Assignment 3

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November 17, 2015

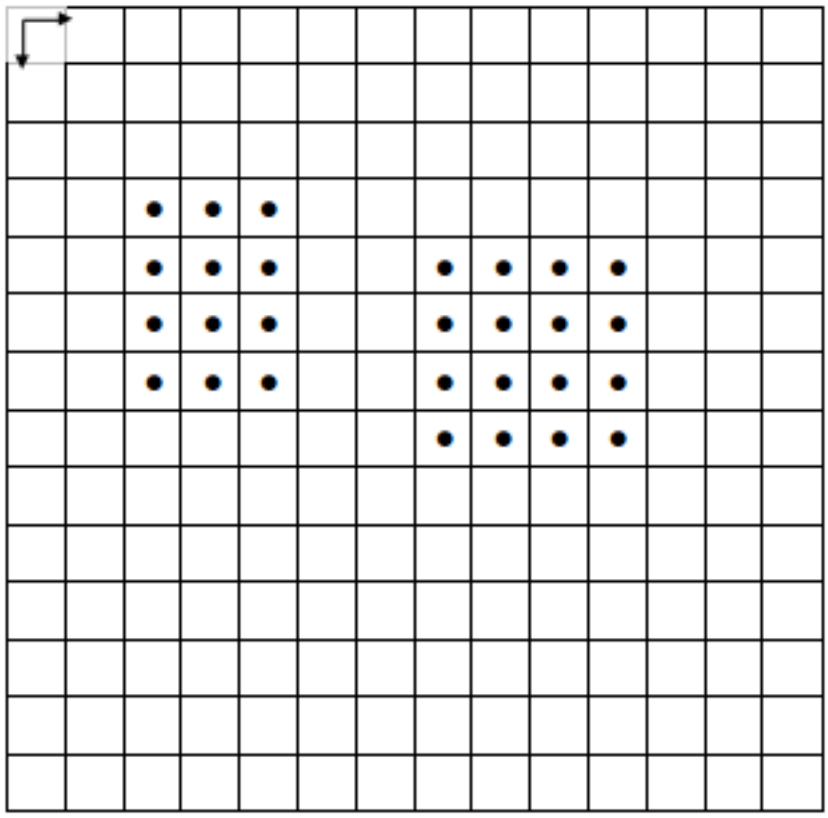
1 Questions

Question 1. Using the definition of dilation:

$$\begin{aligned} A \oplus B &= \bigcup_{b \in B} A_b \\ &= \bigcup_{b \in B} \{c | c = a + b, \forall a \in A\} \\ &= \{c | c = a + b, \forall a \in A, \forall b \in B\} \\ &= \bigcup_{a \in A} \{c | c = a + b, \forall b \in B\} \\ &= B \oplus A \end{aligned}$$

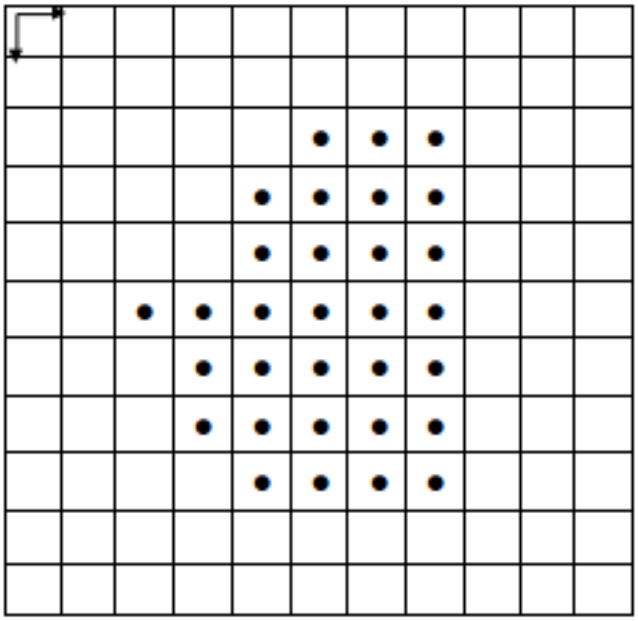
Question 2. Opening:

$A \circ B$

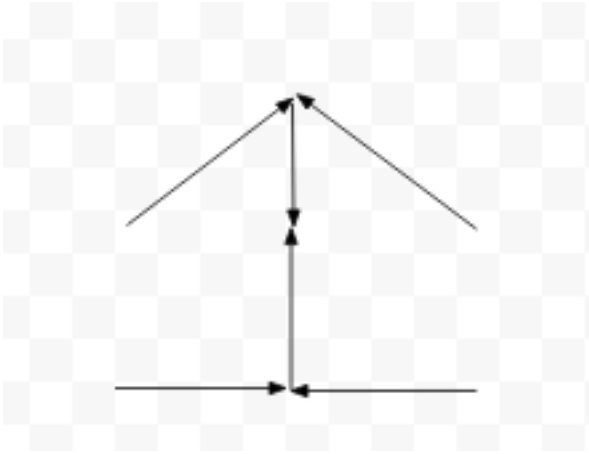


Closing:

$C \bullet B$



Question 3. Part (a):



Part (b):

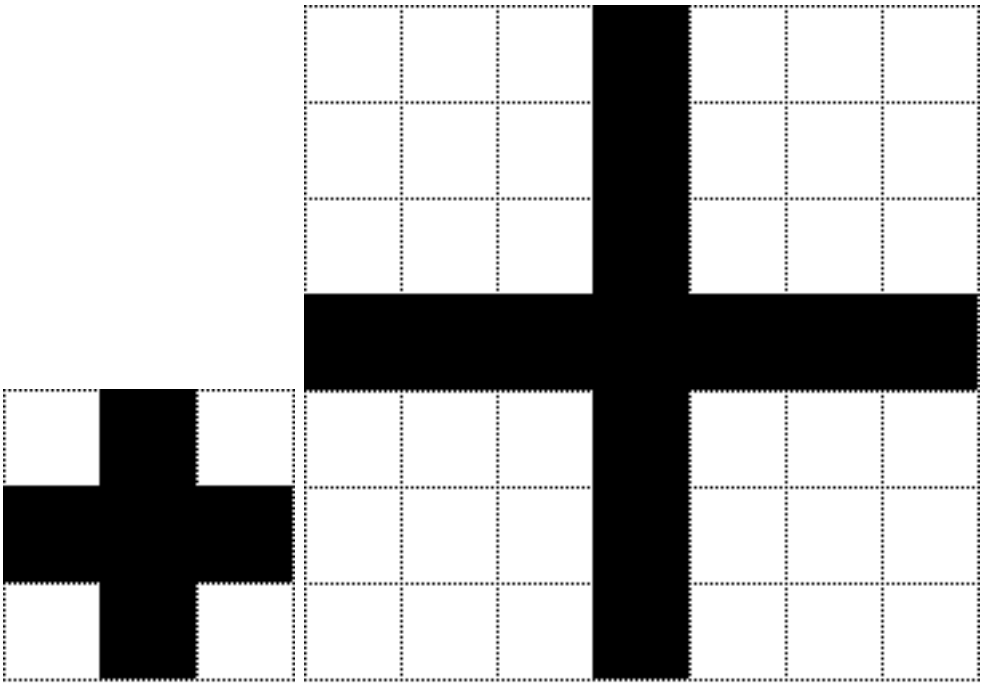
$$[e+ \sim f]+ \sim d + [a \times b]$$

$$[e * f] - [\sim e* \sim f]$$

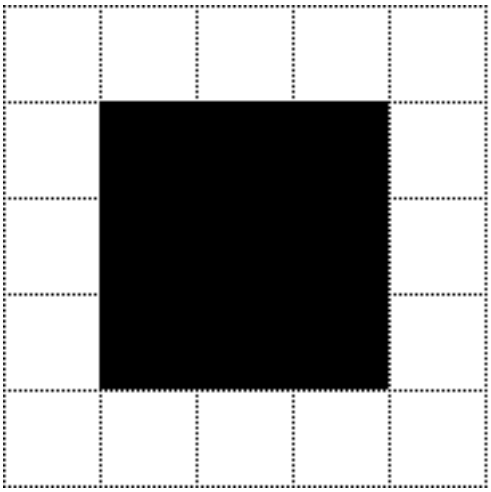
2 Morphology

The pigs in this image are bright relative to everthing else in this image. Taking that into account along with that there's a lot of grainy noise and some text overlayed on the image, we'll probably need to do some cleaning up. The segmented image using Otsu's method looks like this:

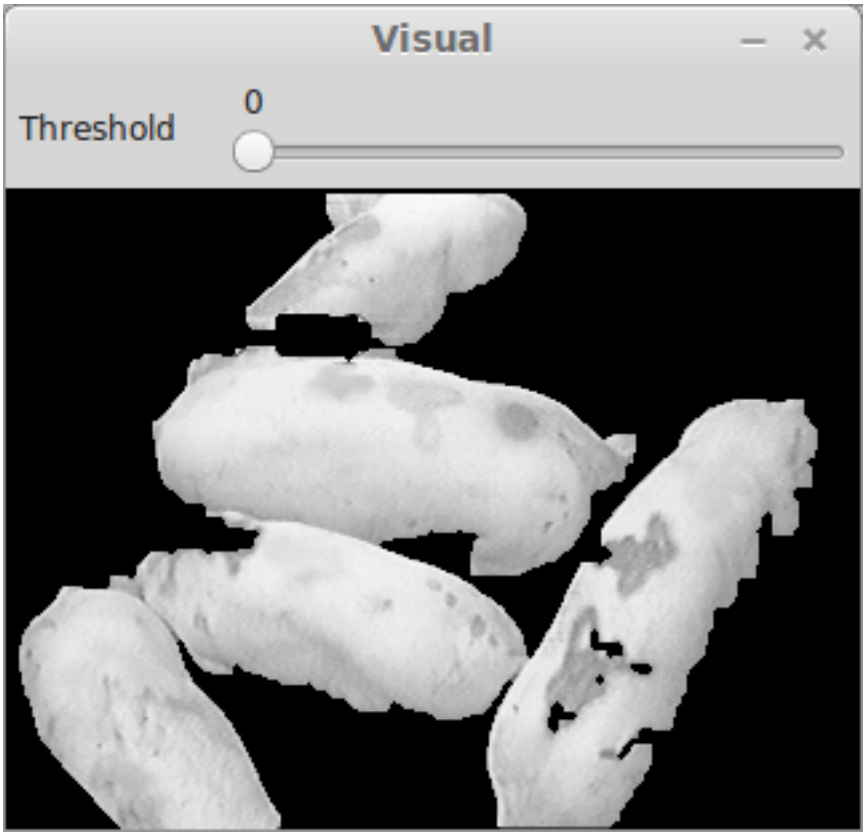
As we might suspect, there's still too much noise to see what's going on. We can clean the bits of salt up by opening the image. I used a small cross and then a bigger cross to clear any leftovers the first one didn't get.



And then to deal with the pepper noise, I found closing the image with a square helped better after using the cross shape.



I then filtered out the original image using the morphed binary image as a mask to generate a nice view of just the pigs:



3 References

1. OpenCV 3.0 Documentation — http://docs.opencv.org/3.0.0/