

Digital printing with adaptive screening technology

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- **Introduction**
- **Technology description**
- **Architecture**
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- **Competitive landscape and industrial implementation issues**
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**This advanced screening technique was
initiated and developed in NWIP with the active
participation of the number of generations of
its graduate and doctorate students.**

Screening has always comprised the actual, cornerstone R&D issue of illustrative printing as far as the basic quality features of a print image (**color, tone rendition, sharpness, definition**) are fundamentally dependent on the halftone dot **area, form and geometry of placement.**

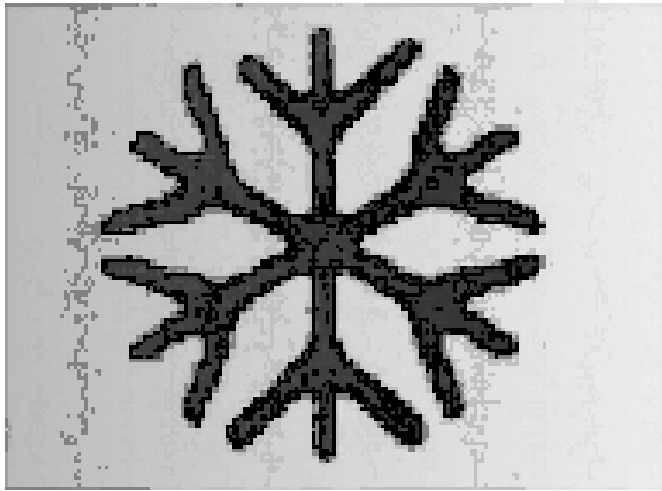
PROBLEM

Today the halftone image **definition** is many times less of a printing system resolution and comprises just the **half of a screen ruling value**

in spite of the prepress technology of today formally pretends to reproduce (to transmit through the printing channel) any detail of an image and, for example, the quarter of millimeter thick line in as much as 16 million colors (256^3).

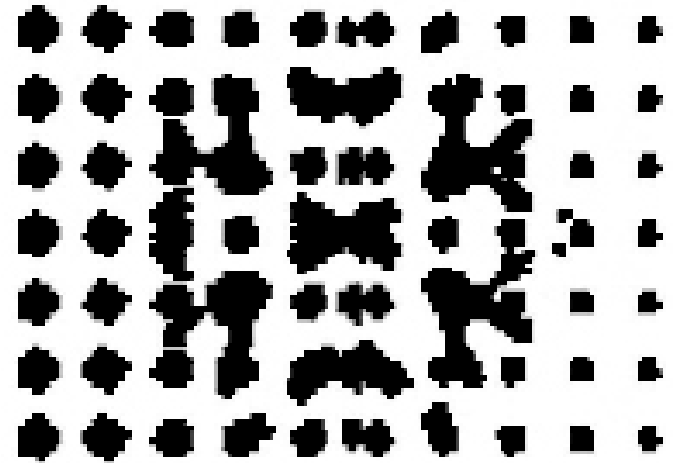
However, the eye can scarcely tell if such a line is somewhat darker or lighter, and is it green, cyan or grey.

The imaging system resources are not as effectively used in graphic industry as it take place in color TV and in image data compression techniques



a

continuous tone original



b

halftone copy

In spite of great excess of an input data, the image fine detail is badly damaged on a print by the halftone dots (Figure 1 a,b).

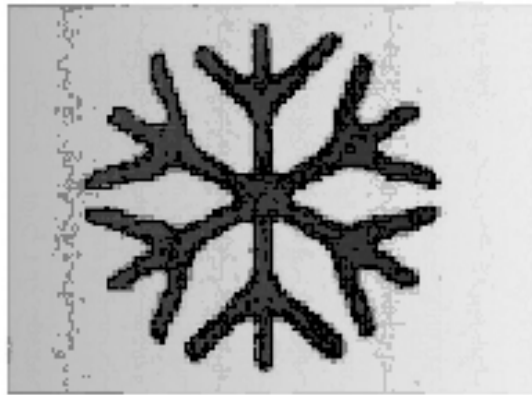
HDHP uses the patented screening procedure which is locally adaptive to an image “activity factor”, busyness or tone value gradient q .

The input pixel tone value S is divided on two parts S_1 and S_2 in proportion:

$$S = (1 - q) S_1 + q S_2$$

This allows to applying the **different way of halftoning to fine detail/contour and stationary image area.**

As result, the image quality is significantly improved due to more effective use of a printer potential resolution



a
continuous tone
original



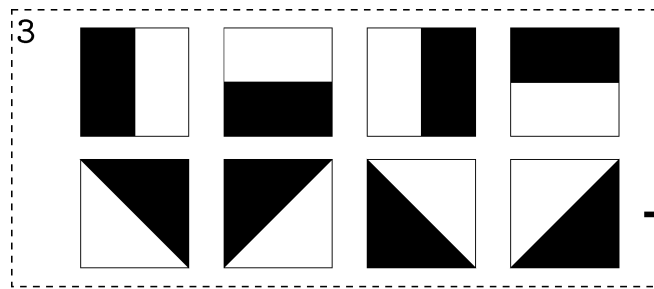
b



c

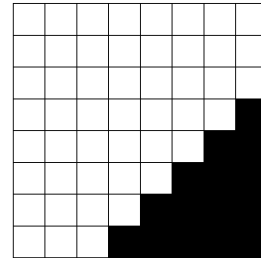
halftone copy

HDHP

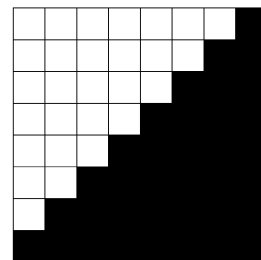


1	2	5	7	12	17	23	30
3	6	10	14	18	25	32	38
4	9	15	21	26	34	40	45
8	13	20	28	36	42	47	51
11	19	27	35	43	49	53	56
16	24	33	41	48	54	58	60
22	31	39	46	52	57	61	62
29	37	44	50	55	59	63	64

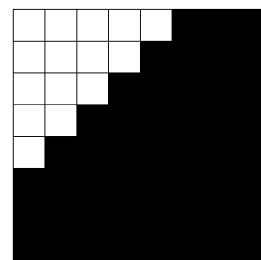
P_2



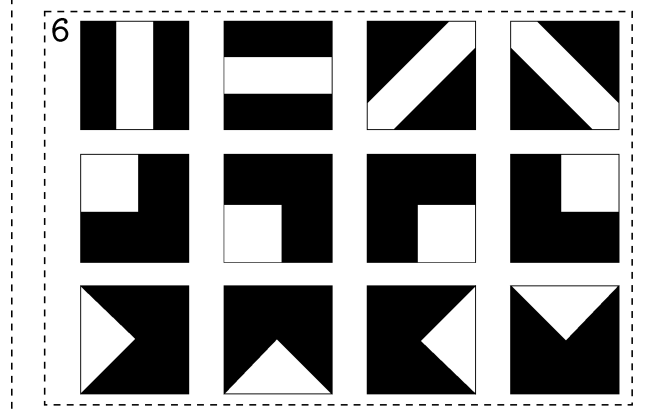
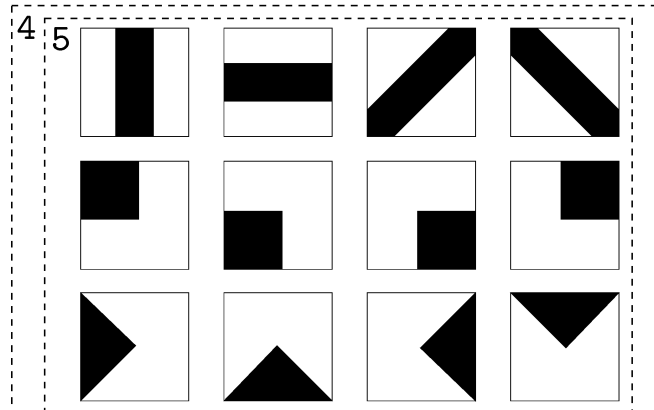
$S_2 > 48$



$S_2 > 28$



$S_2 > 15$



a

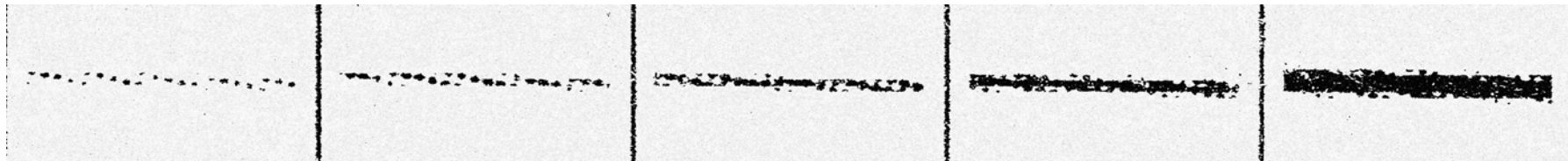
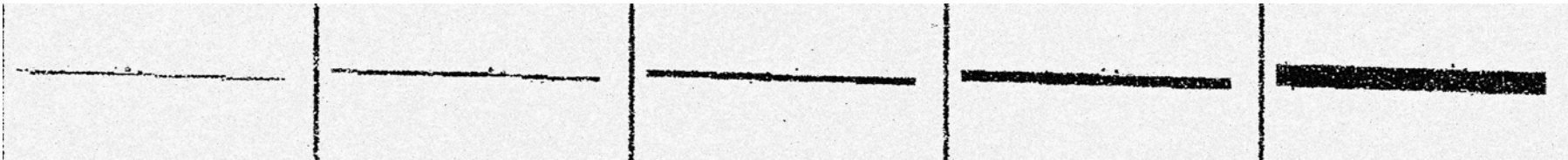
b

a) exemplary geometries of tiles;

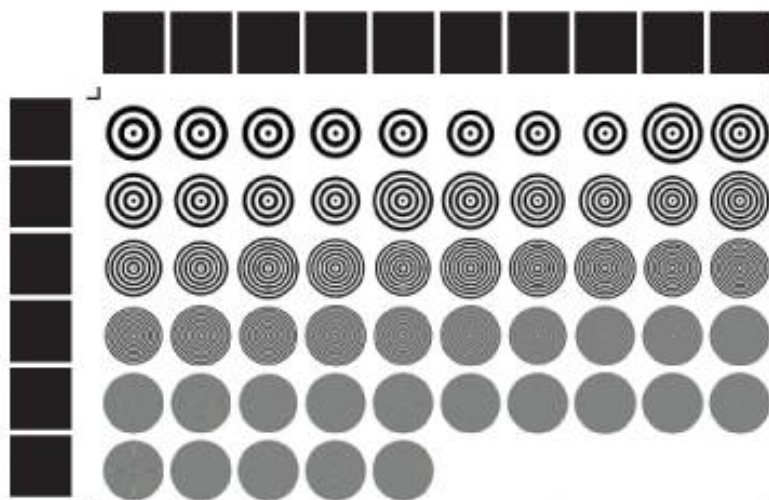
b) auxiliary screen function for one of these geometries;

c

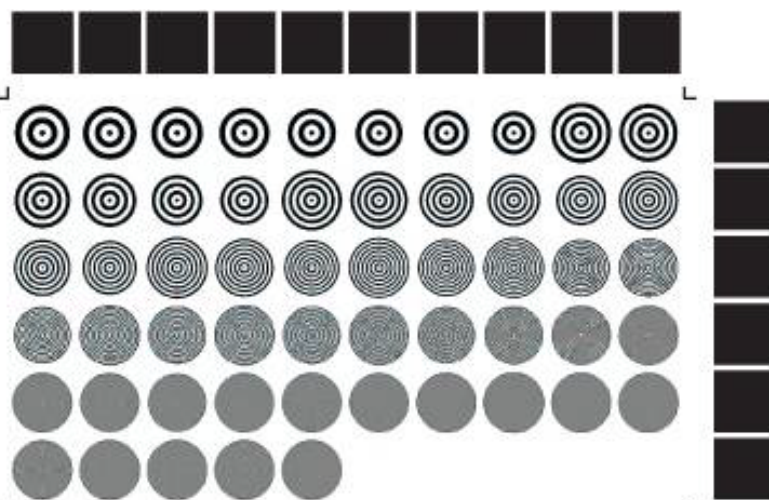
c) tiles produced with the use of this function for three tone values S_2

0,02 мм (1/8L)	0,04 мм (1/4L)	0,08 мм (1/2L)	0,14 мм (1/L)	0,28 мм (2/L)
				
Traditional ($L = 70 \text{ л/см}$)				
				
HDHP ($L = 70 \text{ л/см}$)				

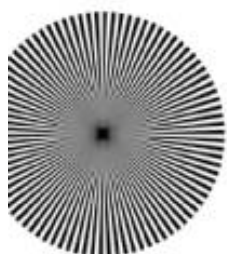
The individual thin lines are reproduced in HDHP by ink solid instead of scattered dots of conventional halftones.



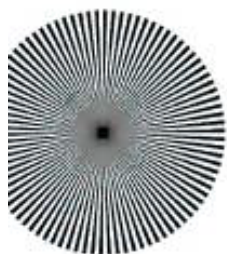
Растривание типографии



Технология HDNR



Растривание
типографии



Технология HDNR



Test

Advantages of technology are seen on printed samples of this test produced at the following equipment:

Industrial:

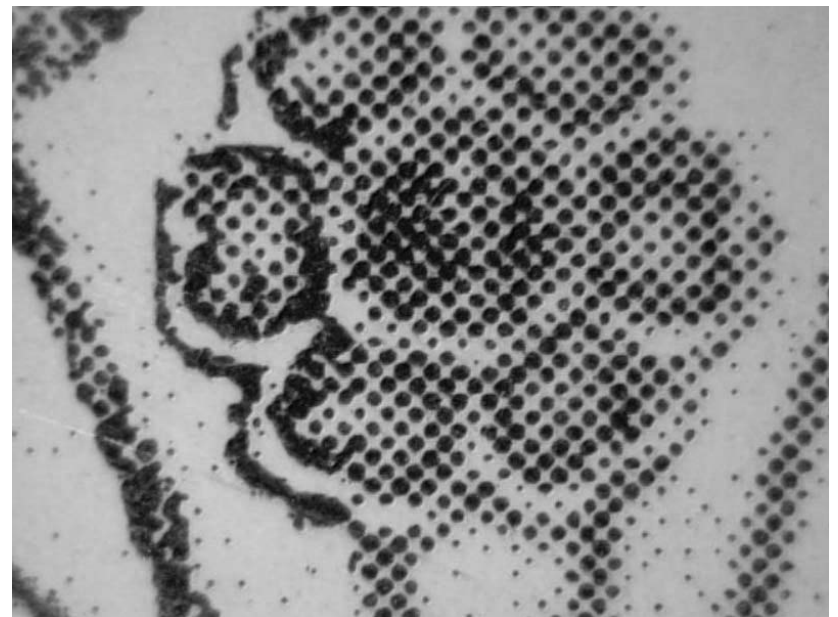
- Xerox WorkCenter 245;
- Xerox DocuColor 250;
- Xerox WorkCenter M118;
- Xerox DC 5000;
- Xerox DocuColor 6060;
- HP Indigo Press 5500;
- Canon CLC-4040.

SOHO:

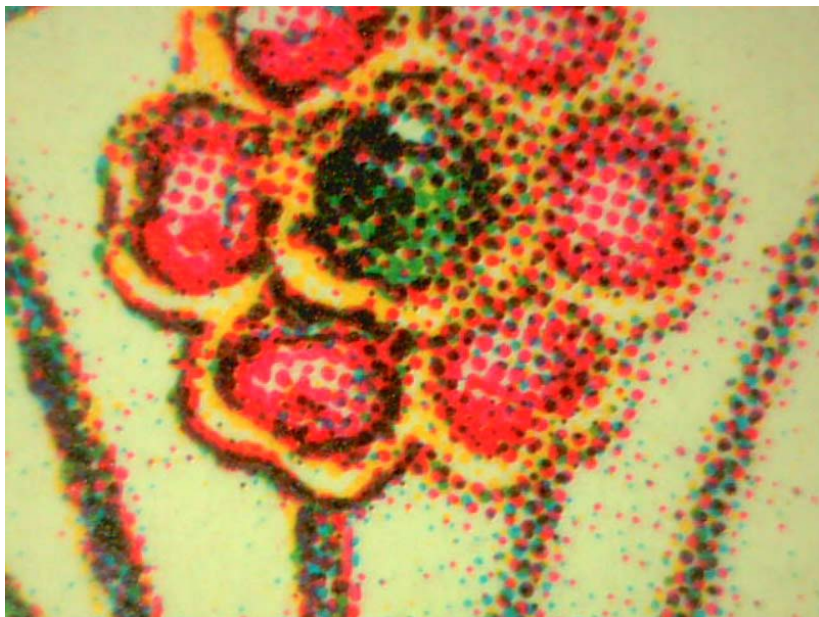
- HP CP3505;
- Samsung SCX-5112;
- Samsung ML-2510;
- Epson R290;
- Epson C110A;
- Canon IRC 624;
- Lexmark 2500;
- HP DeskJet F300;
- HP Photosmart 8400;
- Canon MX300.



Xerox 7750



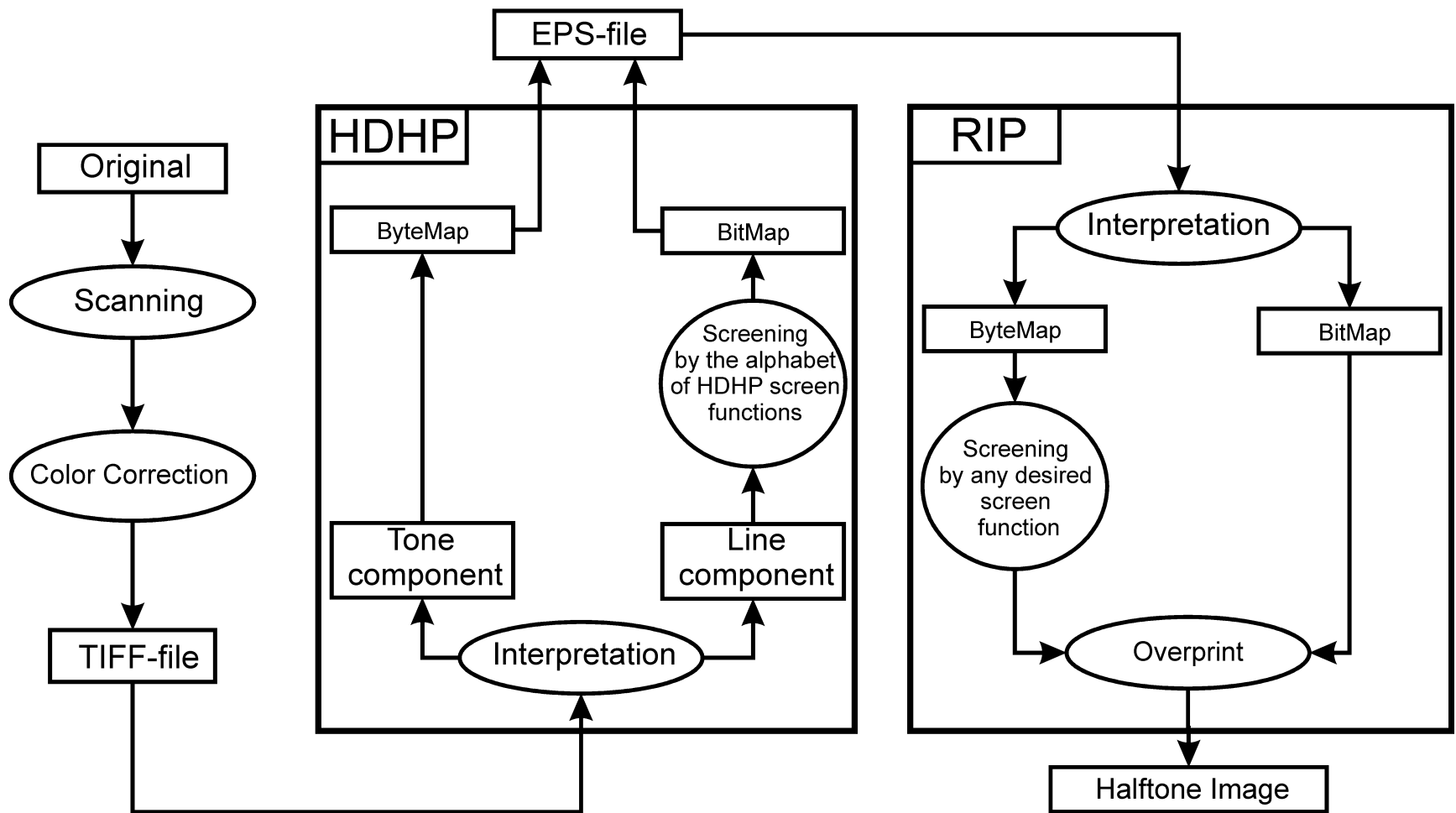
Indigo 5500



Indigo 5500



HP CP3505



The current version of HDHP workflow

The ways of implementing this novel method an image encoding may comprise:

incorporating the HDHP technology to a RIP or a printing device;

on-line service of processing the other party image file within the prepress workflow with providing the printout quality improvement;

realization of HDHP as the commercial software application for current users of printing equipment.

Conclusions

The conventional and digital printing technologies enable the high potential of halftone image quality improvement.

It stays still unused due to the non-optimal image data encoding for the print output.

It can be much more effectively explored with the use of locally adaptive screening approach and, in particular, by the implementing the High Definition Halftone Printing (HDHP) technology in the prepress workflow, RIPs or/and printing devices.

Modern graphic educational institutions are able to teach students not only for proper use of equipment but also to make sometimes this equipment to work better than its vendors can do.

Thank you