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Batch: D

Branch: IT

In [1]:

```
import numpy as np
import matplotlib.pyplot as plt
import cv2
```

In [2]:

```
class MorphologicalImageProcessing():
  def __init__(self):
    print("Morphological Image Processing")
    self.mask = np.array([1,1])
  def erosion(self,image):
    print("Erosion")
    self.x,self.y = image.shape
    res = np.copy(image)
    for i in range(self.x-1):
      for j in range(self.y):
        curr = image[i:i+2,j]
        val = np.sum(np.multiply(curr,self.mask))
        if val==2:
          res[i][j] = 1
        else:
          res[i][j] = 0
    return res

  def dilation(self,image):
    print("Dilation")
    self.x,self.y = image.shape
    res = np.copy(image)
    for i in range(self.x-1):
      for j in range(self.y):
        curr = image[i:i+2,j]
        val = np.sum(np.multiply(curr,self.mask))
        if val>=1:
          res[i][j] = 1
        else:
          res[i][j] = 0
    return res

  def opening(self,image):
    print("Opening")
    return self.dilation(self.erosion(image))

  def closing(self,image):
    print("Closing")
    return self.erosion(self.dilation(image))

def plotImage(image,i,title):
  plt.subplot(2,3,i),plt.imshow(image,'gray')
  plt.title(title)

def MIP(image,output_filename):
  titles = ["Original","Erosion","Dilation","Opening","Closing"]
  i = 1
  plotImage(image,i,titles[i-1])
  i+=1
```

```
  mip = MorphologicalImageProcessing()
  print()
  er = mip.erosion(image)
  plotImage(er,i,titles[i-1])
  i+=1
  print()
  di = mip.dilation(image)
  plotImage(di,i,titles[i-1])
  i+=1
  print()
  op = mip.opening(image)
  plotImage(op,i,titles[i-1])
  i+=1
  print()
  cl = mip.closing(image)
  plotImage(cl,i,titles[i-1])
  print()
  plt.tight_layout()
  plt.savefig(output_filename)
  plt.show()

def convertImageToBinary(im):
  (thresh, im_bin) = cv2.threshold(im, 128, 255, cv2.THRESH_BINARY | cv2.
THRESH_OTSU)
  image = np.copy(im_bin)
  for i in range(image.shape[0]):
    for j in range(image.shape[1]):
      if image[i][j] == 255:
        image[i][j] = 1
  return image
```

In [3]:

```
image = np.array([[0,0,0,0,0,0,0,0,0,0],
  [0,0,0,0,0,0,0,0,0,0],
  [1,1,1,1,0,1,1,0,1,1],
  [1,1,0,1,0,1,1,0,0,1],
  [1,1,1,0,1,1,1,0,1,1],
  [1,1,1,1,0,1,1,1,1,1],
  [1,1,0,1,0,1,1,1,1,1],
  [0,0,0,0,0,0,0,0,0,0],
  [0,0,0,0,0,0,0,0,0,0],
  [0,0,0,0,0,0,0,0,0,0]])
MIP(image,'result1.png')
```

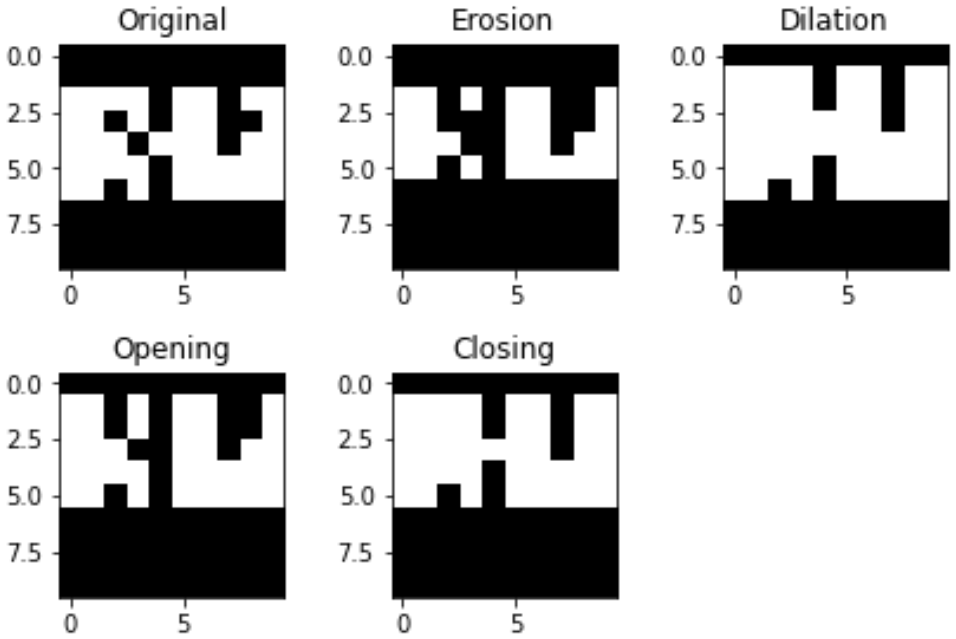
```
Morphological Image Processing

Erosion

Dilation

Opening
Erosion
Dilation

Closing
Dilation
Erosion
```



In [4]:

```
img_path = '/content/drive/MyDrive/Sem-7/DIP-Lab/Morphology/DIP_MorphoImg1_Krish.jpg'
```

In [5]:

```
im = cv2.imread(img_path,0)
im = cv2.resize(im, (0,0), fx=0.2, fy=0.2)
image = convertImageToBinary(im)
MIP(image,'result2.png')
```

```
Morphological Image Processing

Erosion

Dilation

Opening
Erosion
Dilation

Closing
Dilation
Erosion
```