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EXPERIMENTS WITH NEW RASTER ELEMENTS

Scientist: ŽILJAK VUJIĆ, Jana; Young Researcher: PLEHATI, Silvio
Supervisor/Mentor: KROPAR VANČINA, Vesna

Abstract: *In this work new unpublished raster elements (RE) are tested in security and individualized printing. The results of earlier researches dealing with graphic technology and design are published at the conferences. Results obtained by measuring outline of RE, with defined coverness area and coverness area after digital printing are given in this work. For new RE, as well as for earlier published RE no discussions and/or researches of these parameters are still not done. Measuring procedure and valorization of regular behavior or change of RE shape in the whole area of coverness are suggested. This procedure should be used whenever new RE is introduced in praxis.*
Keywords: *new raster element (RE), new procedure of measuring and validation of RE*

1. RASTER ELEMENT "MUTANT M68"

Complex mutant in this work is given according to relation as follows:

$$0.666667\,\mathrm{Abs}\left[\mathrm{Sin}\left[\mathrm{Abs}\left[0.25^{x^2}-y^2\right]\right]\right]$$

ContourPlot[1-z,{x,-1,1},{y,-1,1},Contours→8] ;
z=Abs[Sin [Abs[(0.25^(x^2)-y^2)]]]/1.5

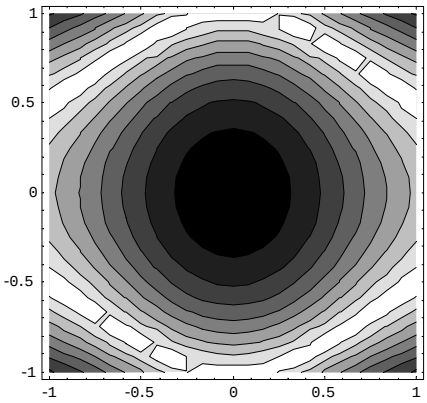

Figure 1. 2D shape of mutant M68 relation

It is difficult to prepare PostScript code from the figure of two-dimensional shape. It is necessary to add relation with angle arrangement and divider of the whole equation. It is even more difficult to find out relation with three-dimensional shape. The only way to find out errors in definition of RE is to use 2D and 3D analysis. It is not possible to find dislocation of definition from space -1,1 in all three coordinates by RIPing but it can be done by 2D and 3D views. Such views ensure reproduction realization by digital printing or CTP processes. Even checked PostScript units do not give evidences about errors during process of screening (Žiljak & Pap, 1999).

Authors suggest to keep uncompleted values of coordinate z while trying to find new RE. Even the smallest penetration of this coordinate over values -1 and 1 can cause stopping/disconnection in digital screening. When new REs are requested it is suggested to provide parallel tests of relations in 2D, 3D and PostScript technique.

Plot3D [z,{x,-1,1},{y,-1,1},PlotRange→{0,1}]

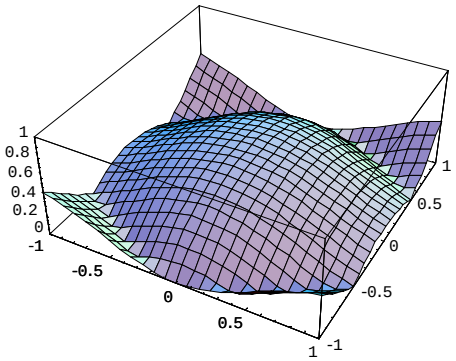

Figure 2. 3D space of mutant M68

Research of new RE include experiments with coverness of color reproduction with RE in continuous gray levels in low and higher frequencies (Žiljak et al, 2003). In this work the quality determination method is established and it has to be used practically always during creation of new RE shapes which have never been used in printing praxis before. Researches are related to regular coverness, changes of raster angles and results obtained at various frequencies. The same research is enlarged to cover digital printing because these techniques are expanding now (Žiljak Vujić et al., 2006).

In the figure 3 structure of new RE M68 with 50% coverness after RIPing with sharp edges is given. Printing plate and process of printing have added some enlargement of RE at the edges which is for the same example presented in figure 4. For realization PostScript graphic language was used (Žiljak & Pap, 1999; 2003). Converting of earlier relation gives following shape:

/r68 {dup mul exch 2 exp 0.25 exch exp exch sub 2 div abs 90 mul sin abs 3 div } bind def

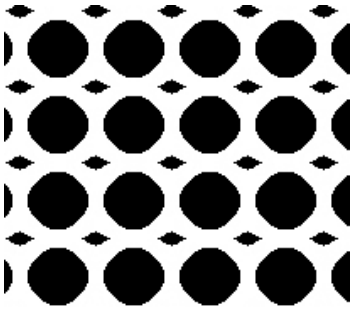
Figure 3. New RE M68 with 50% coverness after RIPing and before printing with sharp edges

2. PRINT WITH MUTANT RASTER ELEMENT

Prints with s 900 dpi, 1200 dpi and 1800 dpi were scaned with the same number which was used for bitmap screening of figures to determine coverness of prints. By this technique it is possible to research dot gain in RE neighbourdhood, because it

is possible to read brightness values for each scaned pixel. If all brightness values of scaned pixels in researched area are added together and obtained value is divided by the number of researched pixels mean value of brightness for researched area is obtained. Digital print of Mutant RE - r68 (M68) with 20 dpi printed by „Xeikon 32“ is presented in figure 4 in two enlargements. Upper part of print covers wider space and bottom parth represents space of one raster cell. Table 1. presents parts of brightness (and darkness) for individual pixels after scanning.

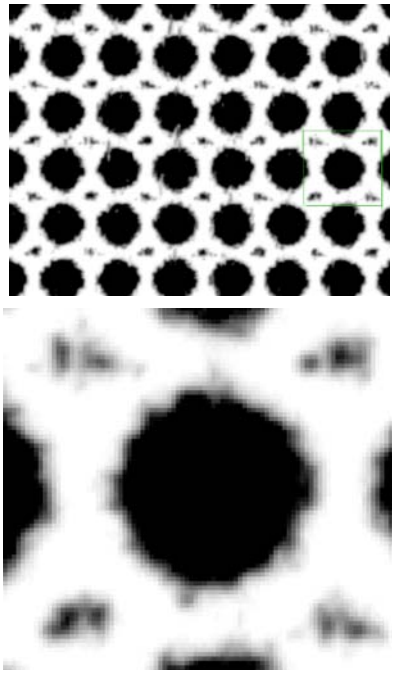

Figure 4. Density of RE M68 edges after printing (scanning of print)

Values of density for some edge-parts of RE in table 1 are given in 10 steps and separated for coverness of 100% and coverness of 0%. There are differences in overall coverness between faze of RIPing before printing plate is made and after printing. Results of these measurements are given for M68 in Table 1. The first column in table 1 represents marks for L 20 lpi where this test was done and defined covernesses of 10, 30, 50, 70 i 90% (abbr Xla20 10). The second column represents number of scanned elements of prints which have entered calculation of density and coverness.

A lot of pixels (more than half of million) were included in research of space and resolution of scanning. Intern structure of every raster element in raster cell was researched when every raster element was divided in hundreds of parts. In the frame of dot gain research it was possible to analyze all gray areas around RE for new mutant shapes, especially for complex crystal and lace raster.

White area was changed with gray area. At high coverness white area disappears and black area is drastically smaller. Color/ink dispersion from the center of defined agglomeration is bigger for the bigger defined coverness. Gray areas gradually and completely close white space.

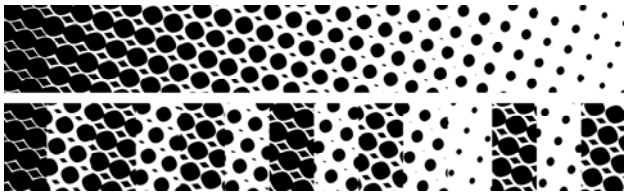

Figure 5. Mutant raster M68 in continuous and discontinuous views

In table 2 coverness of mutant M68 before printing is given (RIP B/W), as well as after digital printing where in calculation are included all parts of gray areas in the neighborhood of RE and in the space of raster cell.

data defined coverness	% coverness of print	gray edges	deviation	% coverness	RIPing
L20 10	10	9,7107	-0.2893	10,3840	0.3840
L20 30	30	29,6882	-0.3118	30,0290	0.0290
L20 50	50	47,9417	-2.3118	49,9269	-0.0731
L20 70	70	69,6083	-0.3917	69,9331	-0.0669
L20 90	90	92,7116	2.7116	90,1436	0.1436

Table 2. Coverness of RIPing and coverness of prints

For mutant M68 deviations at 20 lpi are very small. The figure is defined to the minimal zero deviation after print scanning.

3. CONCLUSION

Introducing of new forms of screening will be used in security printing. Suggested mutant with changeable structure is not safe enough because it has two sub-shapes smaller and bigger central structure. It can be used for documents and design of posters and ambalage. In the frame of this work 2D and 3D shapes are given, behavior of raster in continuous spreading, as well as in areas with disconnections of pixels in various degrees of density. The behavior is the same as it is when conventional raster shapes are used.

4. LITERATURE

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Data	Pixels	Black %	White%	1-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-99
XLa20 **10**	518400	3.080	83.563	1,8245	1,382	1,084	0,9898	0,899	0,8729	1,026	1,2986	1,565	2,407
XLa20 **30**	518400	22.366	56.510	2,1956	1,663	1,452	1,4583	1,466	1,5945	1,881	2,4481	3,248	5,715
XLa20 **50**	518400	33.508	27.533	2,9971	2,536	2,360	2,5068	2,451	2,6298	2,999	3,9921	5,498	10,987
XLa20 **70**	518400	47.459	0.345	5,1105	4,012	3,611	3,7292	3,498	3,7546	4,523	6,3499	9,706	7,906
XLa20 **90**	518400	73.483	0	5,6105	4,792	4,496	4,5934	3,680	2,4115	0,813	0,1163	0,001	0,000

Table 1. Relative participation in darkness - percents of total number of pixels in percents of darkness

DAAAM AUTHOR QUESTIONNAIRE

PAPER DATA

This paper presents part of Thesis which is made under the title ”RASTER ELEMENT MODELING IN STOCHASTIC MULTICOLOR REPRODUCTION” at the Faculty of Graphic Arts; University of Zagreb, under the supervisor leader KROPAR VANČINA, Vesna. Key data: In this work new unpublished raster elements (RE) are tested in security and individualized printing. Results obtained by measuring outline of RE, with defined print coverage and coverage after digital printing are given in this work. For new RE, as well as for earlier published RE no discussions and/or researches of these parameters are still not done. Measuring procedure and valorization of regular behavior or change of RE shape in the whole area of coverness are suggested. This procedure should be used whenever new RE is introduced in praxis.
PLEHATI, Silvio, Young Researcher, splehati@gmail.com
This paper will be presented as poster.
We are nominating this paper for Best Paper Award in the category - Design

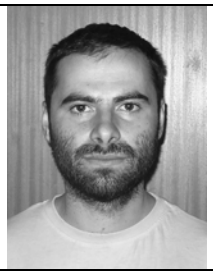
SUPERVISORS/PROJECT LEADER DATA

1. 
2. Vesna KROPAR VANČINA
3. Full Professor (D. tech. Sc., grad. chemical engineer)
4. Head of the Department for Materials in Printing Processes / since November 1st 2002
5. Institution: Faculty of Graphic Arts; University of Zagreb
6. Zagreb, 1947-03-10, Croatia
7. Croatian / Zagreb
8. Paper, Ink, Polymer Materials in Conventional and Digital Printing
9. Reading, Ancient Mythology, Yoga
10. jasnahelenahorvat@gmail.com
11. /
12. ++ 385 1 91 569 5783
13. Vesna Kropar Vančina, B. Magovca 9, 10010 Zagreb, Croatia:
14.Publishing of paper, reviewer of papers and manuscripts
15 Zagreb, 2007-07-05
16. /

AUTHORS DATA (1st author, Scientist**)**

1. 
2. Jana ŽILJAK VUJIĆ
3. PhD (grad. designer)
4. Leader of the Study Programme in Informatics
5. Polytechnic of Zagreb / Department of Informatics and Computing
6. Zagreb, 1972-06-25, Croatia
7. Croatian / Zagreb
8. Graphic Design, Web Page Making, Computing
9. Sport Pilot-Flying
10. janazv@tvz.hr
11. /
12. ++ 385 1 99 2199 429
13. /
14. Publishing of paper, reviewer of papers and manuscripts
15. Zagreb, 2007-07-05
16. /

AUTHORS DATA (2nd author, Young Researcher**)**

1. 
2. Silvio PLEHATI
3. BEng, (Student of Specialist study programme - Polytechnic of Zagreb)
4. Graphic engineer / 2002.
5. FotoSoft Ltd.
6. Virovitica, 1979-01-03, Croatia
7. Croatian / Zagreb
8. Graphic Design, Web Page Making, Computing, 3D graphics
9. Radioamateur, Electronics and Biking.
10. splehati@gmail.com
11. www.plehati.com
12. ++385 98 1990 804
13. Silvio Plehati, Nikole Tesle 92, 43500 Daruvar
14. Publishing of paper
15. Zagreb, 2007-07-05
16. /