Assignment-8
Morphological Operations

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August 2022

1 Introduction

In this assignment, we will perform morphological operations which is generally performed on binary image. It will require a binary image and a structuring element to perform an operation. Then we will discuss the respective outputs for different structuring elements.

2 Operations

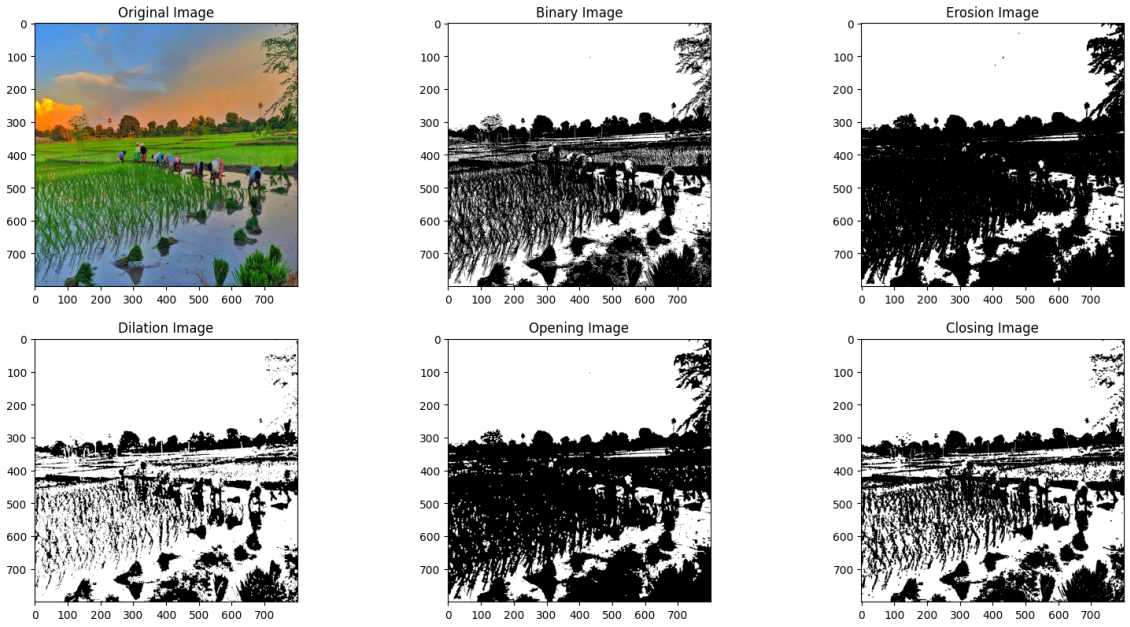
Here, we will perform four operations : *Erosion, Dilation, Opening, Closing.* We will use built-in OpenCV functions for performing these operations.

2.1 Structuring Elements

We used three structuring elements and performed those four operations mentioned earlier for each structuring element.

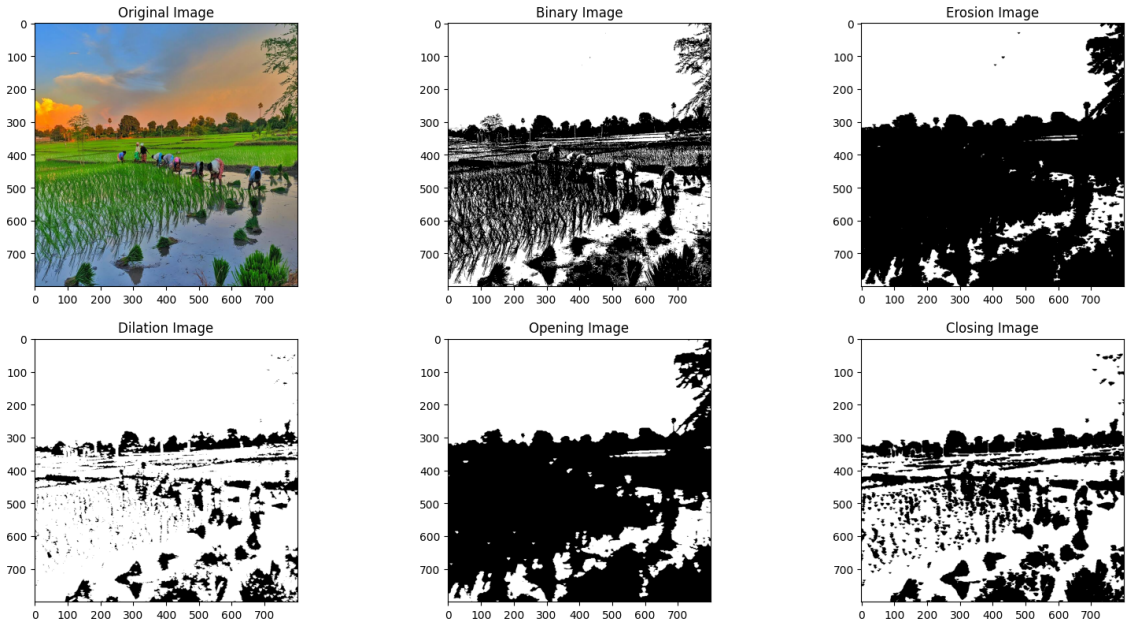
2.1.1 Structuring Elements 1

Here, we are using a 3*3 matrix which is :
[1 1 1]
[1 1 1]
[1 1 1]
The outcomes of four operations are :



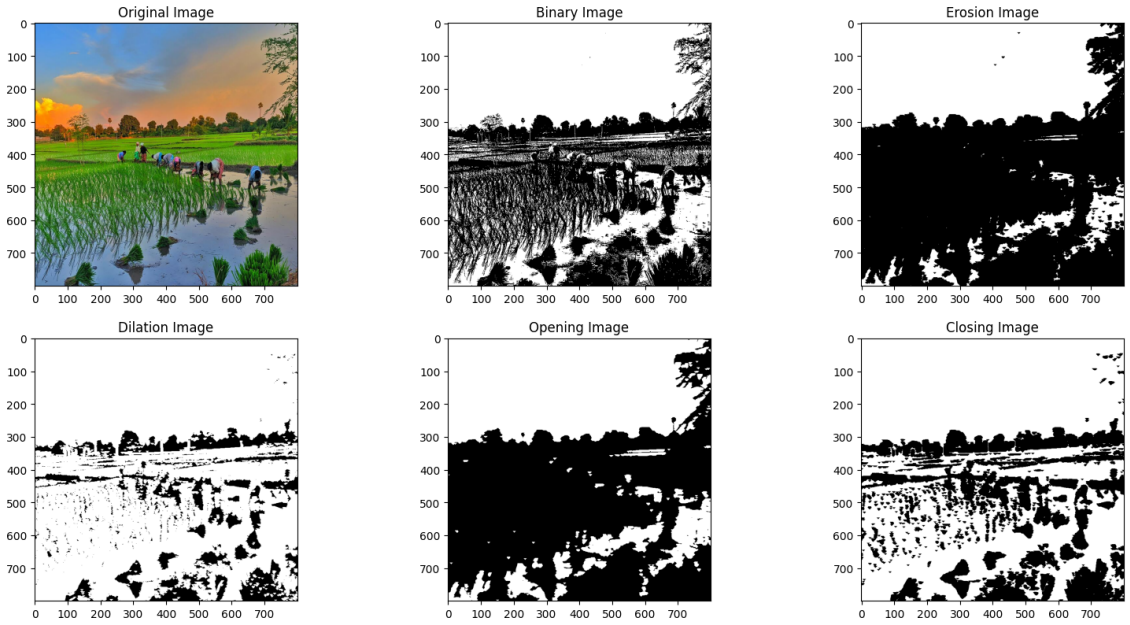
2.1.2 Structuring Element 2

Here, we are using a 6*6 matrix which is :
[0 0 1 1 0 0]
[0 0 1 1 0 0]
[1 1 1 1 1 1]
[1 1 1 1 1 1]
[0 0 1 1 0 0]
[0 0 1 1 0 0]
The outcomes of four operations are :



2.1.3 Structuring Element 3

Here, we are using a 5*9 matrix which is :
[0 0 0 0 1 0 0 0 0]
[0 0 0 1 1 1 0 0 0]
[0 0 1 1 1 1 1 0 0]
[0 1 1 1 1 1 1 1 0]
[1 1 1 1 1 1 1 1 1]
The outcomes of four operations are :



3 Discussion

In section 2.1.1, we can see that for **Erosion** the white region of the image has decreased as we know that erosion removes pixel in boundary line. Hence, the small details are removed from the picture.
For **Dilation**, the white region of the image has increased as it extends the boundary line pixels.
In **Opening**, we use Erosion first and then Dilation. As a result , we can see it is similar to the output of Erosion as the increased darker region cannot be change much after dilation.
In **Closing**, we use Dilation first and Erosion . As a result , we can see it is similar to the output of Dilation as the dark region is reduced after Dilation But it will be more than only Dilation operation.
In section 2.1.2, The outcomes are much smoother for structuring element 2. Hence, it changed a larger amount of boundary line pixels.
In section 2.1.3, The outcomes are smoothest among those three structuring elements. Hence, the dark region is more dark and the white region is more white for respective operations.