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How much difference in the area of an object does the bug make? For simplicity, consider the case of a square object  $n$  grid points on a side. The area of this object should be  $A = n^2$ . However, if the grid points are counted the wrong way, an extra top row and an extra right-hand column of grid squares will be counted, and so the area will be calculated as  $A' = (n + 1)^2$ . The fractional difference is

$$\begin{aligned}\frac{A' - A}{A} &= \frac{(n + 1)^2 - n^2}{n^2} \\ &= \frac{2n + 1}{n^2} \\ &= \frac{2}{n} + \frac{1}{n^2} \\ &\approx \frac{2}{n} \quad \text{if } n \text{ is large} \\ &= \frac{2}{\sqrt{A}}\end{aligned}$$

So the fractional difference scales roughly as  $A^{-1/2}$ . The larger the object, the smaller the relative effect.

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Finally, note that since the bug essentially changes which grid squares in an object are “turned on,” it will have effects on some other derived parameters and attributes downstream from the area computation. Examples are intersection areas and percentile intensity values.