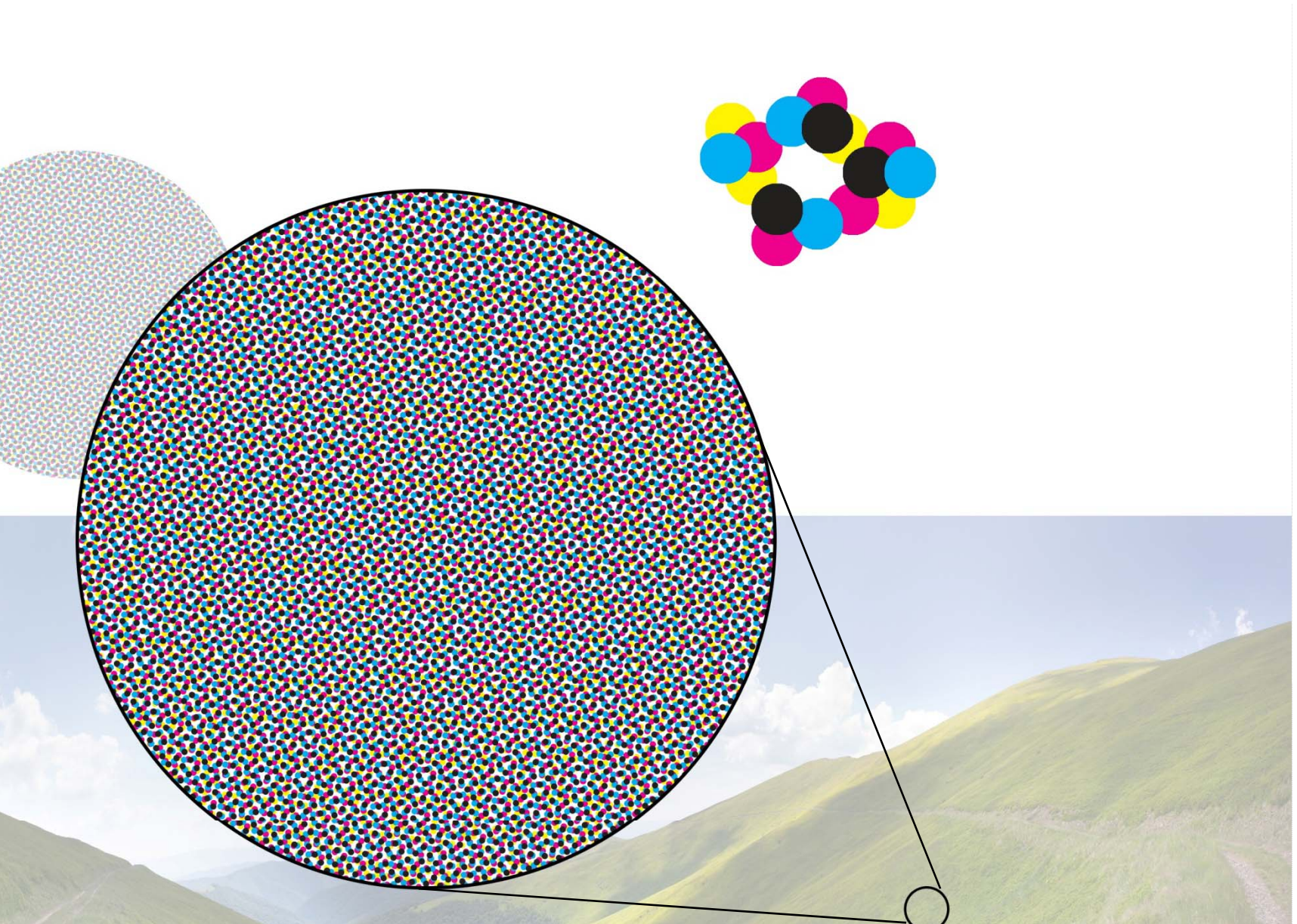
The basis of screening technology

Screening is a technological process
of a halftone image transformation
in a combination of raster dots,
which form the image on a film or a printing plate

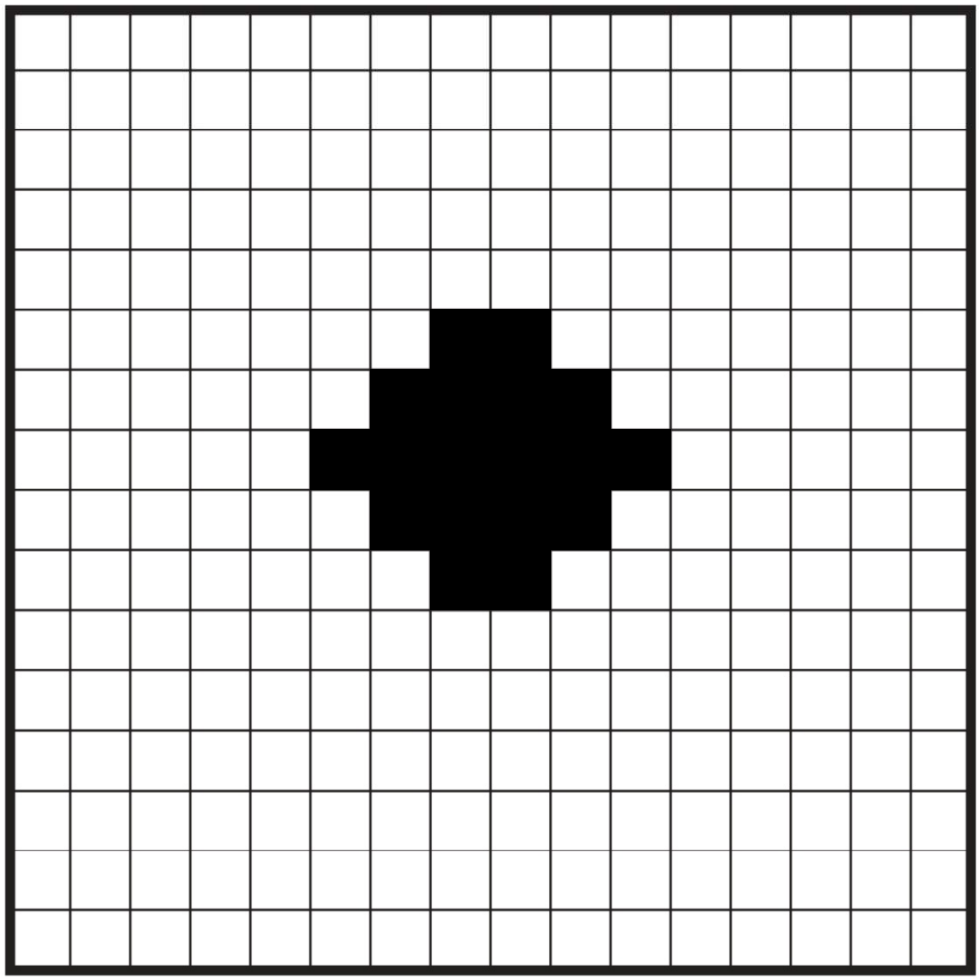


« ... It is impossible to reproduce
any half-toned image,
black-and-white or color,
without screening it preliminary ... »

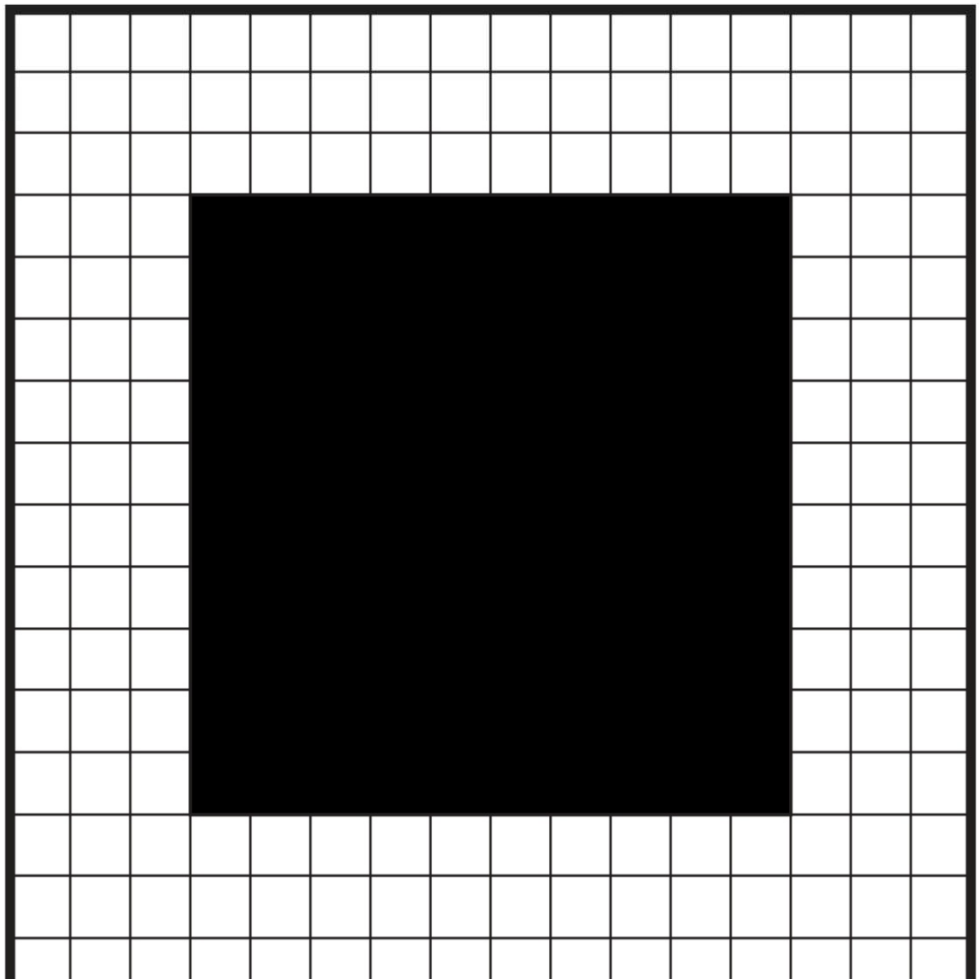




Screen cell which consists of microdots



It is possible to generate screen dots of almost any shape...



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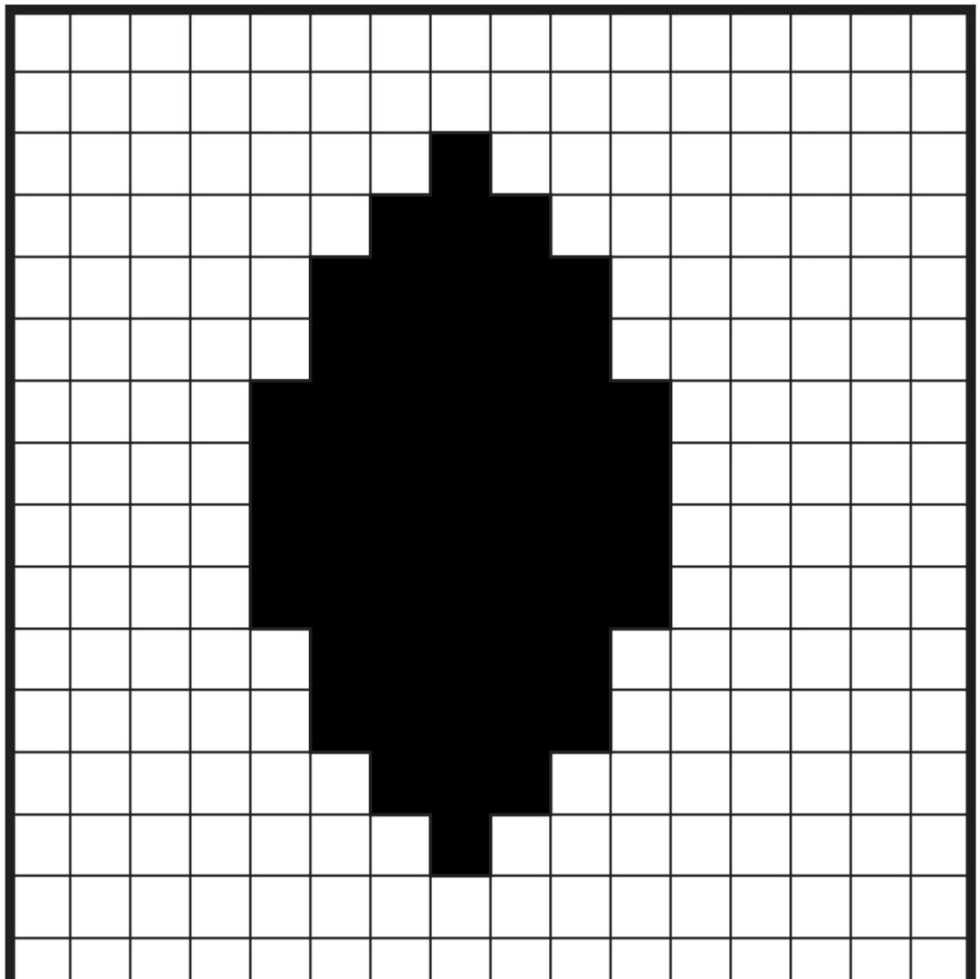

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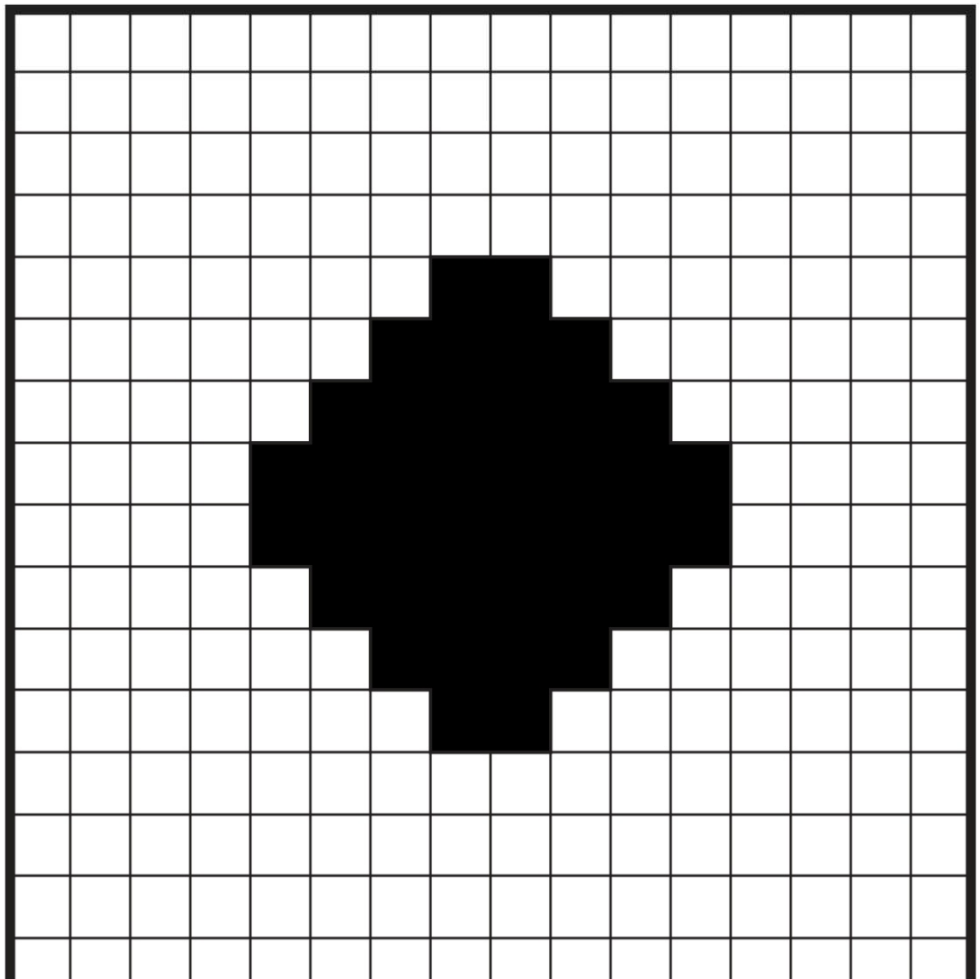
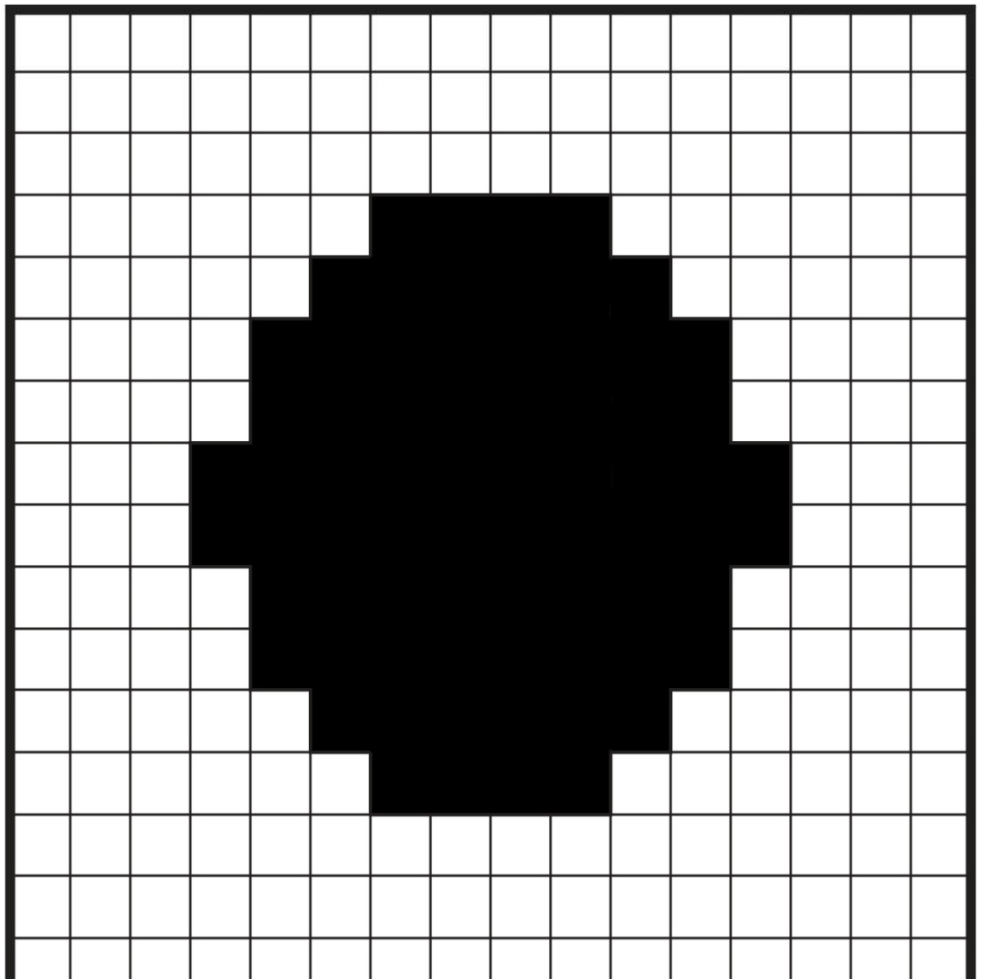


... and it is also possible to place these dots in any place of the cell



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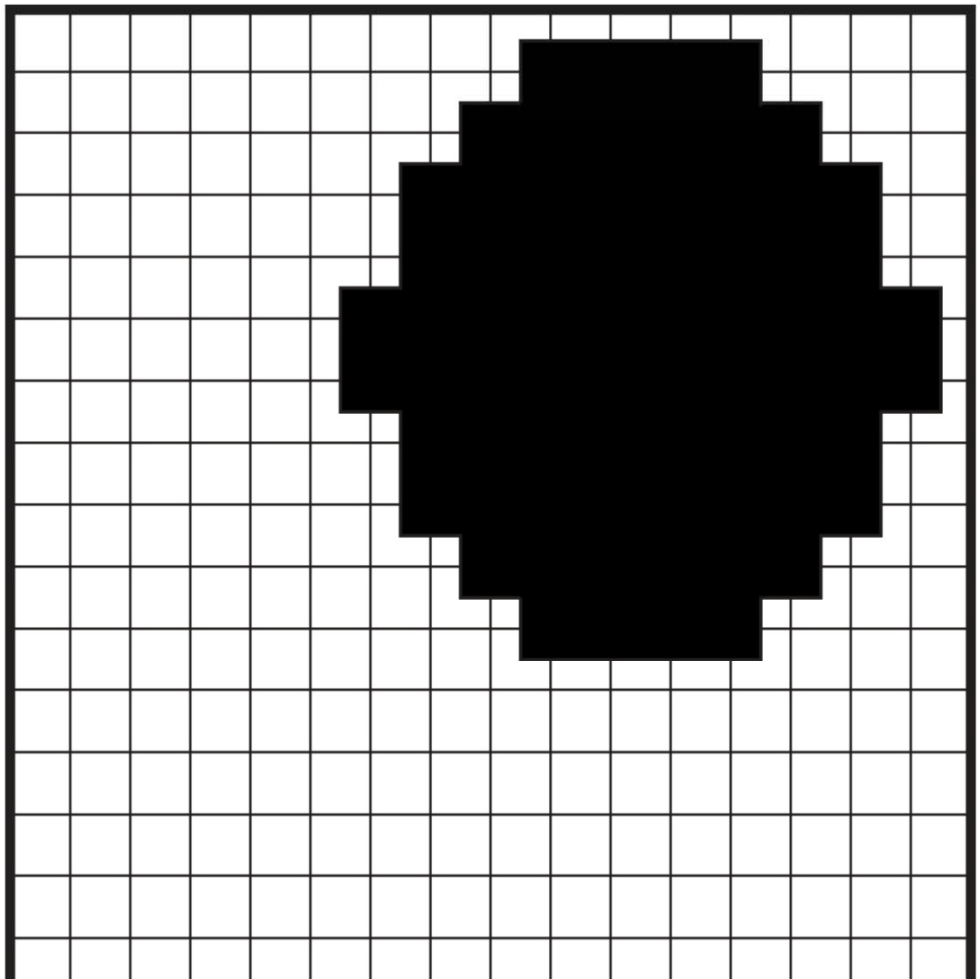

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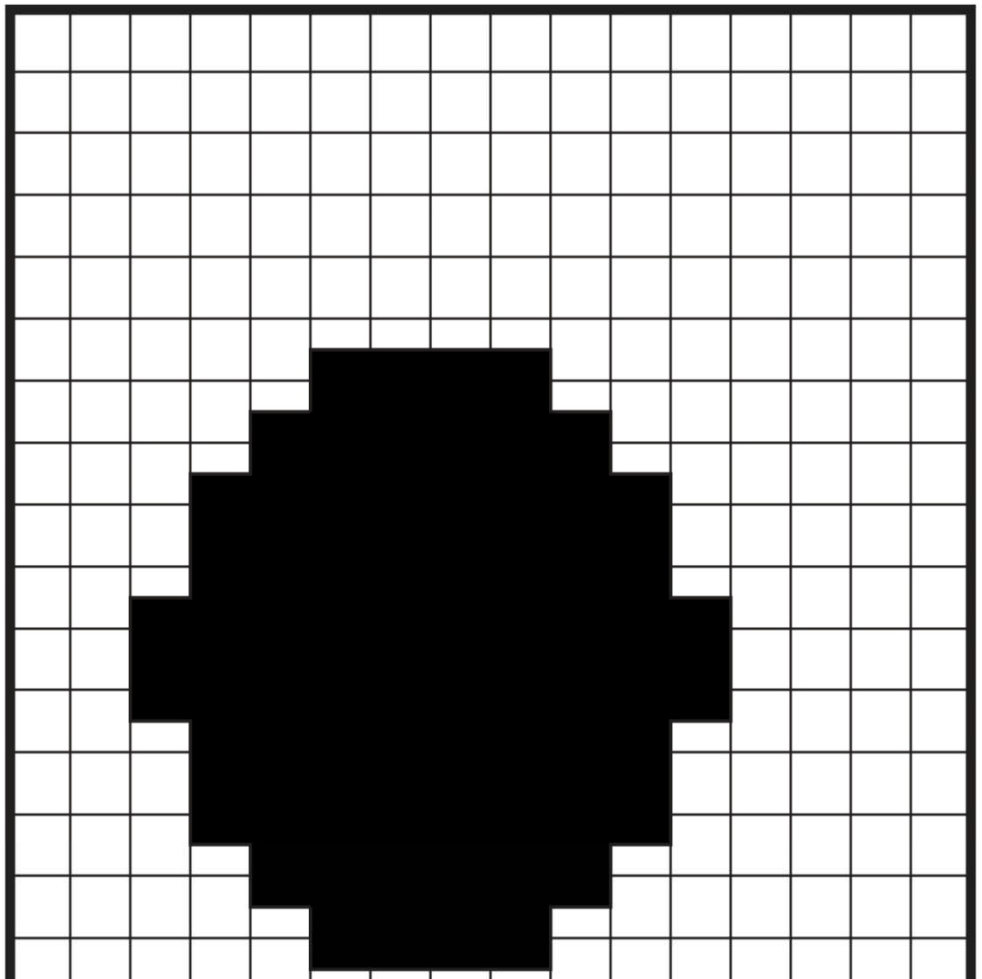


Screening algorithms

Amplitude-modulated technique

Frequency-modulated technique

Second-order stochastic screening

Irrational screening

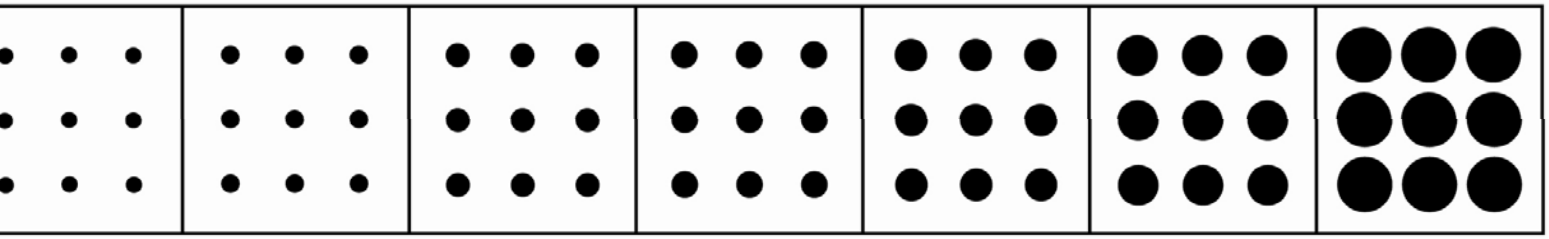
Rational tangent screening

...

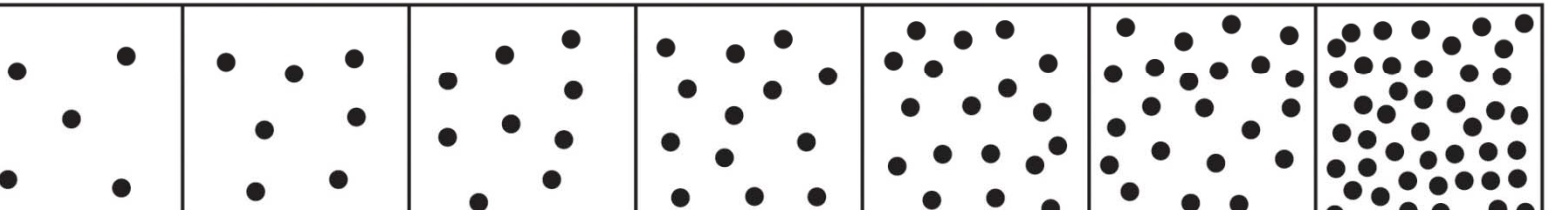
Hybrid screening

Two main screening algorithms

Amplitude-modulated technique



Frequency-modulated technique



Amplitude-modulated technique

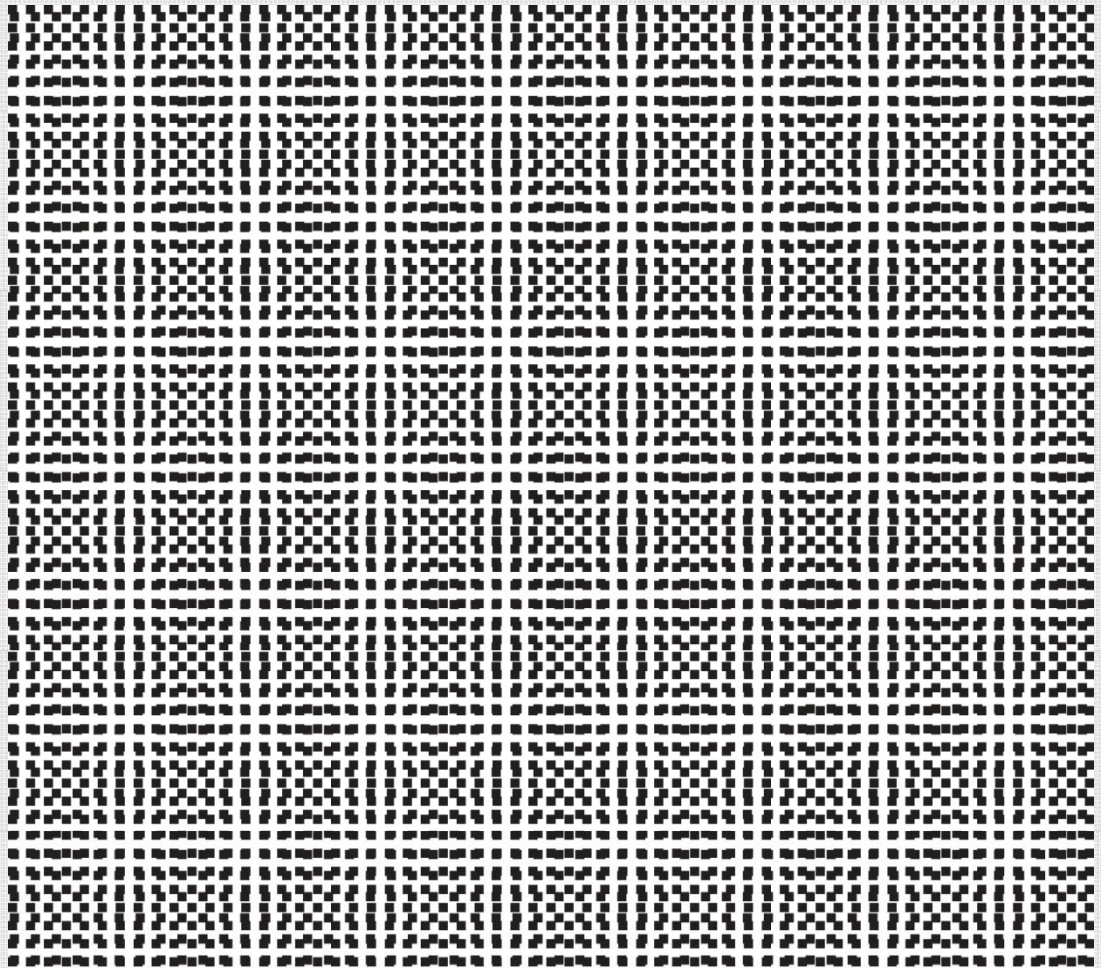
Advantages:

- qualitative reproduction of middle tones

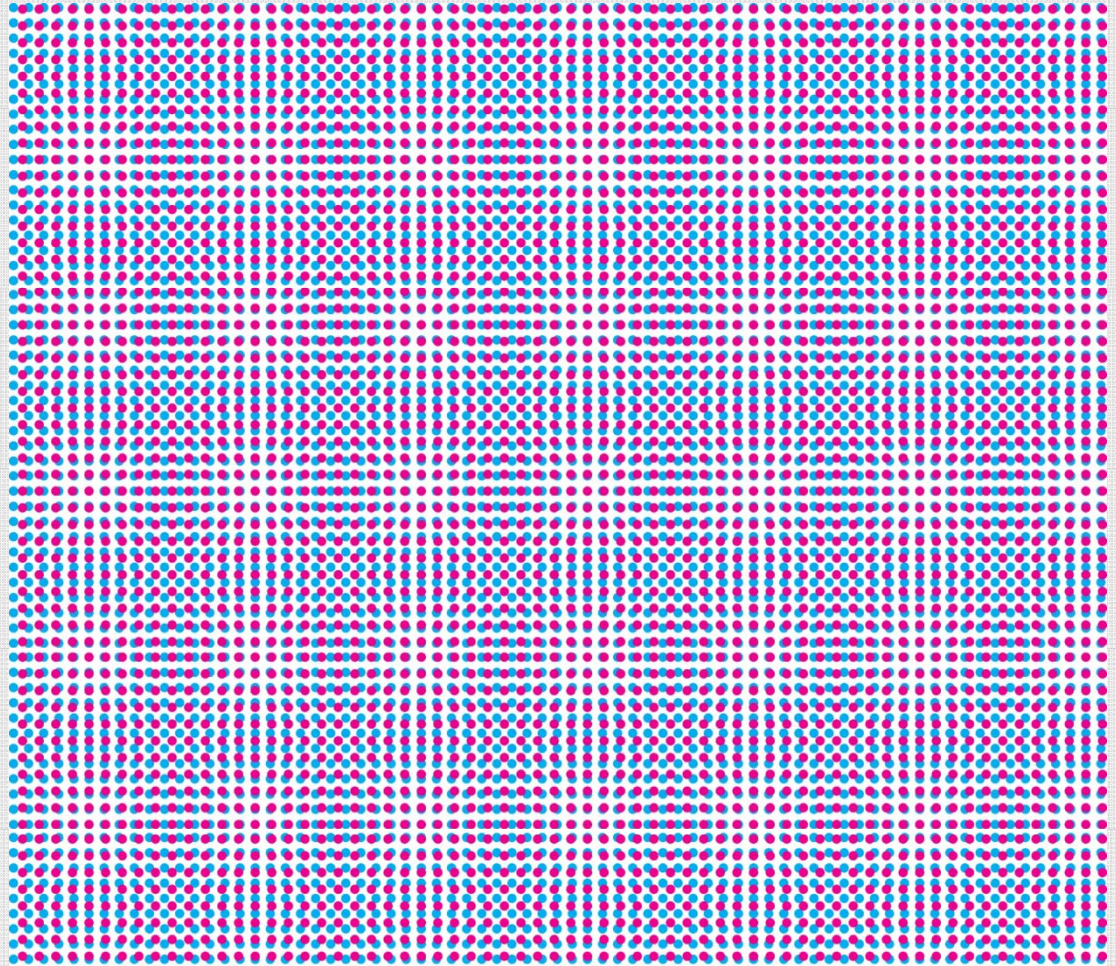
Disadvantages:

- High probability of moiré and rosette patterns occurrence
- Loss or deformation of thin lines

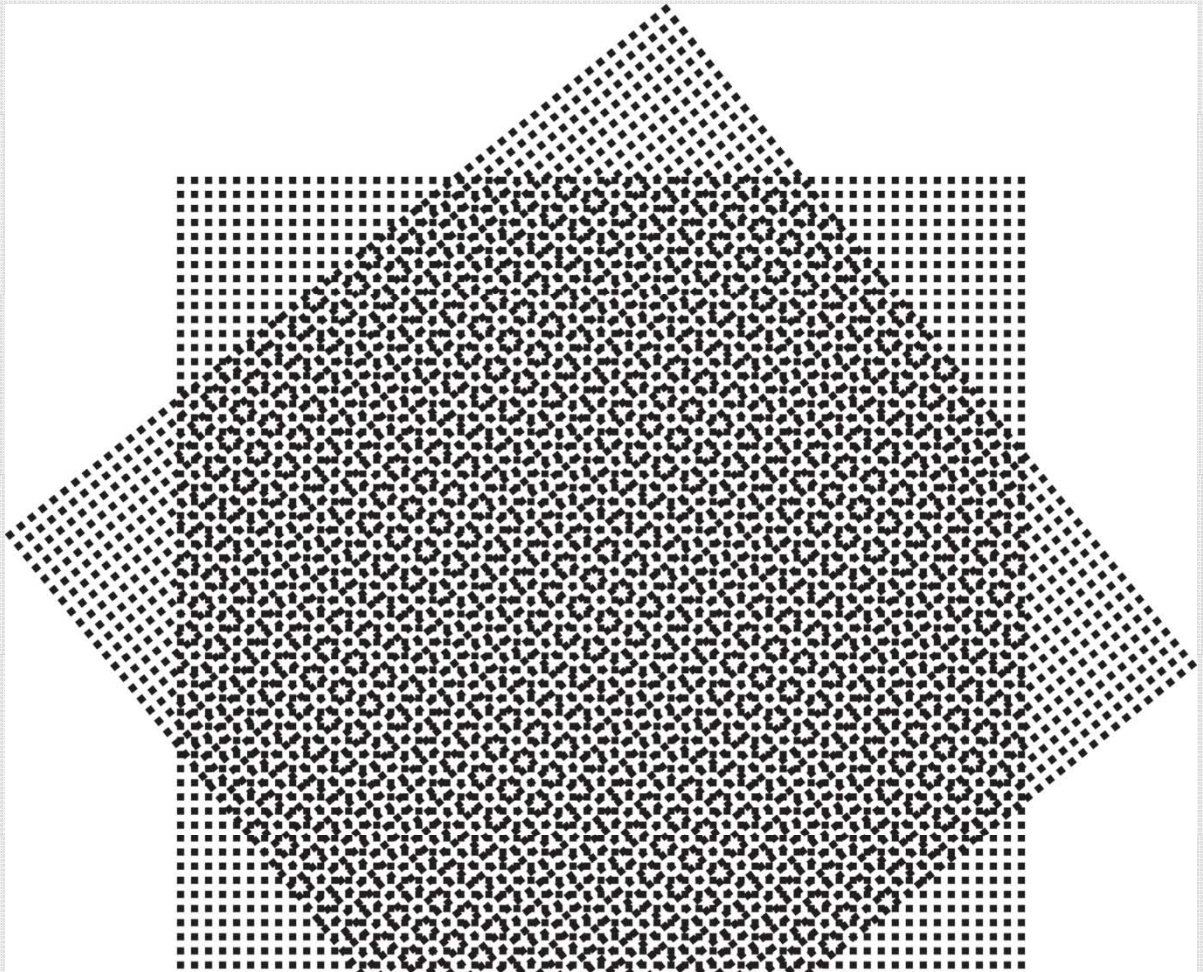
Example of moiré resulting from differing screen frequencies



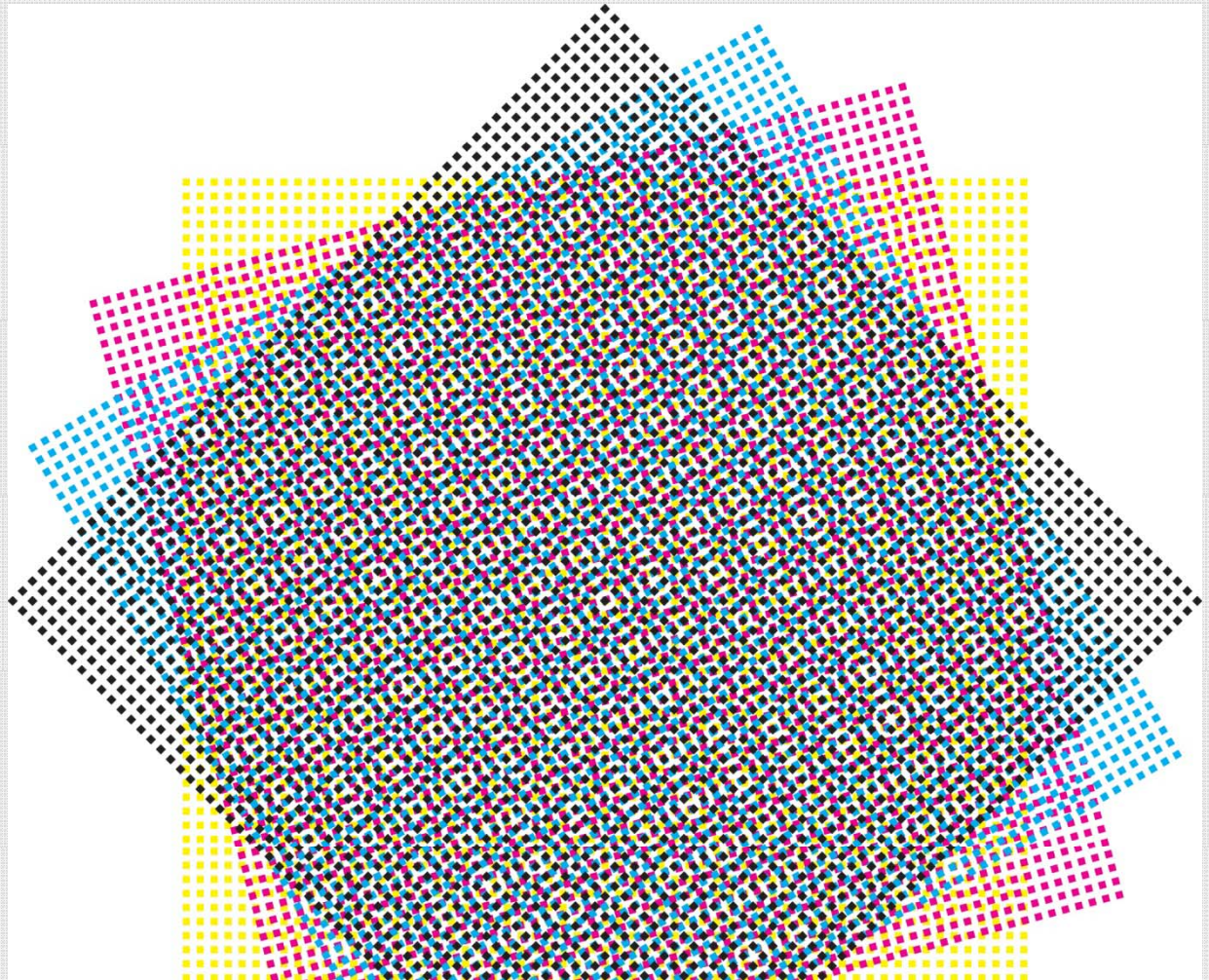
Example of moiré resulting from differing screen frequencies



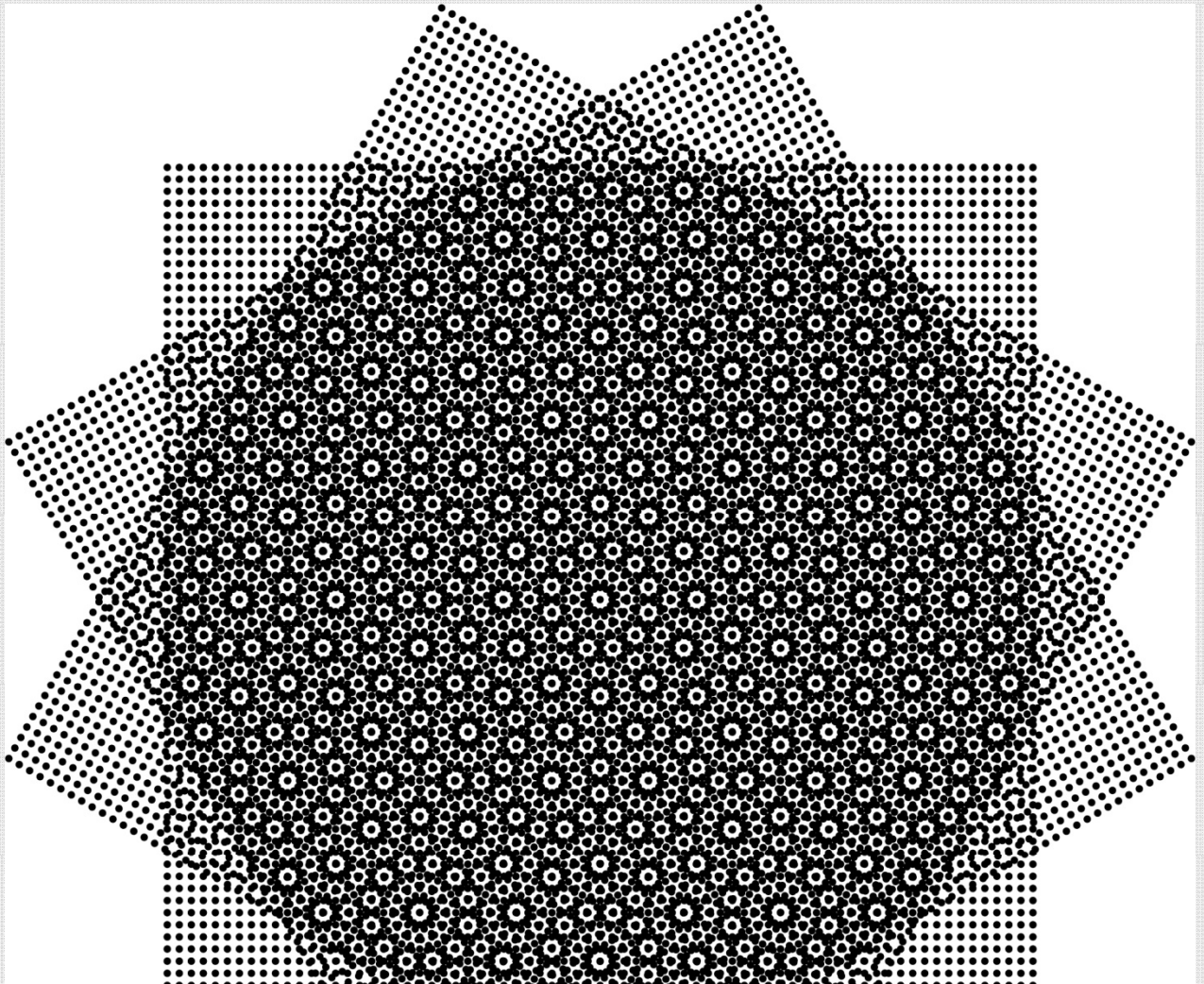
Example of moiré resulting from screen rotation



Example of moiré resulting from screen rotation



Example of rosette pattern



Frequency-modulated technique

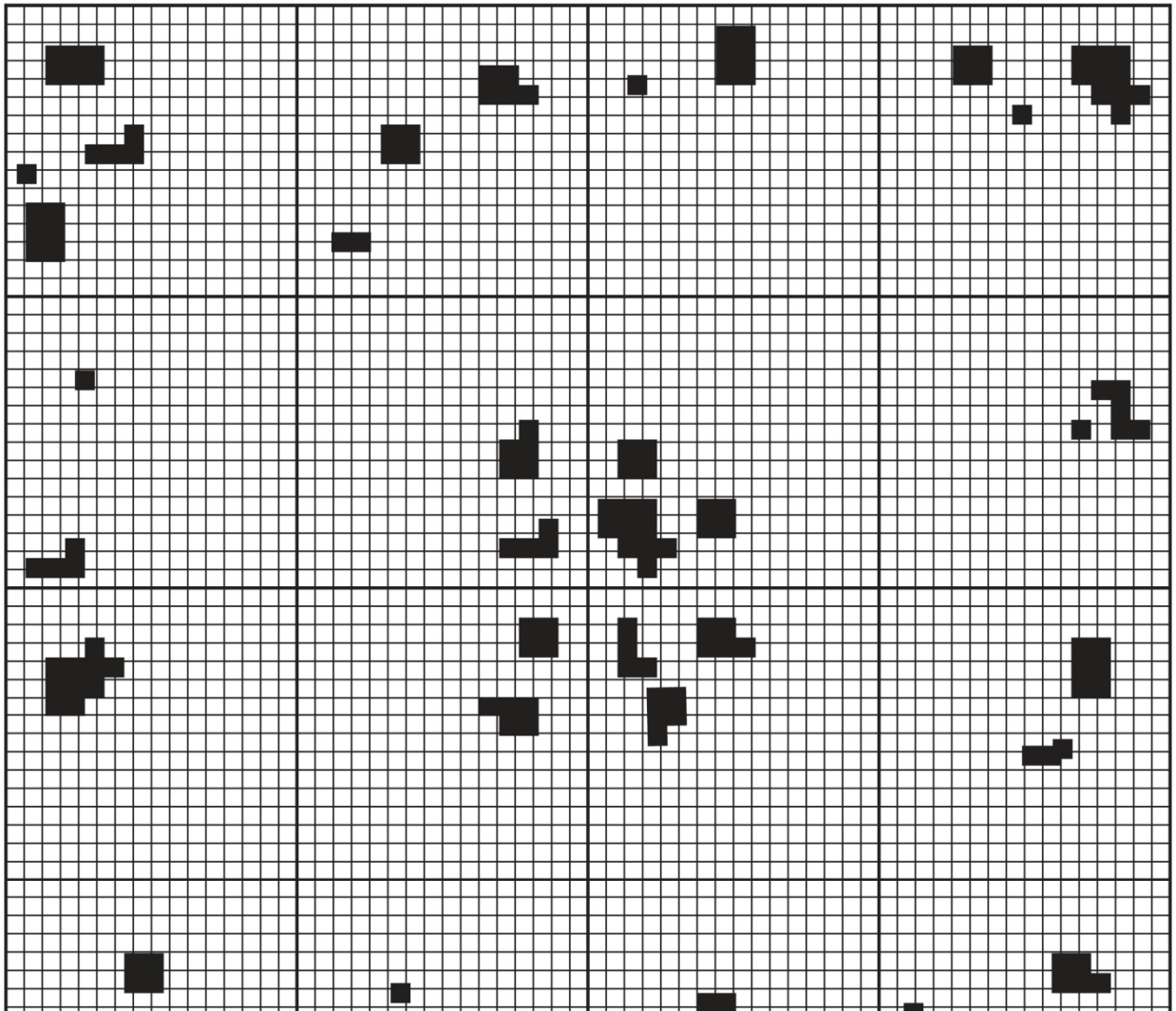
vanages:

ualitative reproduction of highlights and
dows;
w moiré occurrence probability;
gh quality of fine details reproduction;

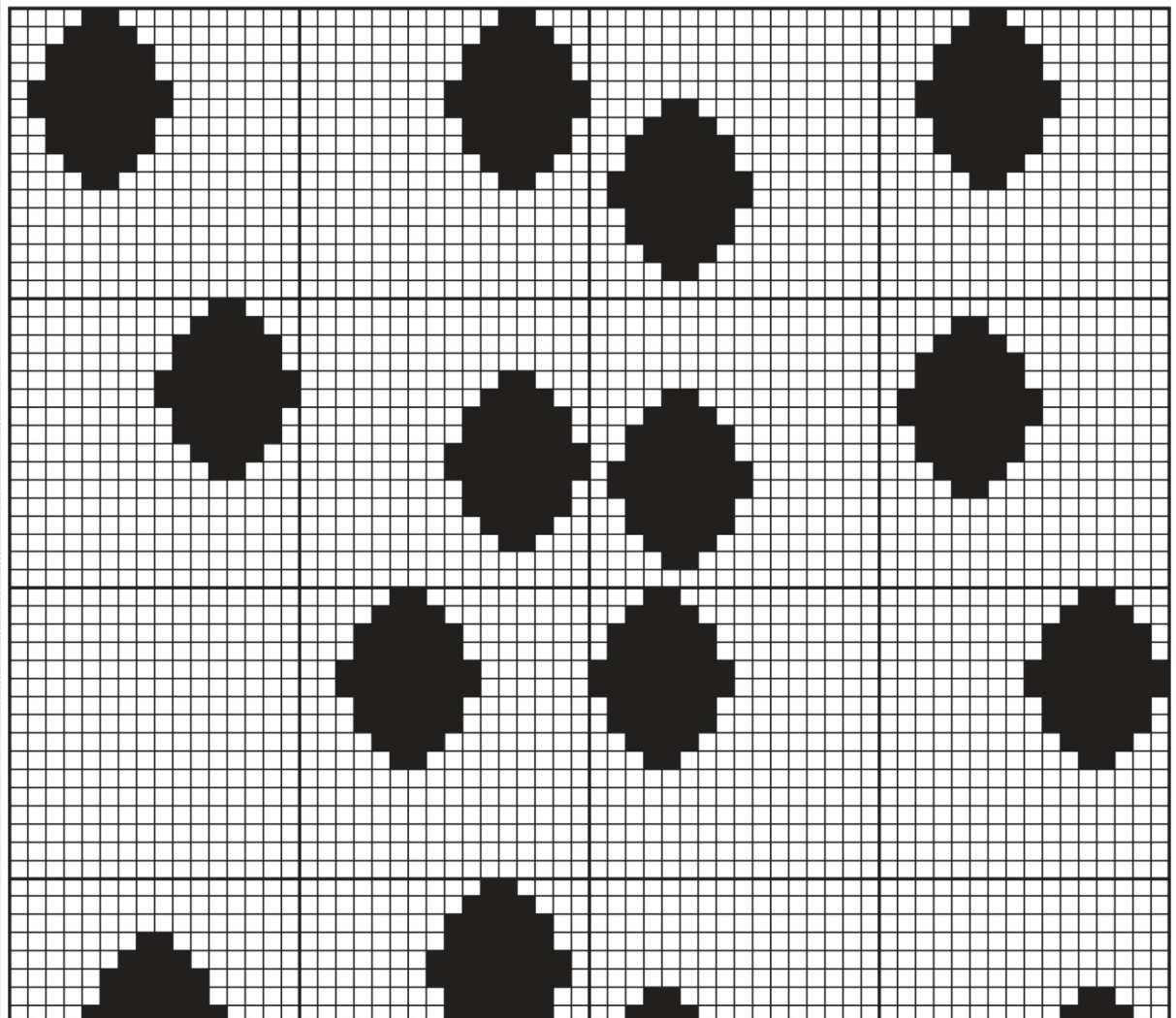
advantages:

robability of the “worms”-defect occurrence;
robability of irregular filling of micro or
een dots;
ecessity in high printing process stability -

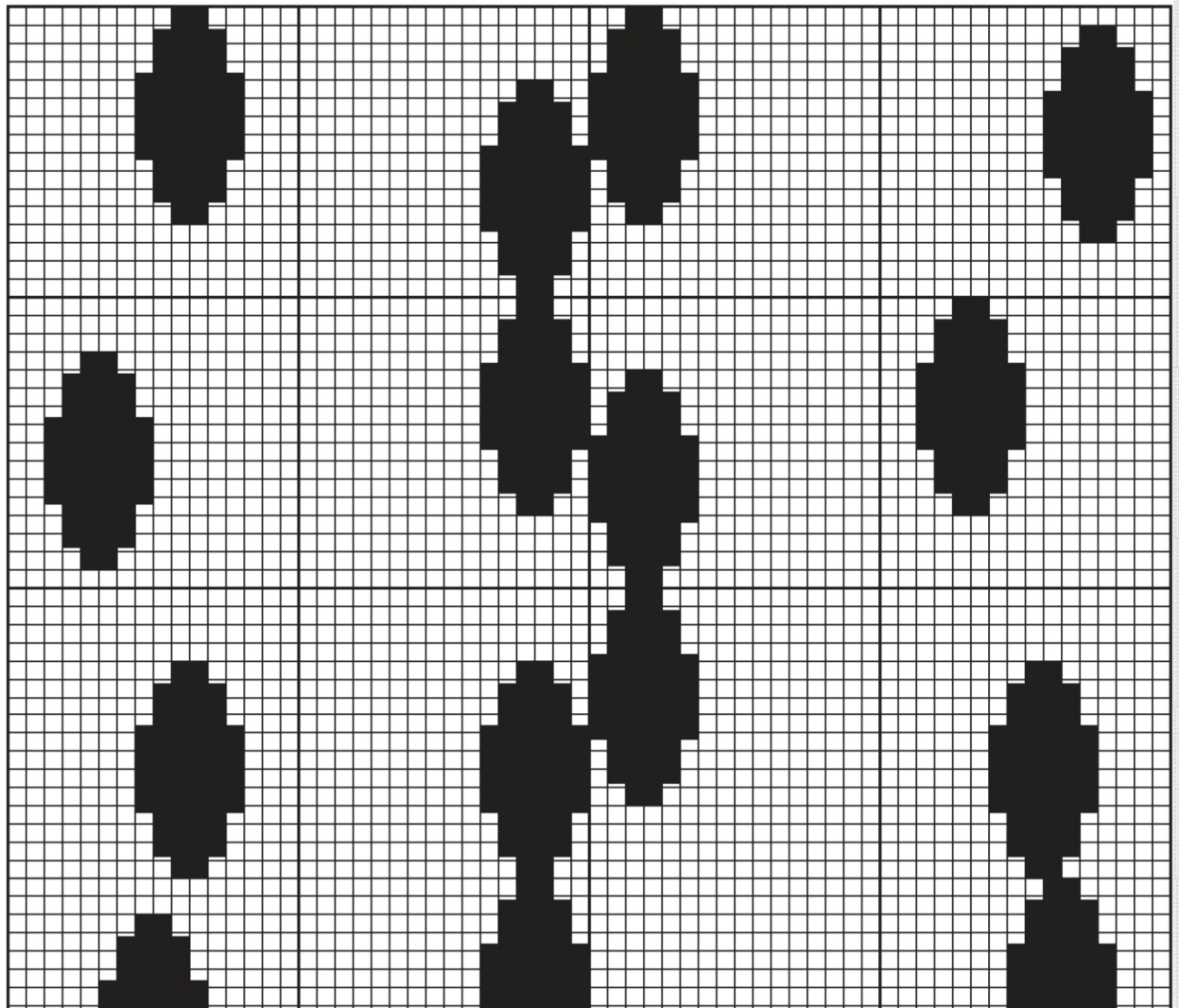
Irregular filling of micro dots



Irregular filling of screen dots



Formation of “worms” defect



« ... It is logical that the exception of lacks of AM and FM screening algorithms, together with association of their advantages in one technology, can lead to improvement of quality characteristics of print... »

...Considerable shortcomings in both algorithms, as well as the fact of that their strong points supplement each other led to the development of combined or hybrid screening algorithms... »

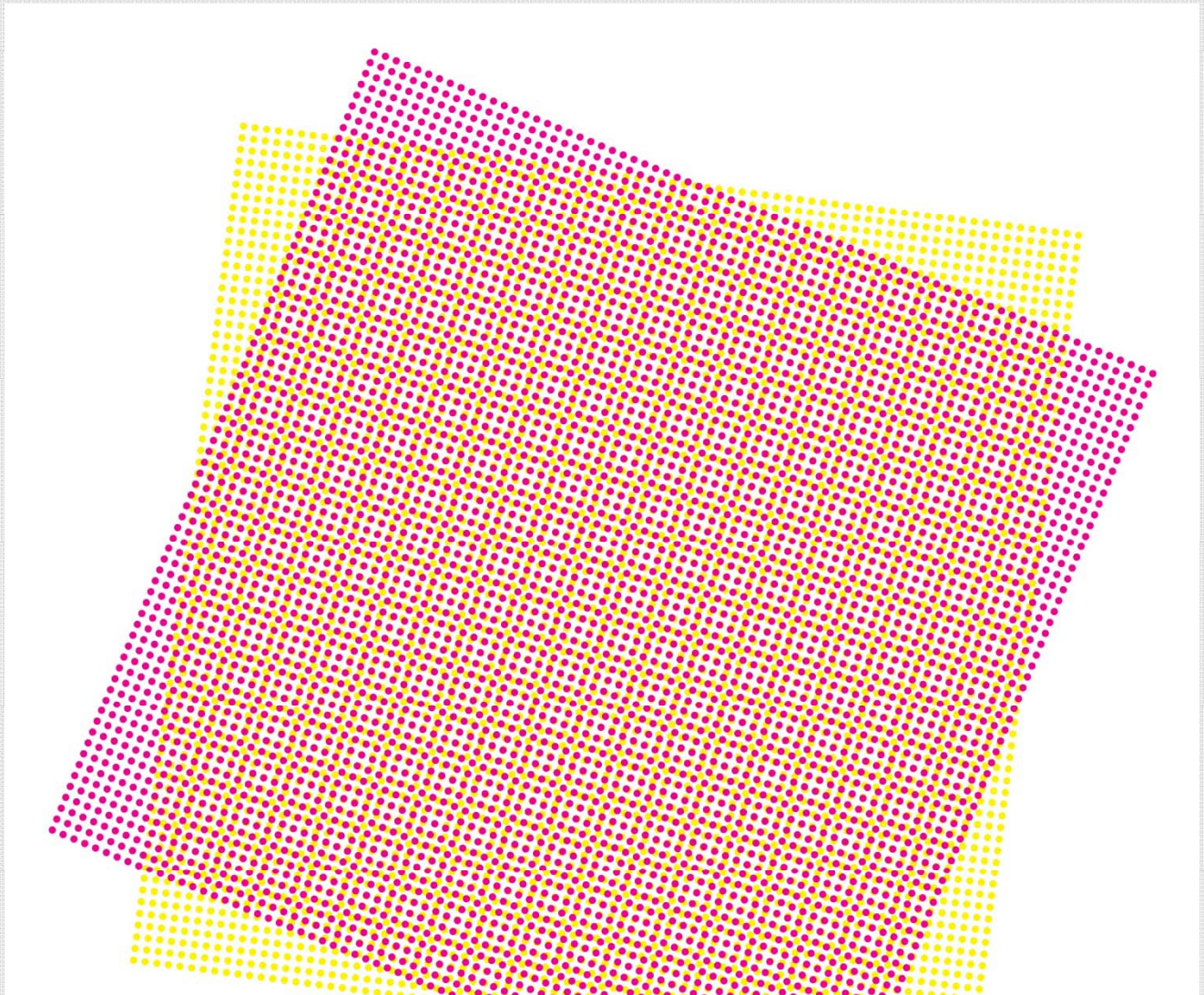
Advantages of hybrid screens:

creasing of color coverage;
k savings and their ability to dry up more quickly;
creasing of wastage;
ing of productivity;
creasing of printing process stability.

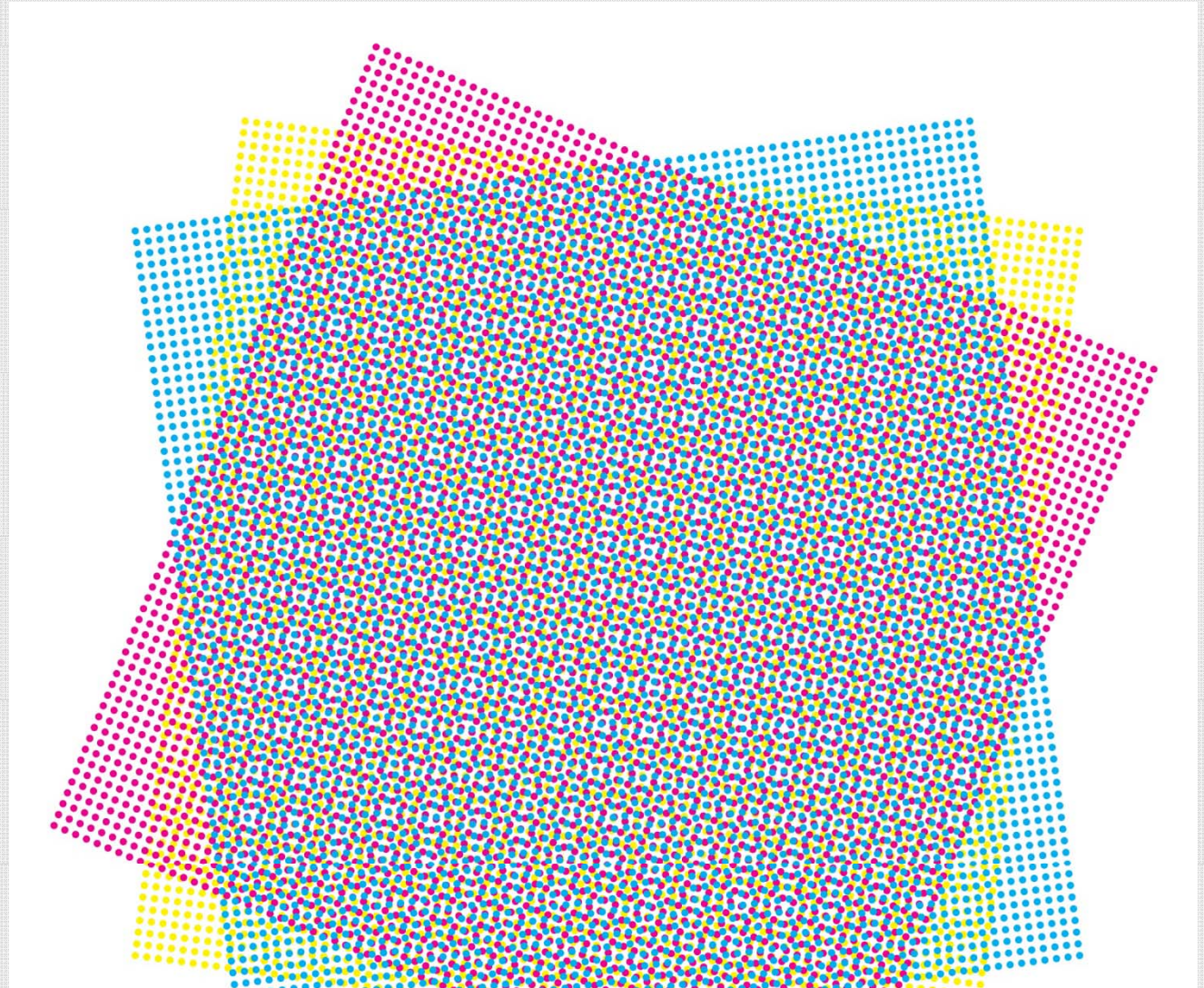
« ...The way of using combined screening
echnology for the purpose of avoiding of moiré
ct in four-color flexography printing is offered... »

Yellow = 82,5°

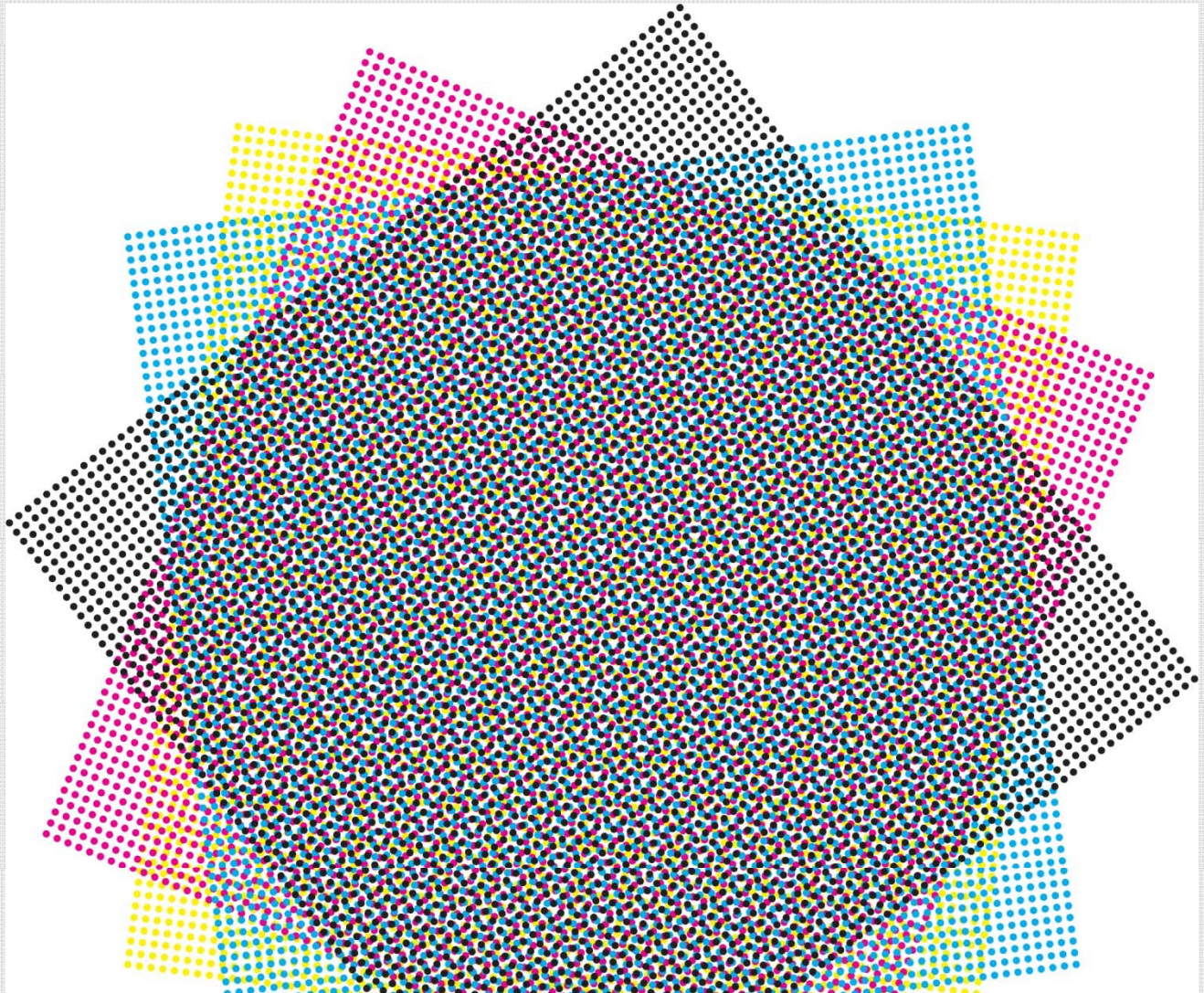
Magenta= 67,5°



Cyan= 7,5°



Black= 37,5°



Yellow = 82,5° ←

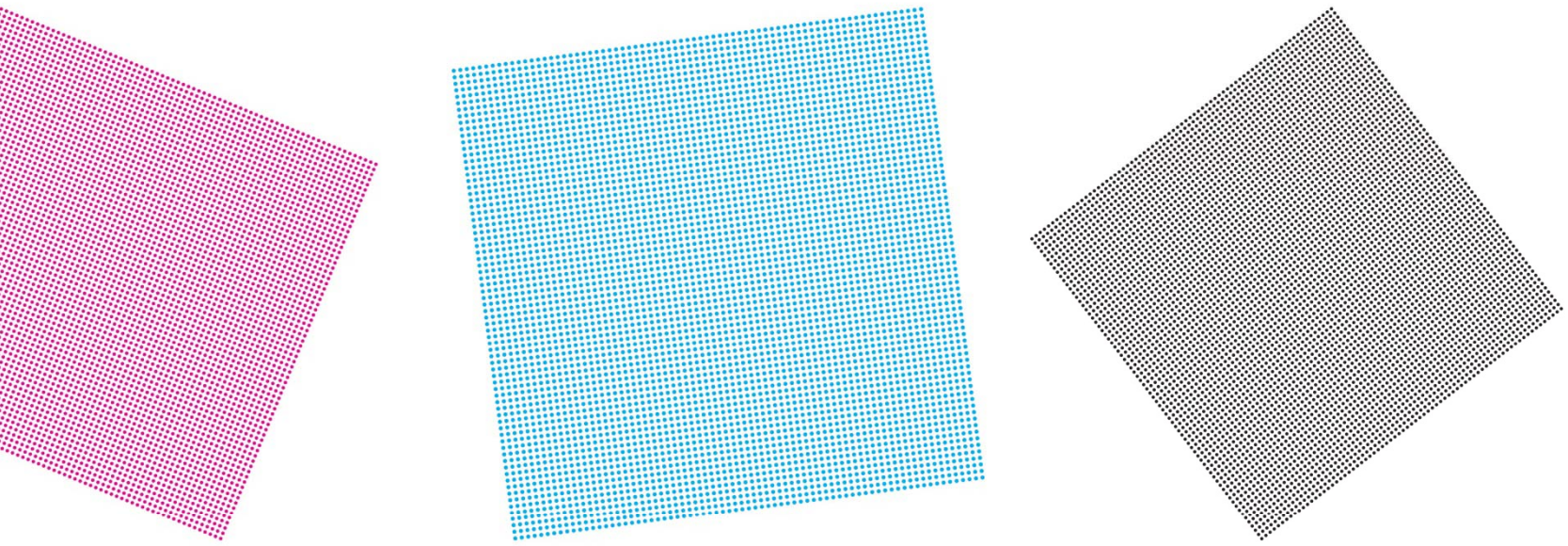
Magenta = 67,5° ←

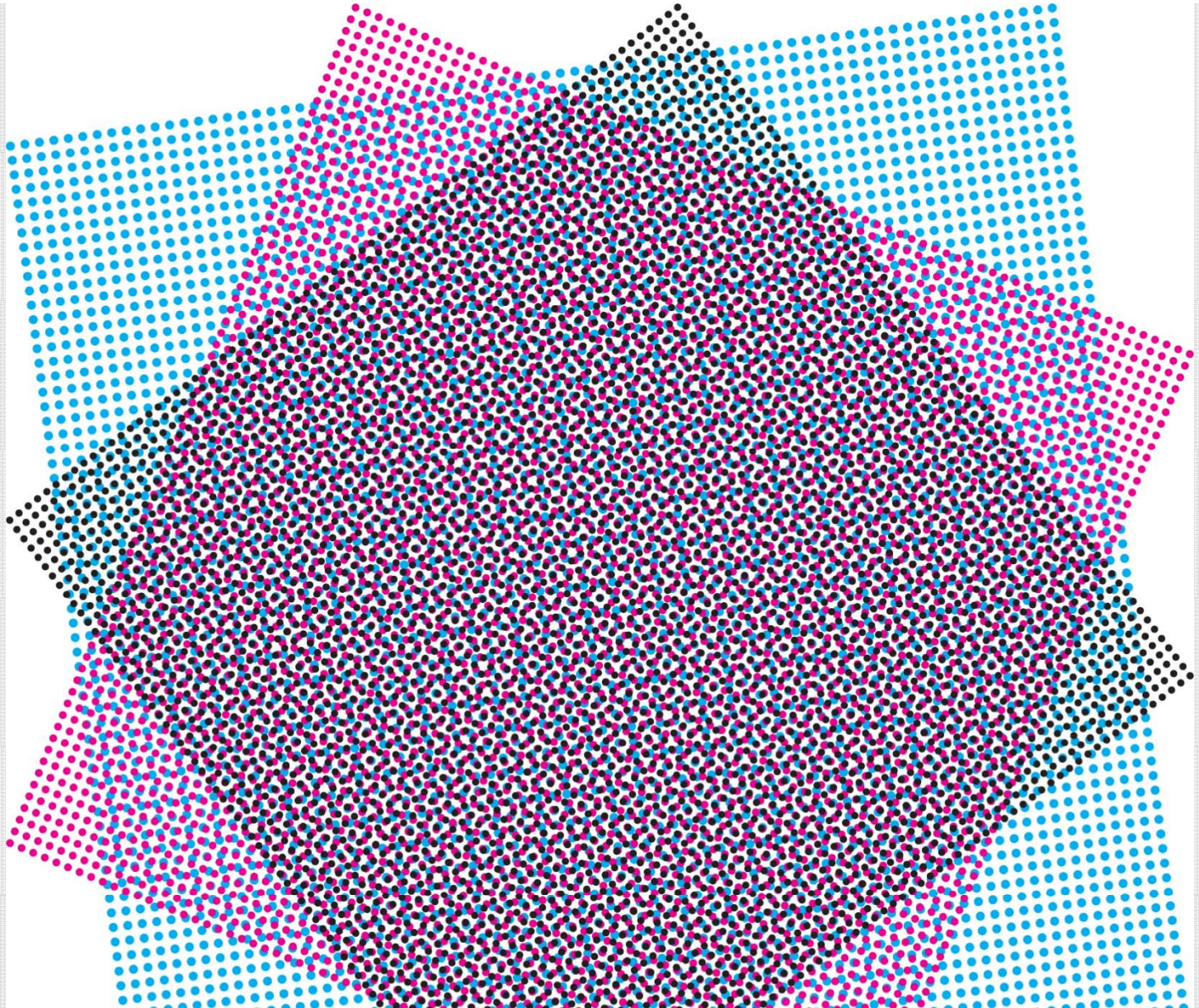
Cyan = 7,5°

Black = 37,5°

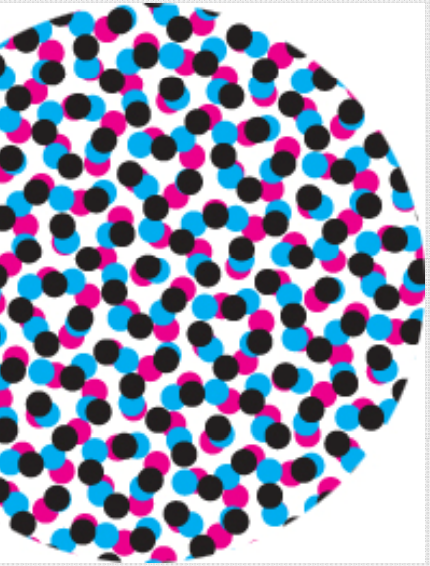
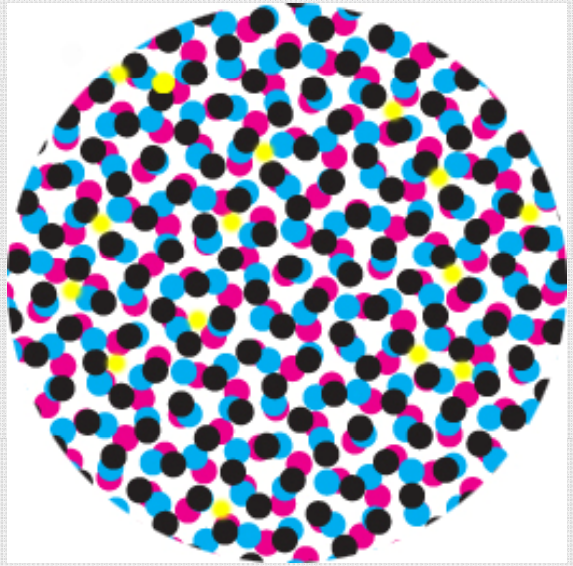
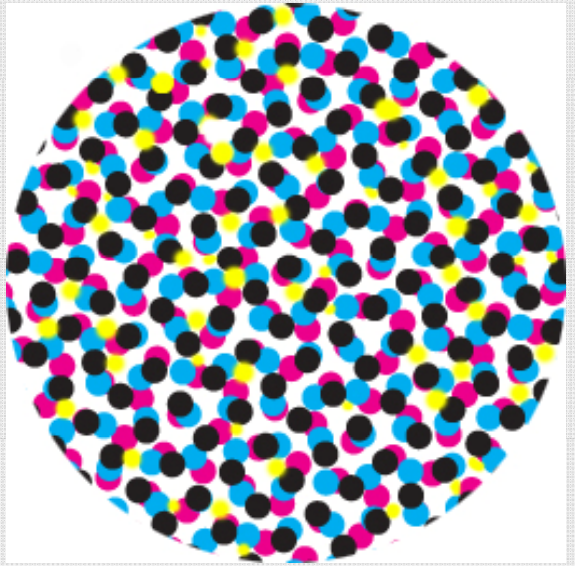
« ...It is determined, that at screen angles between two colors - yellow and magenta, less than or equal to fifteen degrees, pplication of stochastic screening in yellow color nd regular in other colors of CMYK color model is possible ... »

Setting screen angles for three colors: Magenta on 67,5°, Cyan on 7,5° and Black on 37,5° - generating AM screens



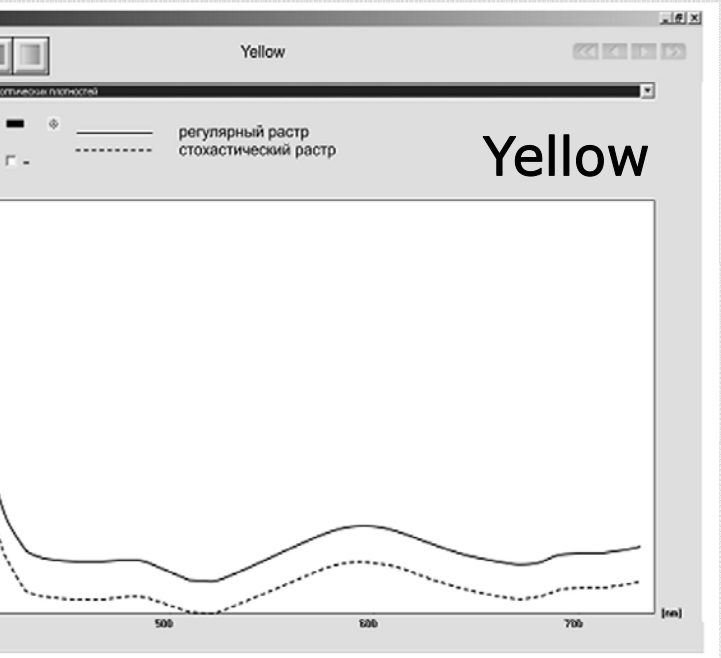


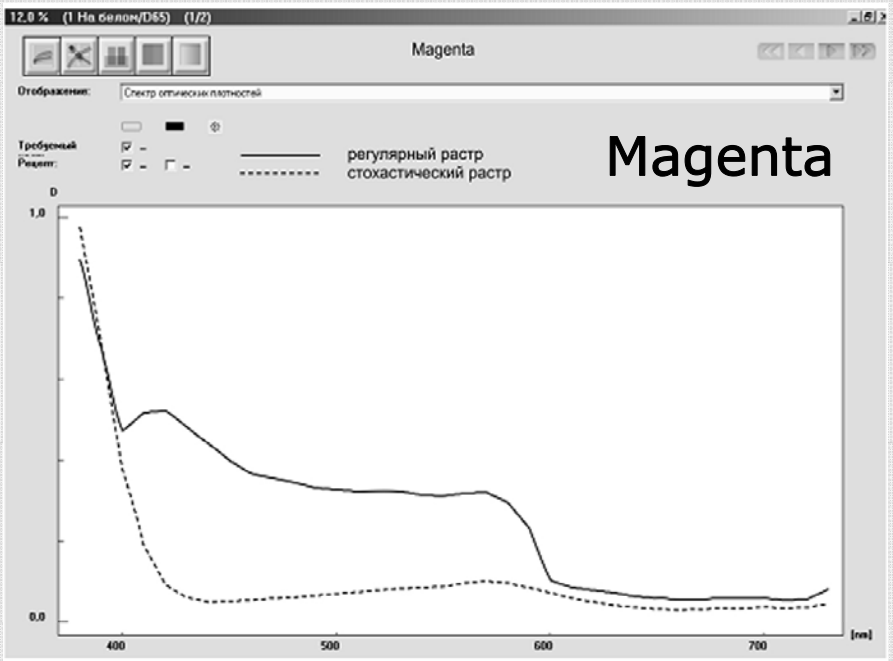
Generating frequency-modulated yellow component

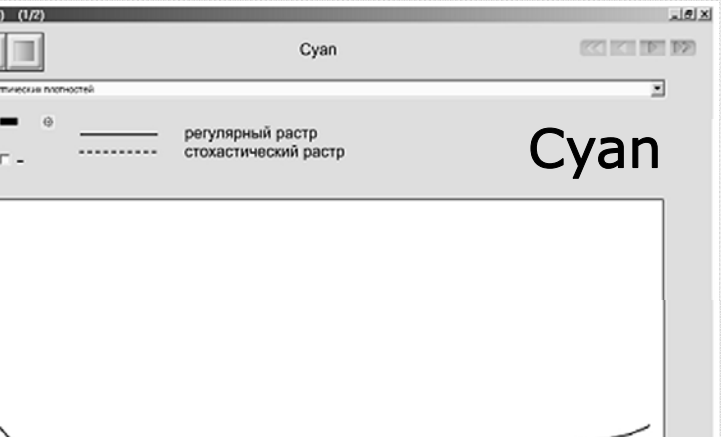




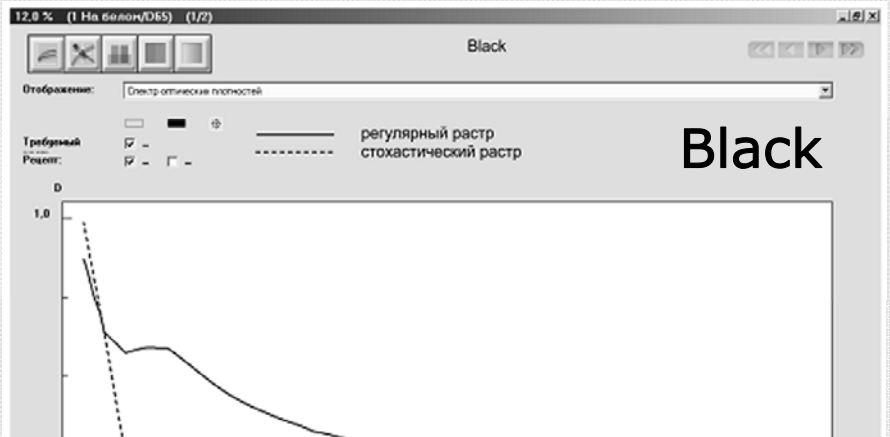

Why yellow?

Optical density spectrums of CMYK colors

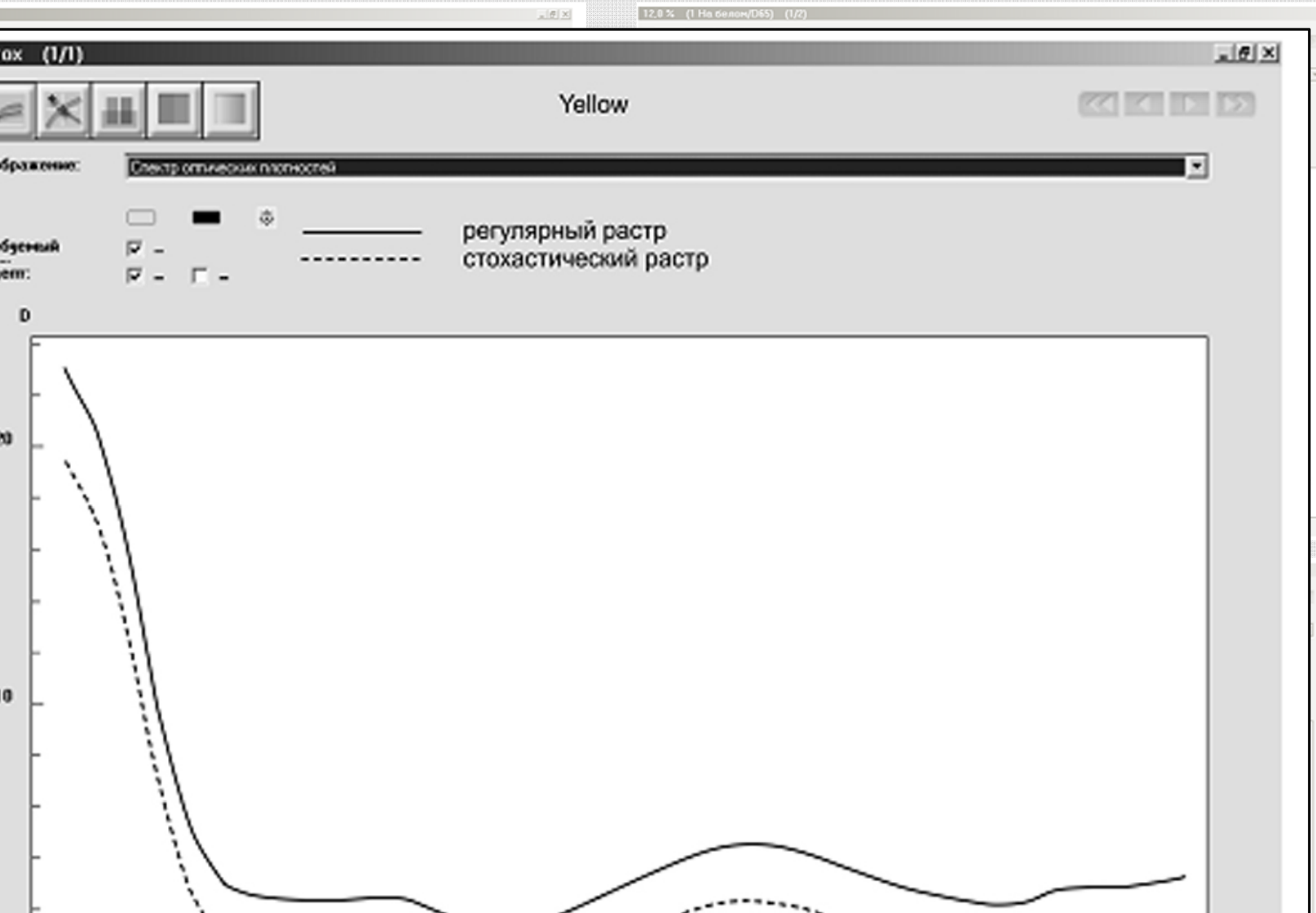








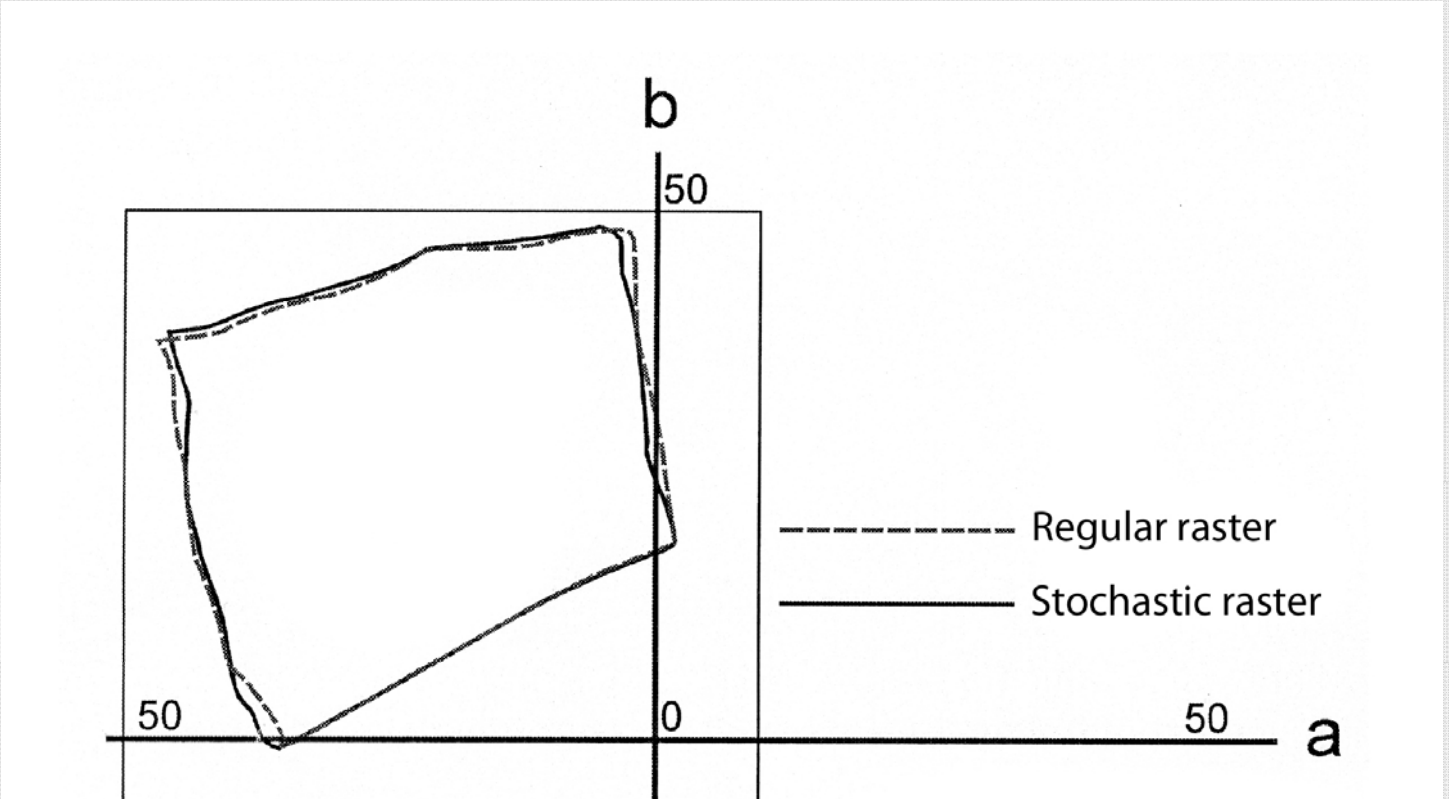
Optical density spectrum of yellow color



Color coverage zones

Yellow, Magenta, Cyan, Black - regular screens

Yellow - stochastic screen; Magenta, Cyan, Black - regular screens



Conclusions

method of hybrid screening in four-color
graphy printing is offered;

probability of moiré occurrence is reduced while
coverage of the image remains invariable;

ease of stability in flexography printing is reached.

Thank you for your attention!