

## Sample out for Assignment Part 2 (Image Editor)

Input image:



Averaging output:



**Edge detection:** For edge detection, there are two possible ways to handle the boundary conditions (for  $i=0$ ,  $i=H-1$ ,  $j=0$ ,  $j=W-1$ ), as already discussed in class:

1. Wrapping: The first values are used to pad the end and the end values are used to pad the beginning, i.e.,
  - $\text{image}[H, j] = \text{image}[0, j]$
  - $\text{image}[-1, j] = \text{image}[H-1, j]$
  - $\text{image}[i, W] = \text{image}[i, 0]$
  - $\text{image}[i, -1] = \text{image}[i, W-1]$

Edge detection is then performed on the padded image.




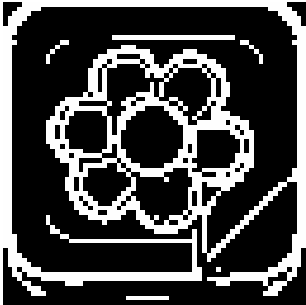
2. Zero-padding: Pad the edges with zeroes, i.e.,
  - $\text{image}[H, j] = 0$
  - $\text{image}[-1, j] = 0$
  - $\text{image}[i, W] = 0$
  - $\text{image}[i, -1] = 0$

Perform edge detection on the padded image.

The gradient values obtained may not lie in the range (0, 255). This can be handled in two ways:

1. Normalization: Scale all the gradient values to the range (0, 255).
2. Thresholding: Decide a threshold, and set all values above the threshold to 255, and all values below the threshold to 0.

Edge detection output:

<p>Wrapping + Normalization</p> 	<p>Wrapping + Thresholding</p> 
<p>Zero padding + Normalization</p> 	<p>Zero padding + Thresholding</p> 

**Path of least energy:**

Sample output for gradient image obtained with wrapping + normalization:

