CMOS Image Sensor with Pseudorandom Pixel Placement For Jaggy Reduction in Line Representation

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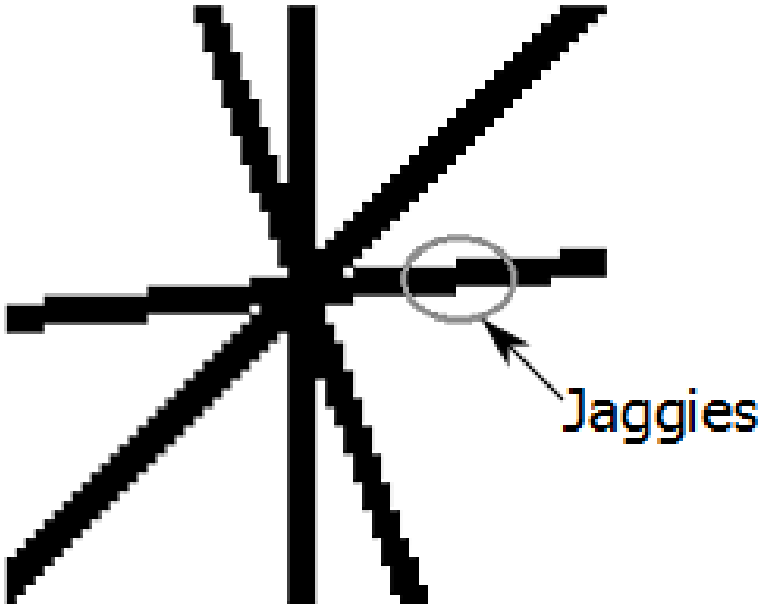
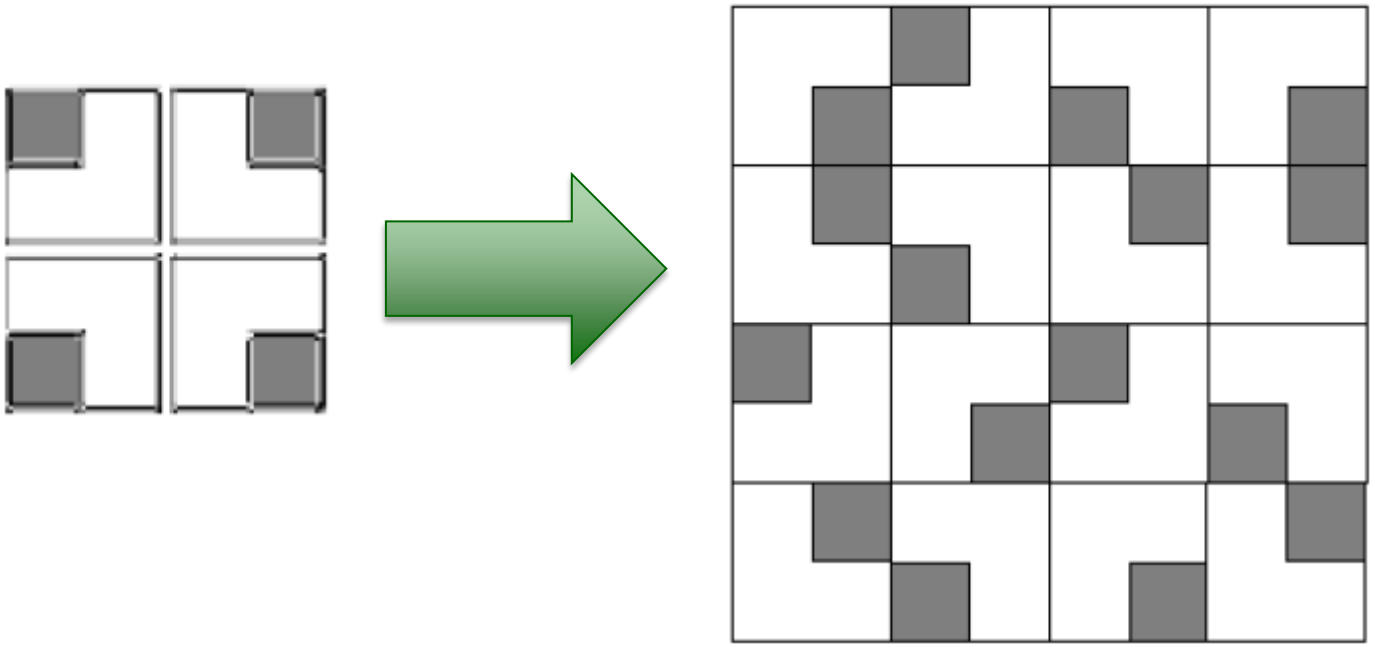
Motivation

- ☑Jaggy at edge
  - ☑Hard to eliminate the “perceived” jaggy
  - ☑High Vernier accuracy for step
  - ☑Insufficient by high resolution



Pseudorandom Pixel Placement

- ☑Method for generating “Random” placement of Photo Receptor (active area)
  - ☑Array placement of 4 type pixels

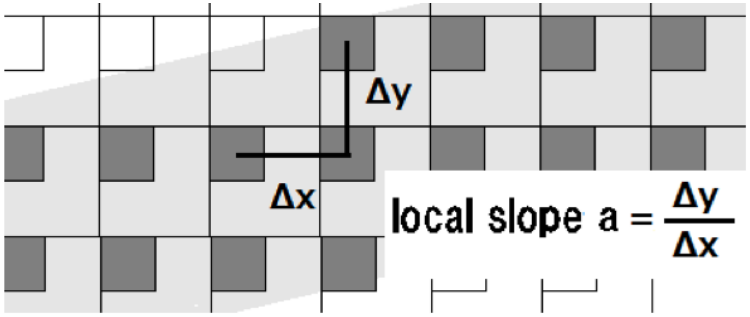


Line Representation & Local Slope

By Lattice Placement

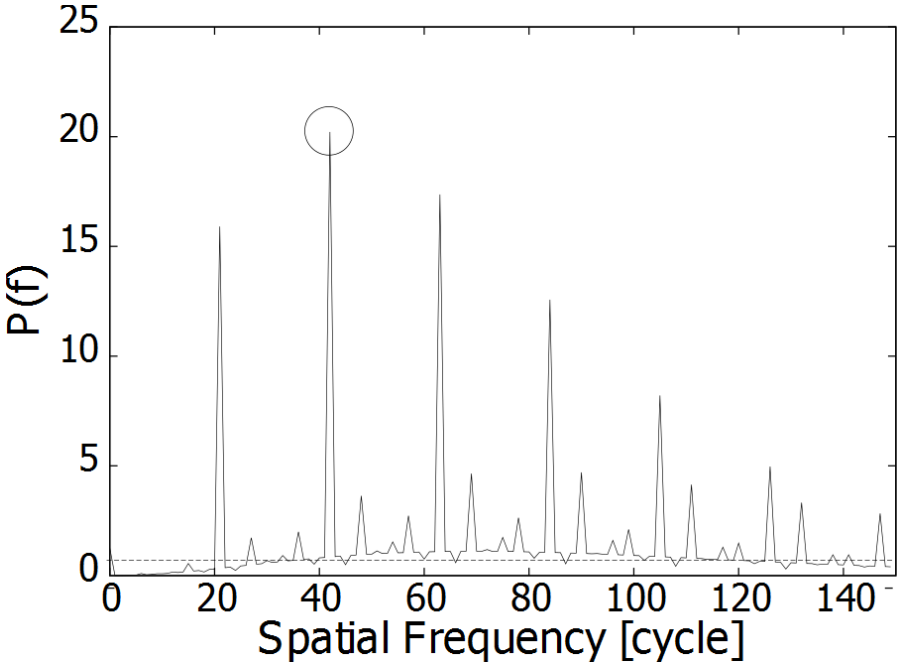
(small scatter steps)

By Pseudorandom Placement

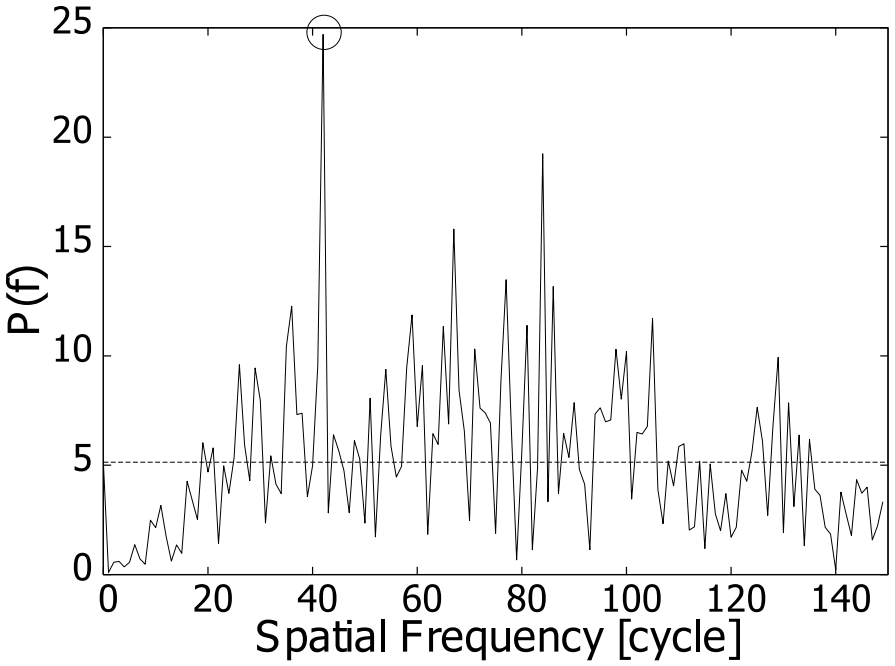


Jaggy
= (Long) Periodical Step
= (Long) Periodical non-zero local slope

Spectrum of Local Slope



Lattice Placement



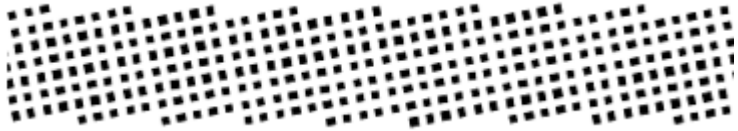
Pseudorandom Placement

Standing Spectrum Factor = Jaggy

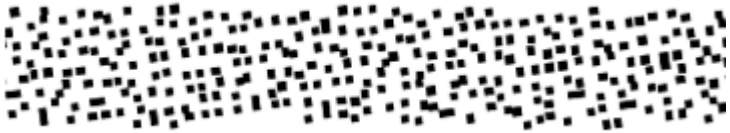
Jaggy Appearance Index: Top/Other

- ☑Top/Other
  = (Strongest Factor) / (Avg. of Other Factors)
  - ☑How strong factor stands in spatial spectrum
  - ☑Large Top/Other = Strongly Perceived Jaggy
  - ☑Small Top/Other = Weakly Perceived Jaggy

Top/Other and Jaggy



Top/Other = 23.4



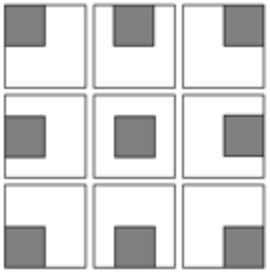
Top/Other = 6.6

Top/Other = 2.7

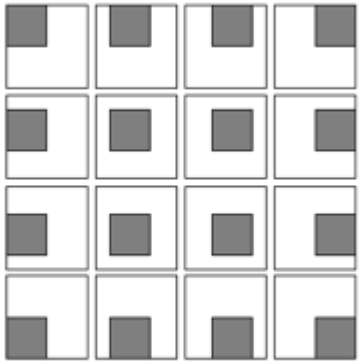
Numer of Pixel Types

☑#Pixels for Pseudorandom Generation

4 Types

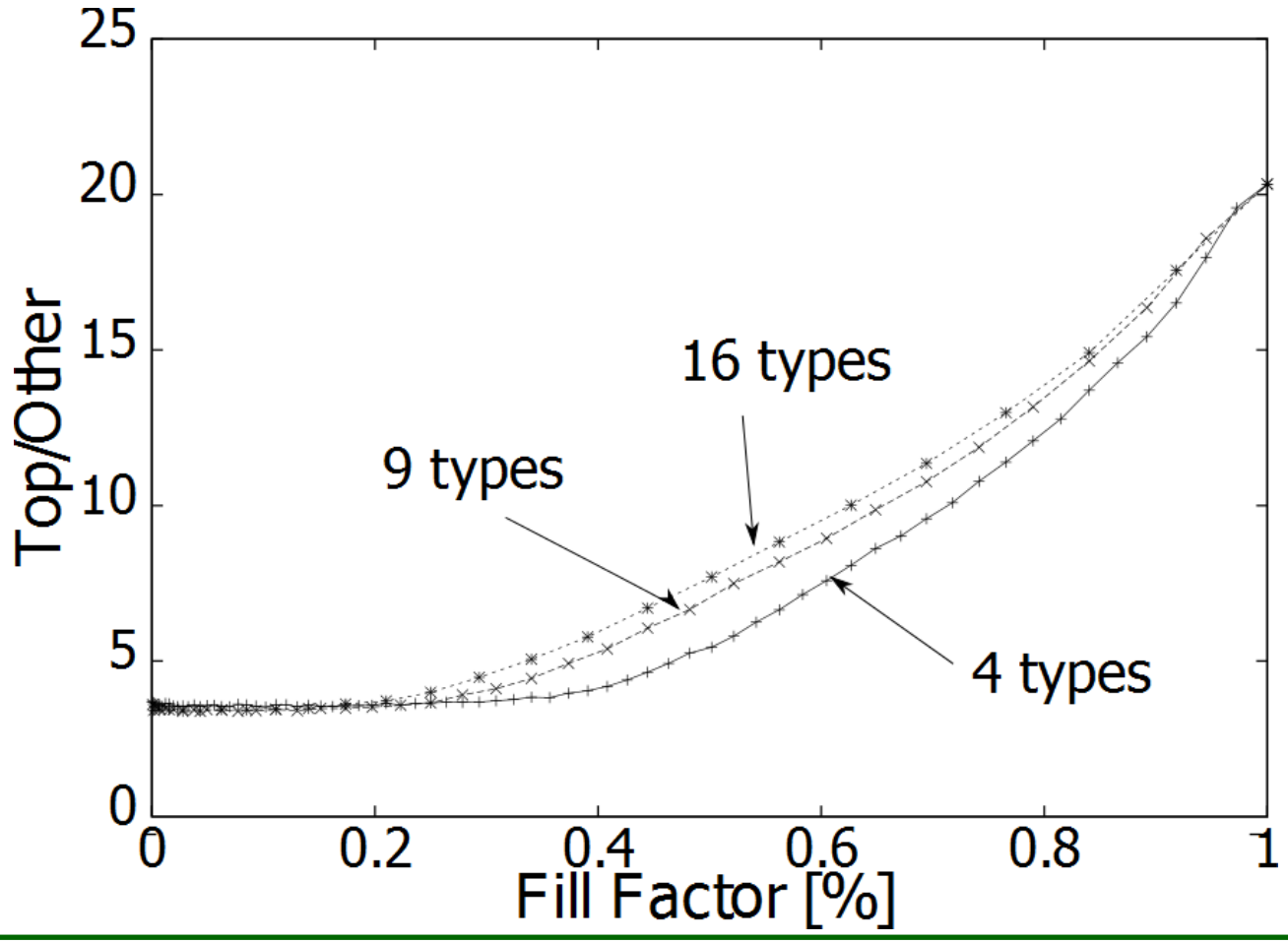


9 Types



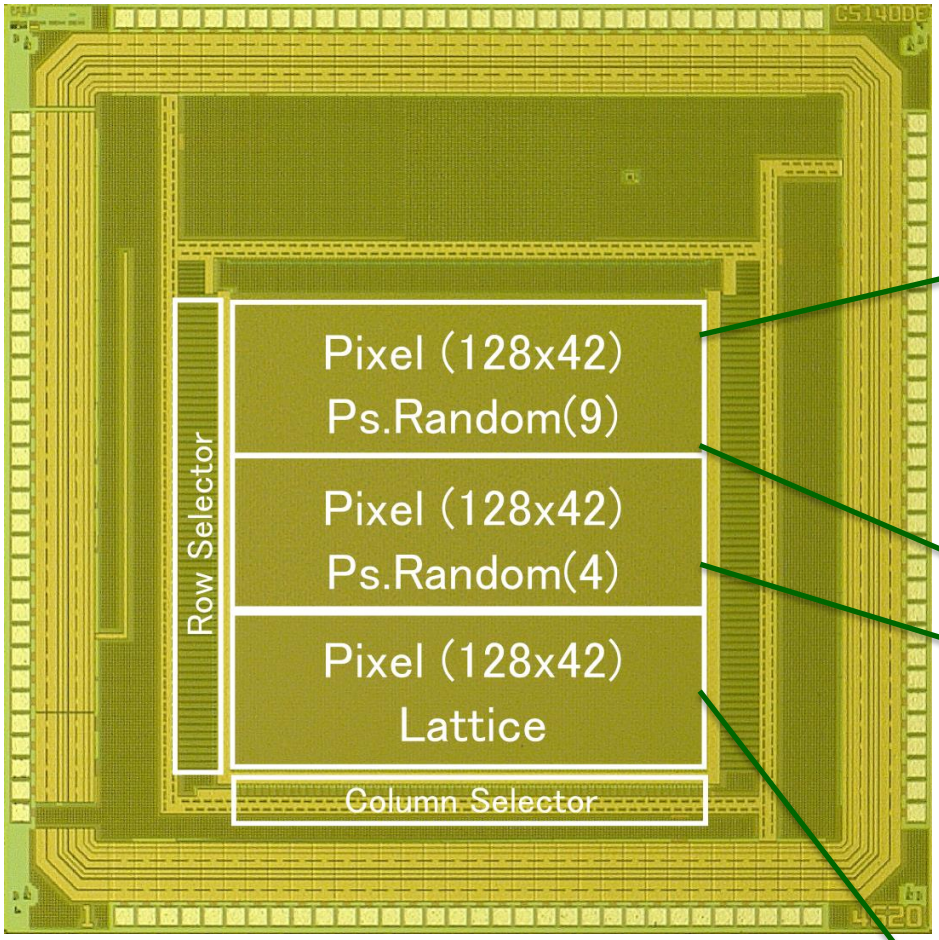
16 Types

Top/Other / Pixel Types / Fill Factor

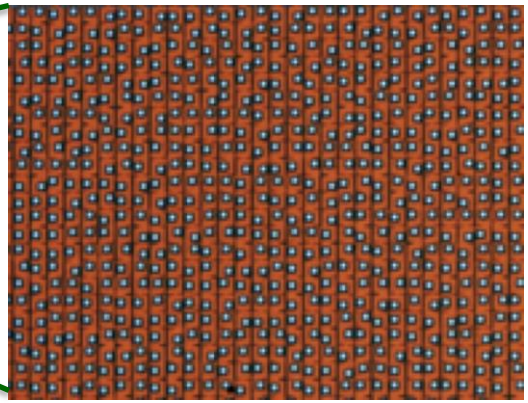


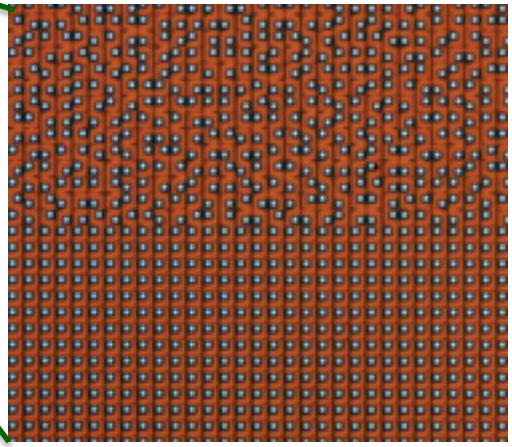
Best Top/Other in “4 types”, for Fill Factor > 0.25

CMOS Image Sensor Design



- ☑ CMOS 0.18[um]
- ☑ #Pixels: 128 x 128
- ☑ Fill Factor: 25%
- ☑ #Pixel Types; 1, 4, 9





Conclusion

- ☑Pseudorandom Pixel Placement for Jaggy Elimination
- ☑Index for Perceived Jaggy, Top/Other
  - ☑Small Top/Other in 4 Types of Pixels
- ☑CMOS Image Sensor with Pseudorandom Pixel Placement