**LAPORAN PRAKTIKUM PENGOLAHAN CITRA DIGITAL**

**17. BASIC MORPHOLOGICAL ALGORITHMS**



**Disusun oleh :**

**Nama : Garcia Bryan Farrel**

**NPM : 2327250026**

**Kelas : IF41**

**PROGRAM STUDI INFORMATIKA**

**FAKULTAS ILMU KOMPUTER DAN REKAYASA**

**UNIVERSITAS MULTI DATA PALEMBANG**

**2024**

**TUTORIAL : BASIC MORPHOLOGICAL ALGORITHMS**

**Goal**

The goal of this tutorial is to learn how to implement basic morphological algorithms

in MATLAB.

**Objectives**

* Learn how to perform boundary extraction.
* Explore the bwperim function.
* Learn how to fill object holes using the imfill function.
* Explore object selection using the bwselect function.
* Learn how to label objects in a binary image using the bwlabel function.
* Explore the bwmorph function to perform thinning, thickening, and skeletonization.

**What You Will Need**

* morph.bmp

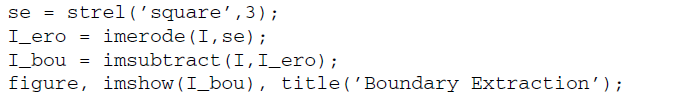
**Procedure**

**Boundary Extraction**

1. Load and display the test image.



1. Subtract the original image from its eroded version to get the boundary image.



|  |
| --- |
|  |
|  |

1. Perform boundary extraction using the bwperim function.



|  |
| --- |
|  |
|  |

**Question 1** Show that the I\_perim image is exactly the same as I\_bou.

|  |
| --- |
|  |

**Question 2** If we specify 4-connectivity in the bwperim function call, how will this affect the output image?

|  |
| --- |
| Mengubah menjadi 4-connectivity akan membuat garis pada gambar menjadi tipis. |
|  |

**Region Filling**

We can use the imfill function to fill holes within objects (among other operations).

1. Close any open figures.
2. Fill holes in the image using the imfill function.



|  |  |
| --- | --- |
|  |  |

Function imfill can also be used in an interactive mode.

1. Pick two of the three holes interactively by executing this statement. After selecting the points, press Enter.



|  |  |
| --- | --- |
|  |  |
|  |  |

**Question 3** What other output parameters can be specified when using imfill?

|  |  |
| --- | --- |
| I\_fill2 = imfill(I);  Kita harus mengclick sendri untuk fill lubang pada gambar atau bagian mana saja yang mau di fill | Sesudah pilih yang di fill pada mata kanan: |

**Selecting and Labeling Objects**

The bwselect function allows the user to interactively select connected components—which often correspond to objects of interest—in a binary image.

1. Close any open figures.
2. Select any of the white objects and press Enter.



|  |  |
| --- | --- |
| A black and white image of a black and white object  AI-generated content may be incorrect. | A white and black logo  AI-generated content may be incorrect. |

**Question 4** In the last step, we did not save the output image into a workspace variable. Does this function allow us to do this? If so, what is the syntax?

|  |
| --- |
| Fungsi bwselect memungkinkan kita untuk menyimpan keluaran ke dalam variabel di workspace. Matlab hanya akan menampilkan hasilnya secara interaktif tanpa menyimpan ke variable. |

In many cases, we need to label the connected components so that we can reference them individually. We can use the function bwlabel for this purpose.

1. Label the objects in an image using bwlabel.



|  |  |
| --- | --- |
|  |  |

**Question 5** What do the different shades of gray represent when the image is displayed?

|  |
| --- |
| Gradasi warna abu-abu yang berbeda menunjukkan label yang berbeda untuk setiap komponen objek terhubung dalam gambar biner. Nilai piksel 0 mewakili latar belakang (background), dan nilainya juga ditampilkan dalam warna abu-abu gelap. |

**Question 6** What other display options can you choose to make it easier to tell the different labeled regions apart?

|  |
| --- |
| Agar lebih mudah membedakan antar region, Anda bisa menggunakan warna semu (pseudo-color) dengan fungsi label2rgb.      Kelebihan pakai ini setiap region diberi warna yang berbeda secara acak. |

**Thinning**

Thinning is one of the many operations that can be achieved through the use of the bwmorph function (see Table 13.1 for a complete list).

1. Use bwmorph to thin the original image with five iterations.



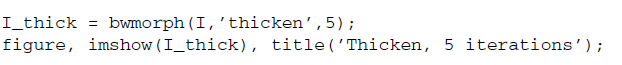
|  |  |
| --- | --- |
|  |  |

**Question 7** What happens if we specify 10, 15, or Inf (infinitely many) iterations instead?

|  |
| --- |
| Gambar nya semakin tipis |
|  |

**Thickening**

1. Thicken the original image with five iterations.



|  |  |
| --- | --- |
|  |  |

**Question 8** What happens when we specify a higher number of iterations?

|  |  |
| --- | --- |
| Gambar akan semakin tebal semakin besar angka iterations. |  |

**Question 9** How does MATLAB know when to stop thickening an object? (Hint: Check to see what happens if we use Inf (infinitely many) iterations?

|  |  |
| --- | --- |
| Gambar nya menjadi hancul karena semua nya ditebalkan sampai max. |  |

**Skeletonization**

1. Close any open figures.
2. Generate the skeleton using the bwmorph function.



|  |  |
| --- | --- |
|  |  |

**Question 10** How does skeletonization compare with thinning? Explain.

|  |
| --- |
| Skeletonization membuat gambar menjadi sangat tipis tapi tidak sampai hilang. Thinning cocok jika Anda ingin mempertahankan bentuk asli objek sambil mengurangi ketebalannya |