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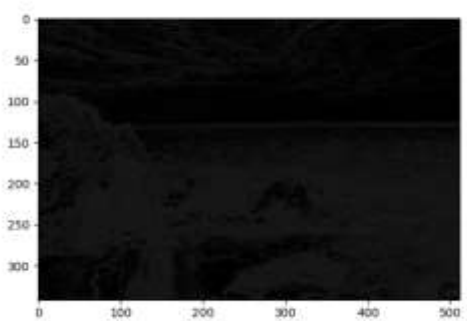
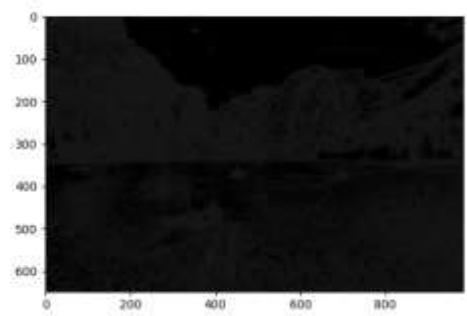
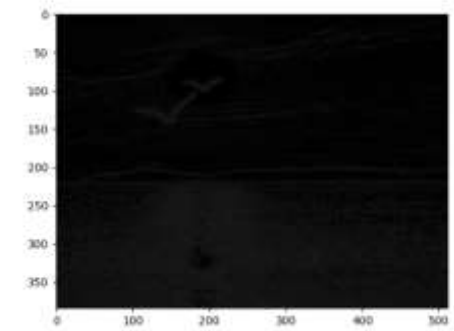
## **Assignment 3**

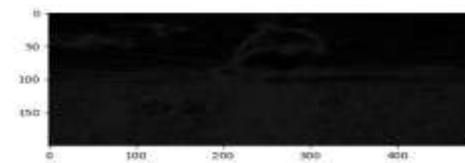
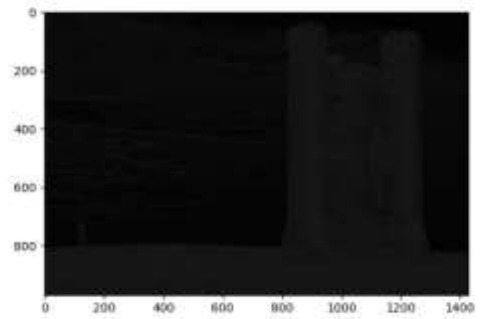
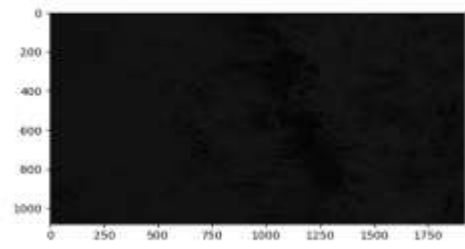
**Seam Carving:** It is a method of re-sizing an image in a sense of context aware. It is basically used to preserve the details of an image when the image is either enlarged or shortened. The main idea behind re-sizing is to find the minimum seam energy going from top to bottom (vertical seam) or from left to right (horizontal seam). The energy of all pixels is calculated with the help of gradient function. For finding minimum energy, dynamic programming is used. We are calculating the minimum energy of row  $i$  pixels once we know the minimum energies of all the pixels upto rows  $i-1$ .

$M[i,j] = \min(M[i-1,j-1], M[i-1,j], M[i-1,j+1])$  except for the boundary cases.

Where  $M[i,j]$  represents the minimum energy pixel from top to bottom upto row  $i$  and column  $j$ .

**Energy function of some of the images:**





**Seam Insertion:** Once we have found the minimum energy seam either top to bottom (vertical seam) or left to right (horizontal seam). We take that seam and remove that seam from the given image to reduce the size of the image. For

column removal, we just calculate the seam of the minimum energy from top to bottom and remove the particular seam from the image. For removal of row seam, instead of repeating the same procedure, we rotated the given image by 90 degree and performed the column removal and again rotate the image by -90 degree to get back the original image.

**Following are the images after removing the desired number of columns:**

1. After removing 50 columns of minimum energy, we get the desired image.



2. After removing 100 columns of minimum energy, we get the desired image.



3. After removing 30 columns of minimum energy, we get the desired image.





**Seam Insertion:** For scaling up the image, we take a reference image same as the given image and then remove seams same where the number of seams removal is same as the number of seams we want to insert. Then, we store the seams index of the removed seams. Now, while insertion of seams, we take the removed seams index and add the seams at the desired location by taking the neighbors of the seams index.

**Following are the images after adding the desired number of columns:**

1. After adding 50 columns of minimum energy, we get the desired image.







2. After adding 30 columns of minimum energy, we get the desired image.



3. After adding 50 columns of minimum energy, we get the desired image.





**Following are the images after adding the desired number of rows:**

1. After adding 30 rows of minimum energy, we get the desired image.







2. After adding 30 rows of minimum energy, we get the desired image.



3. After adding 30 rows of minimum energy, we get the desired image.



