

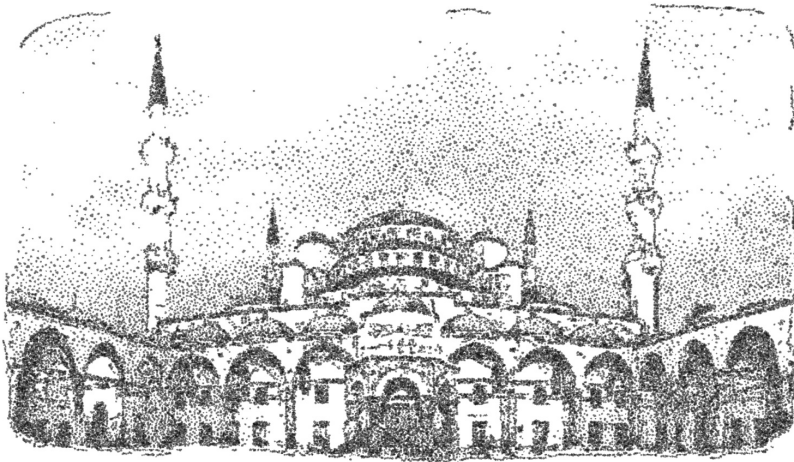
Drawing Characteristics for Reproducing Traditional Hand-Made Stippling

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NPAP 2015
Istanbul, Turkey

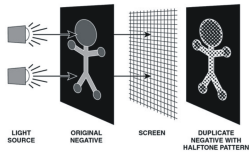
Use of stippling



Reproducing the old technique



Origins



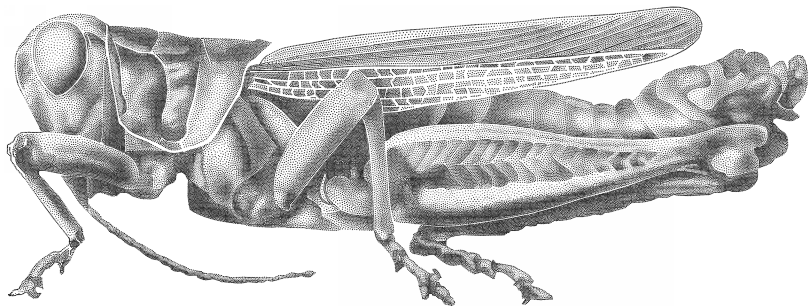
STIPPLING

HALFTONING

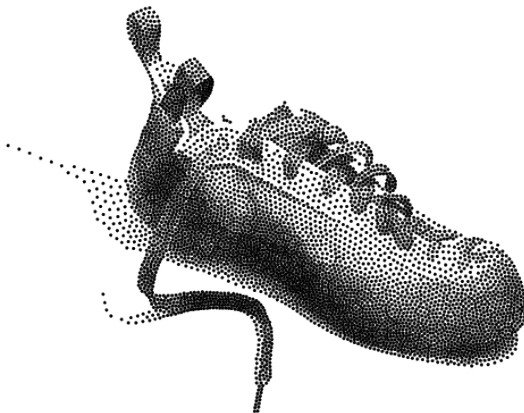
Evolution



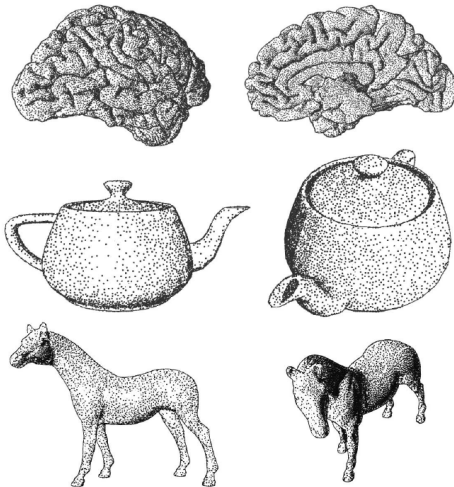
Centroidal Voronoi Diagram [Deussen et al. 2002]



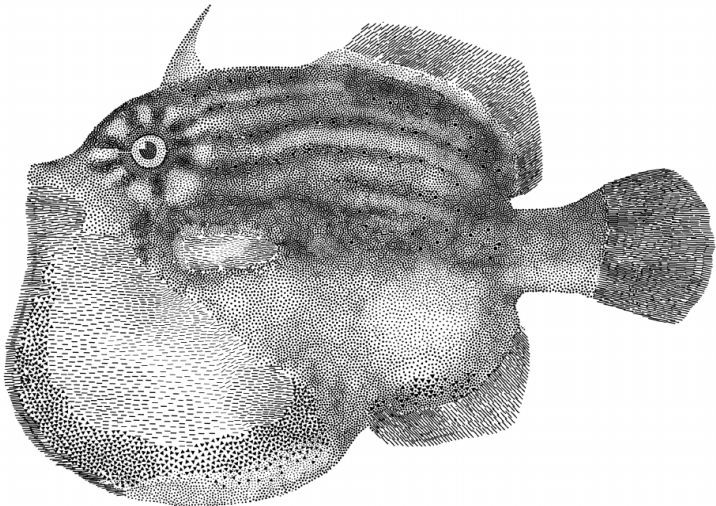
Centroidal Voronoi Diagram [Secord 2002]



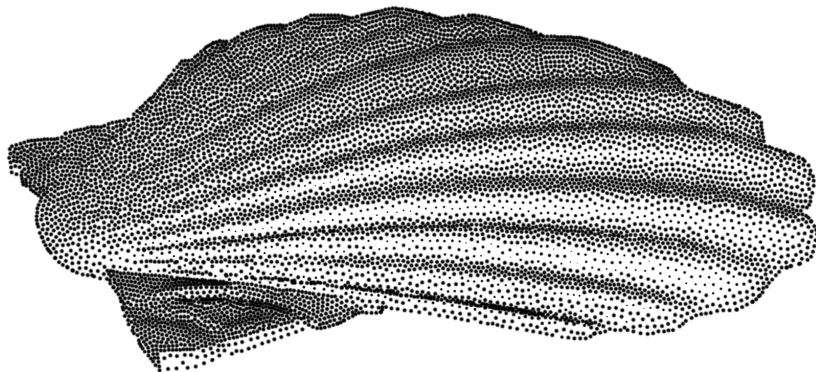
3D/RT/Animation [Meruvia et al. 2003]



Different primitives [Hiller et al. 2003]



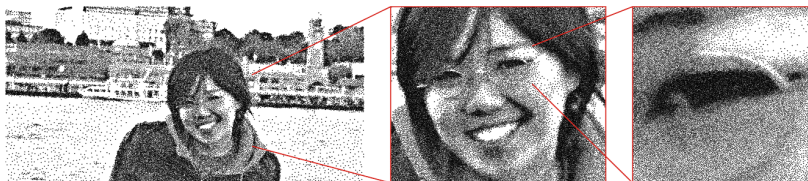
Renderbots [Schlechtweg et al. 2005]



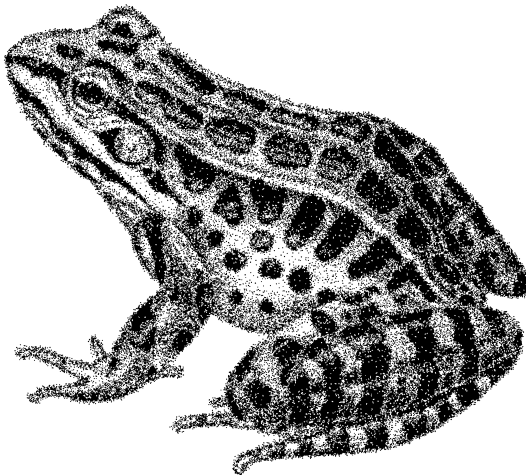
Hedcut [Kim et al. 2006]



Zoom, Wang tiles [Kopf et al. 2006]



Example-based [Kim et al. 2009]



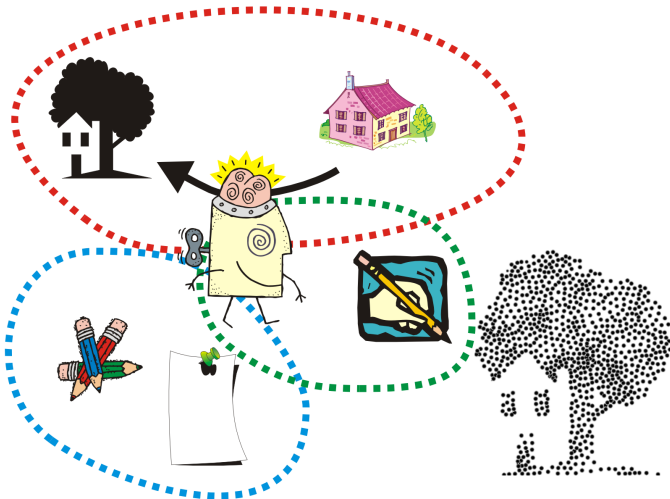
Resolution-dependent [Martín et al. 2010]



Structure-aware [Li and Mould 2011]



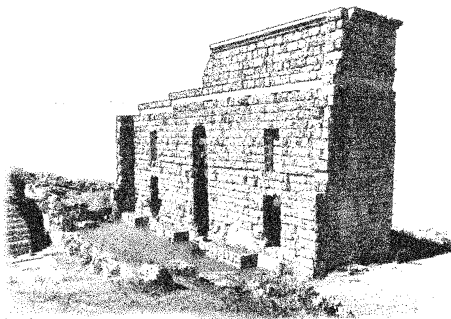
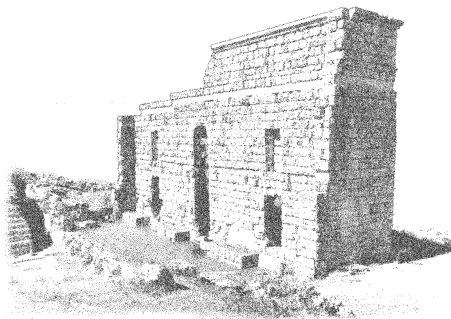
Creative process



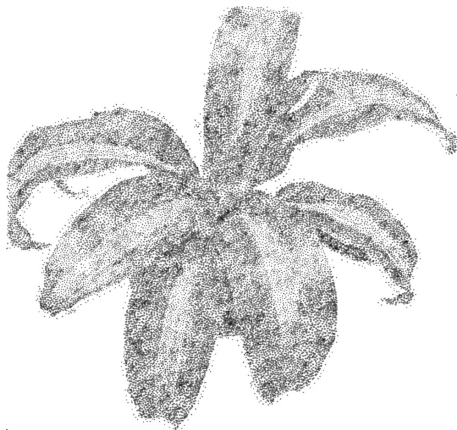
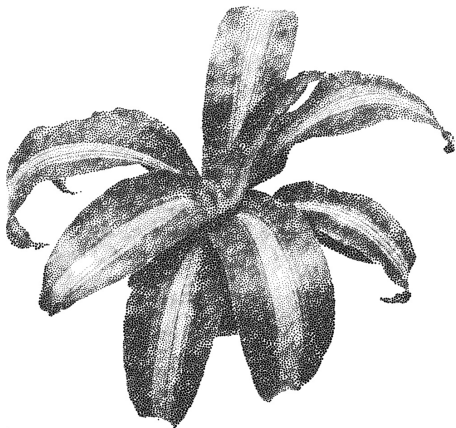
Instrumental task (used concepts)



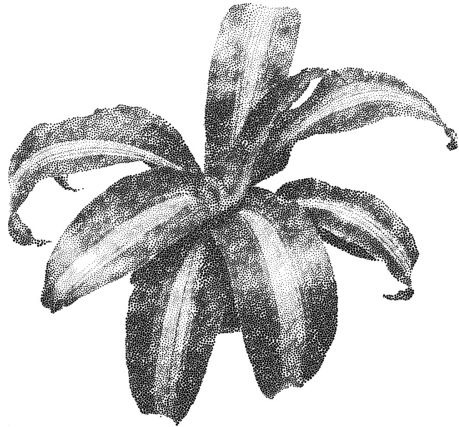
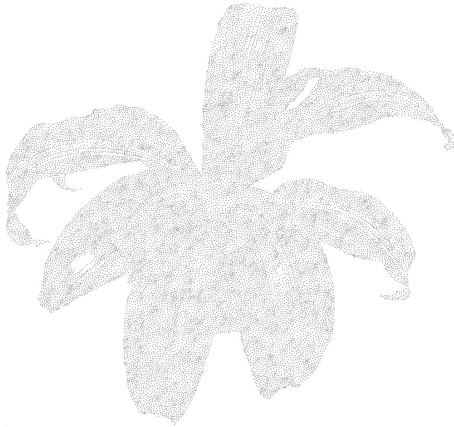
Effects (color)



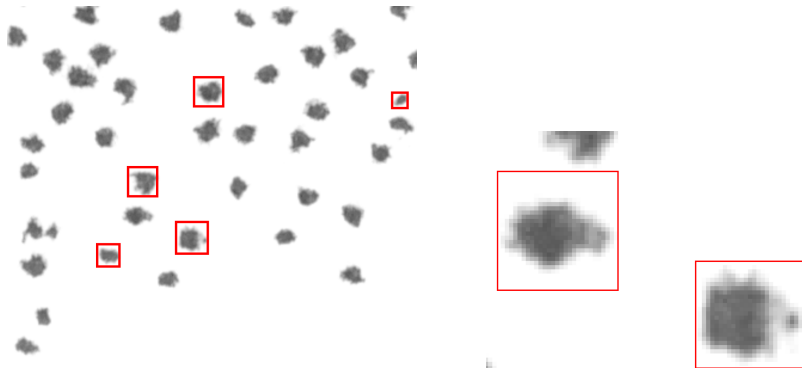
Effects (shape)



Effects (size)

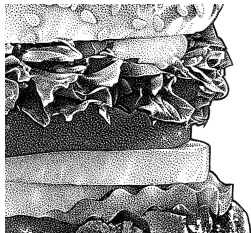
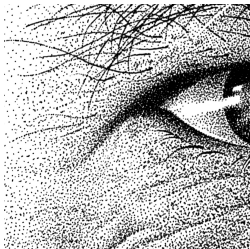
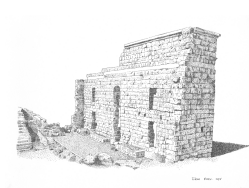
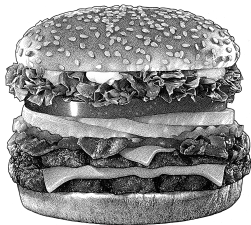
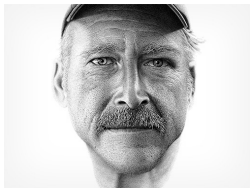


Related (Martín et al. 2010)



Some limitations

Help from artists

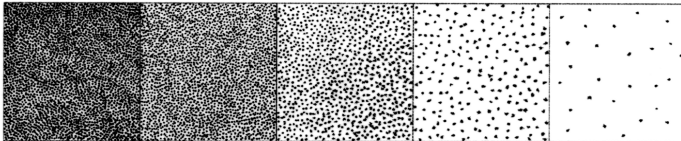


Used pens and papers

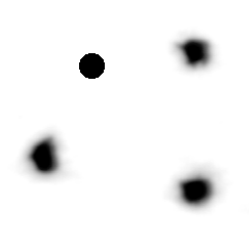
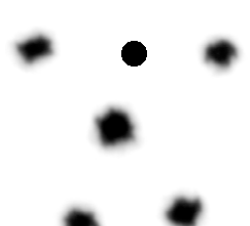
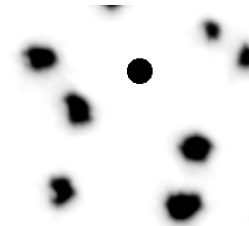
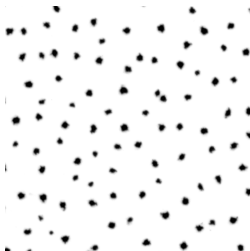
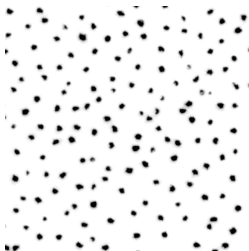
Illustrator	Pen type	Nib size	Paper type
Randy Glass	Rotring Rapidograph	0.13mm	FLAX (Medium press)
Miguel Endara	Sakura Pigma Micron Pen 005	0.20mm	Strathmore 500 Illustration Board (Hot press)
Elena Piñar	Artline Drawing System	0.50mm	Canson Watercolor (Cold press)

Capturing data

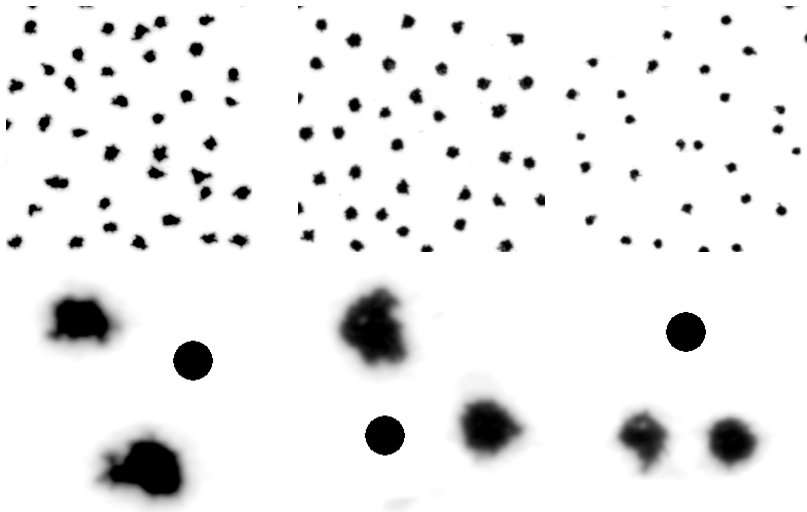
We asked one* fine arts student to draw a ramp with five tones using the three types of pens and three types of papers



Results (0.13mm / 25px)



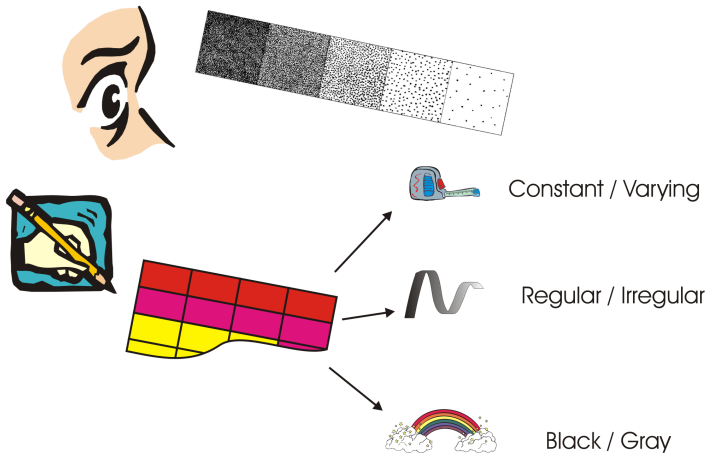
Results (0.20mm / 38px)



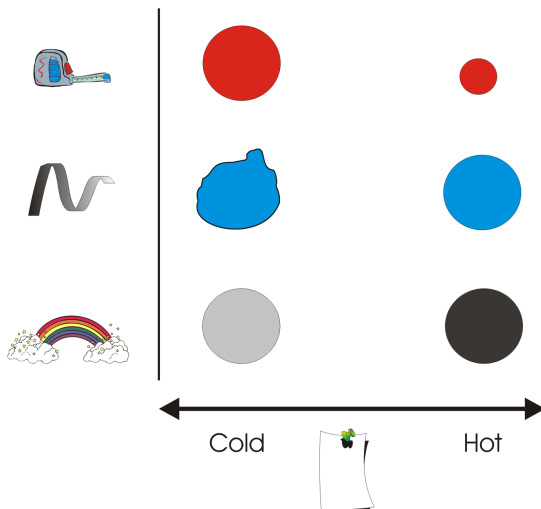
Results (0.50mm / 94px)



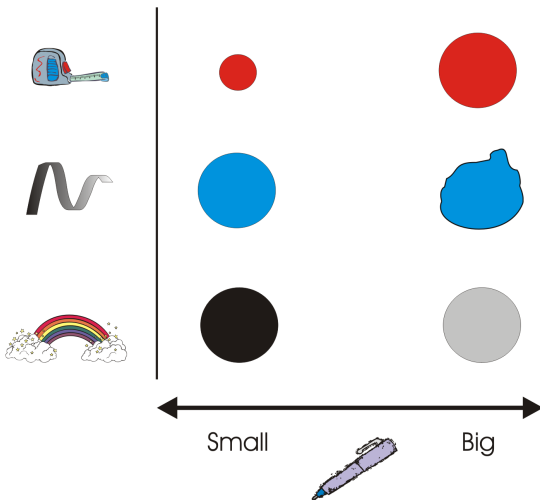
Perceptual study



Perceptual study: hypothesis



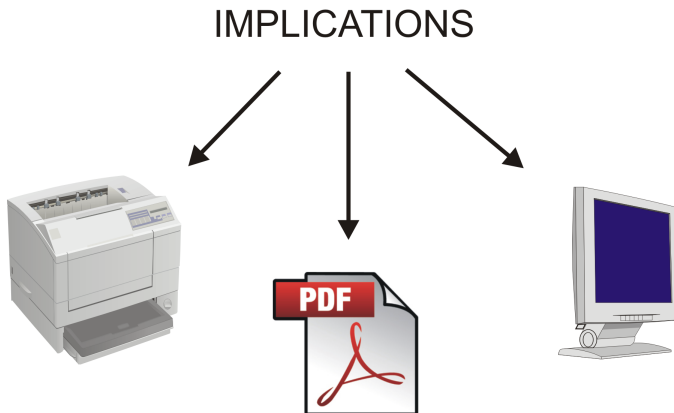
Perceptual study: hypothesis



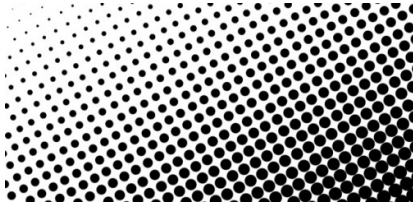
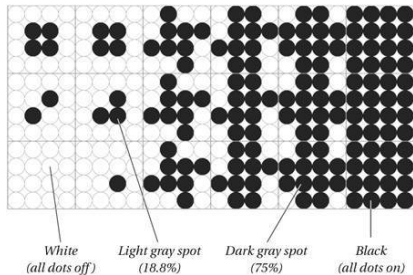
Perceptual study: Not totally conclusive

Feature	Cold press paper		
	0.13	0.2	0.5
Color (black / gray)	73 % / 27 %	82 % / 18 %	100 % / 0 %
Shape (regular / irregular)	55 % / 45 %	36 % / 64 %	27 % / 73 %
Size (constant / varying)	91 % / 9 %	36 % / 64 %	27 % / 73 %
	Medium press paper		
	0.13	0.2	0.5
Color (black / gray)	100 % / 0 %	91 % / 9 %	100 % / 0 %
Shape (regular / irregular)	36 % / 64 %	45 % / 55 %	45 % / 55 %
Size (constant / varying)	55 % / 45 %	45 % / 55 %	55 % / 45 %
	Hot press paper		
	0.13	0.2	0.5
Color (black / gray)	55 % / 45 %	55 % / 45 %	82 % / 18 %
Shape (regular / irregular)	64 % / 36 %	9 % / 91 %	0 % / 100 %
Size (constant / varying)	64 % / 36 %	27 % / 73 %	9 % / 91 %

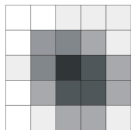
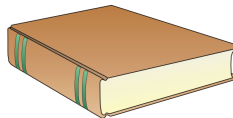
Implications



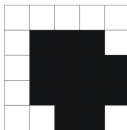
Printing



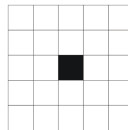
Printing



High fidelity
 $\geq 2400\text{ppi}$

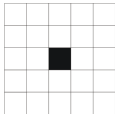
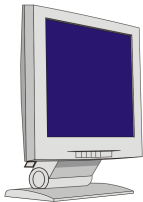


Medium fidelity
 $\geq 1200\text{ppi}$

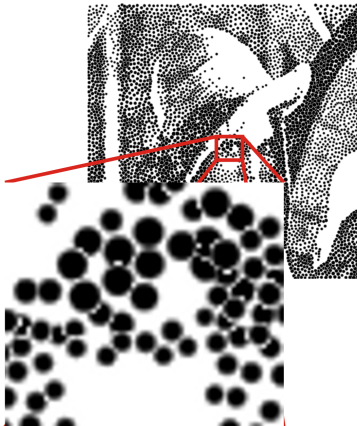


Low fidelity
 $\geq 300\text{ppi}$

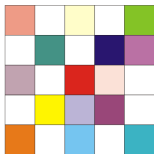
Displaying



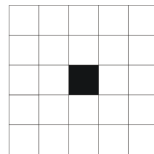
Low fidelity
 $\geq 300\text{ppi}$



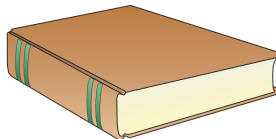
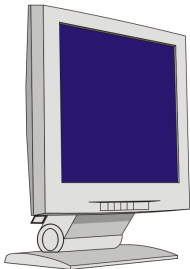
PDF



OK
 $\geq 300\text{ppi}$



Low fidelity
 $\geq 300\text{ppi}$



Conclusions from results

Are these conclusions important?

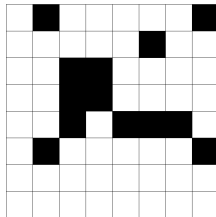
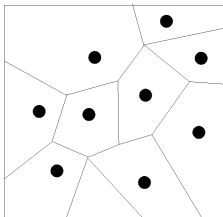
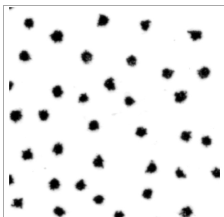
- ▶ More than 20 papers on stippling
- ▶ Almost no distinction between different kinds of stippling
- ▶ In some cases related to halftoning

But color, shape and size matters!

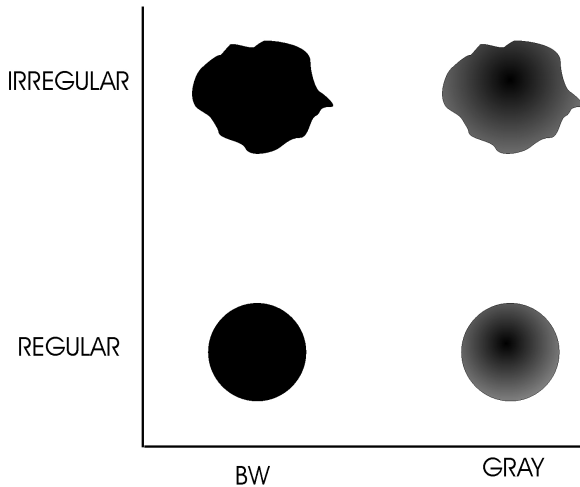
Taxonomy: Criterias

- ▶ Stipple distribution quality
- ▶ Stipple dot quality
- ▶ Stippling reproduction size

Taxonomy: Stipple distribution quality

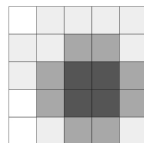
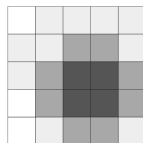
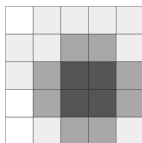


Taxonomy: Stipple dot quality

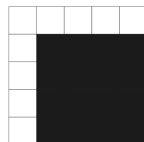
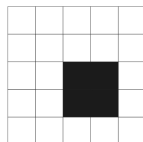
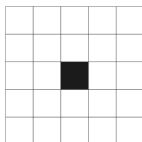


Taxonomy: Stipple reproduction size

High fidelity



Low fidelity



Small

Medium

Large

Image size

Conclusions

- ▶ There are several kinds of stippling
- ▶ They must not be mixed without care
- ▶ This is related to reproduction
- ▶ We propose a taxonomy
 - ▶ More clear classification criterias
 - ▶ It will make easier the comparisons

