CSci 5561
Computer Vision

Extra Credit 3 report

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Overview Structure and Code Files

1. Grassfire algorithms and code files

    1.1   *MainGrassfire.m*

    1.2   *MyHistogram.m*

    1.3   *Mygrassfire.m*

2. Test images

    2.1   *Test1.jpg*

    2.2   *Test2.jpg*

Grassfire Transform

1.1 Basic concepts

In computer vision, the grassfire transform is the computation of the distance from a pixel to the border of a region. It can be described as "setting fire" to the borders of an image region to yield descriptors such as the region's skeleton or medial axis. Harry Blum introduced the concept in 1967.

1.2 Implementation

In my implementation, the first step I did is convert .jpg image to gray image with double format, then I find the threshold through histogram. After that, I use threshold to binarize image, so that I can process grassfire algorithm with binary image. For grassfire algorithm, I adopted sequential grass-fire algorithm which require two pass. In the first pass, it scans the image from top left to bottom right. In the second pass, it scans the image form bottom right to top left.

The pseudocode is shown as following.

```
for each row in image left to right
  for each column in image top to bottom
    if(pixel is in region){
      set pixel to 1 + minimum value of the north and west neighbours
    }else{
      set pixel to zero
    }
  }
}

for each row right to left
  for each column bottom to top
    if(pixel is in region){
      set pixel to min(value of the pixel,1 + minimum value of the south
and east neighbours)
    }else{
      set pixel to zero
    }
  }
}
```

1.3 Results

The histograms and comparison between original image and resulted image are shown as following.
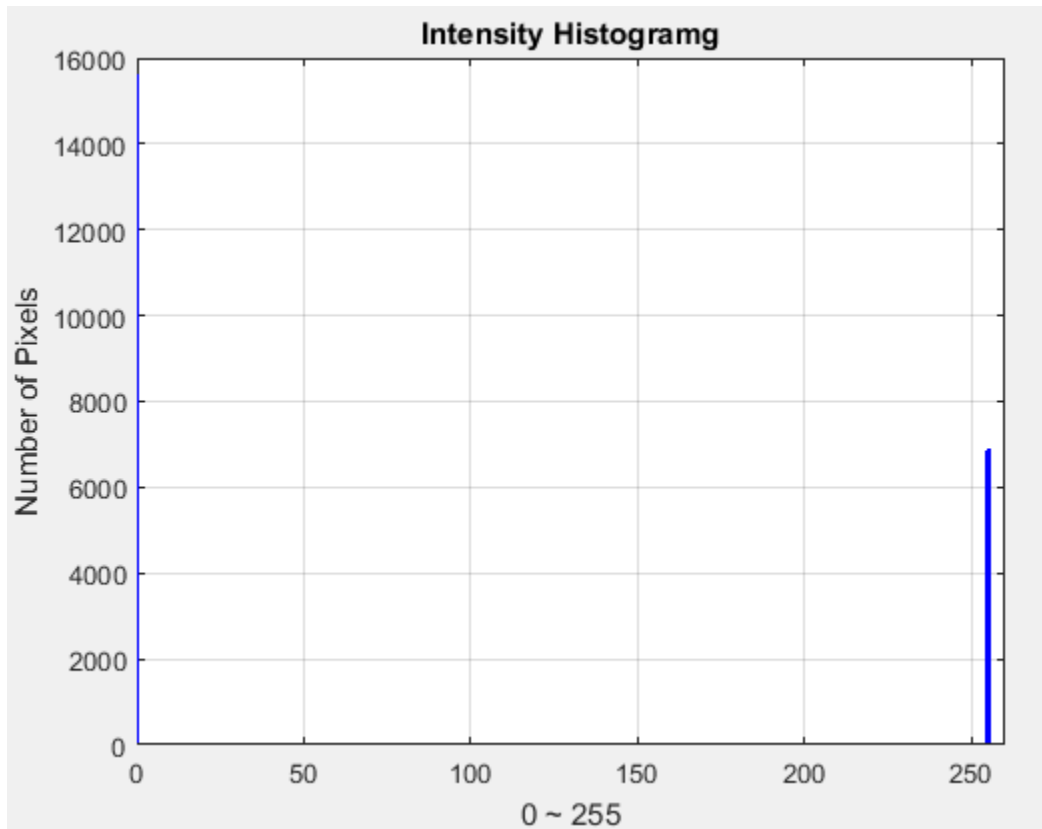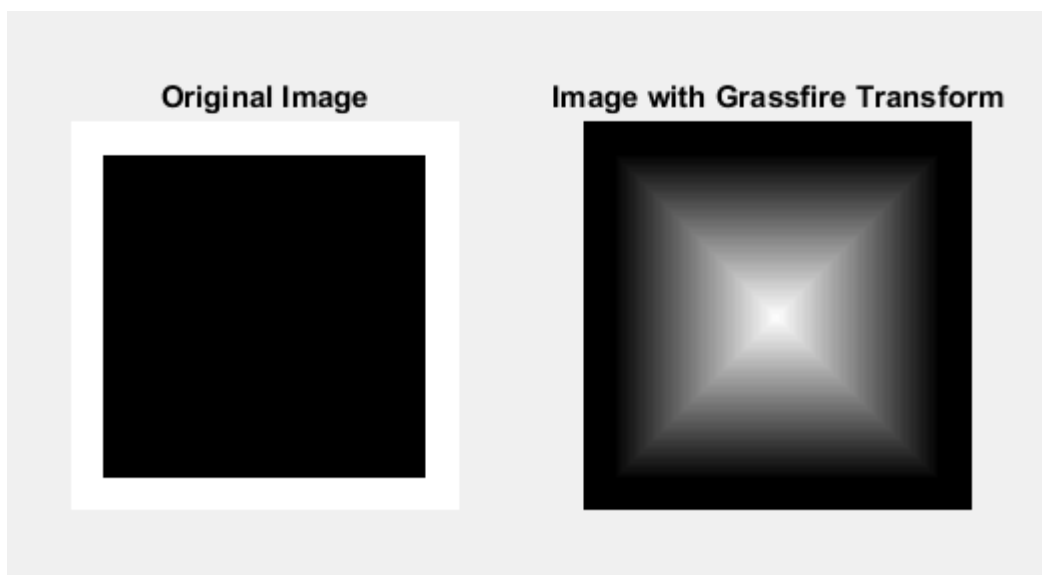
Figure 1. Histogram for Test1.jpg
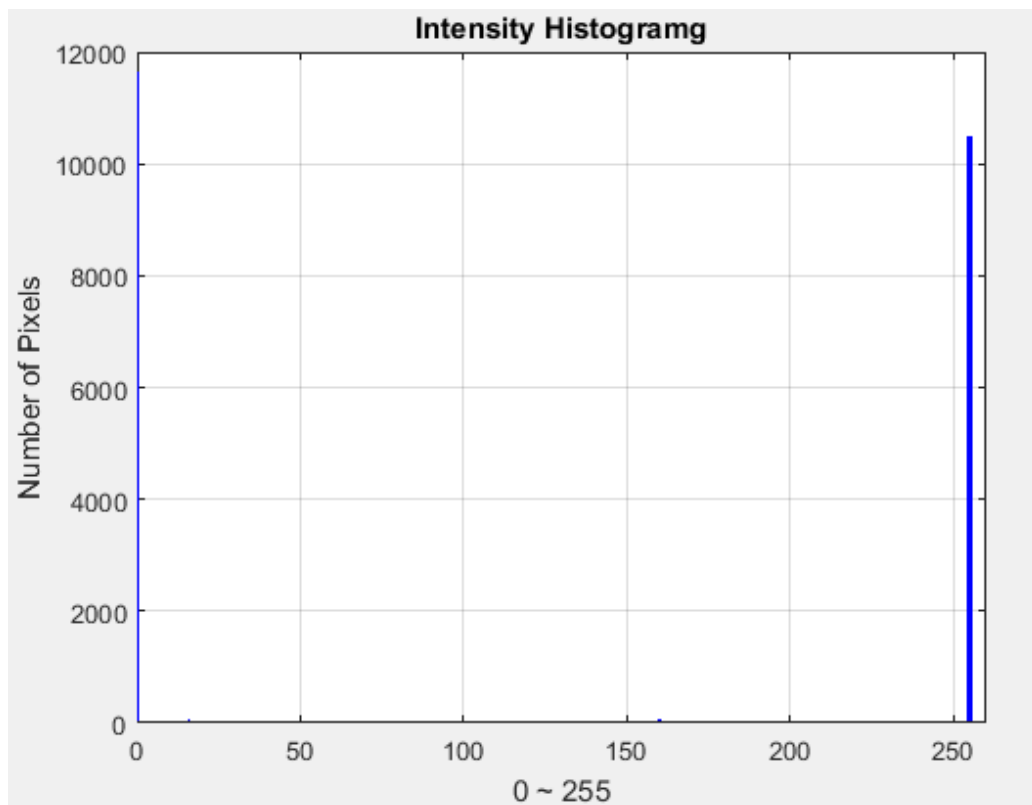

Figure 2. Comparison for Test1.jpg

Figure 3. Histogram for Test2.jpg

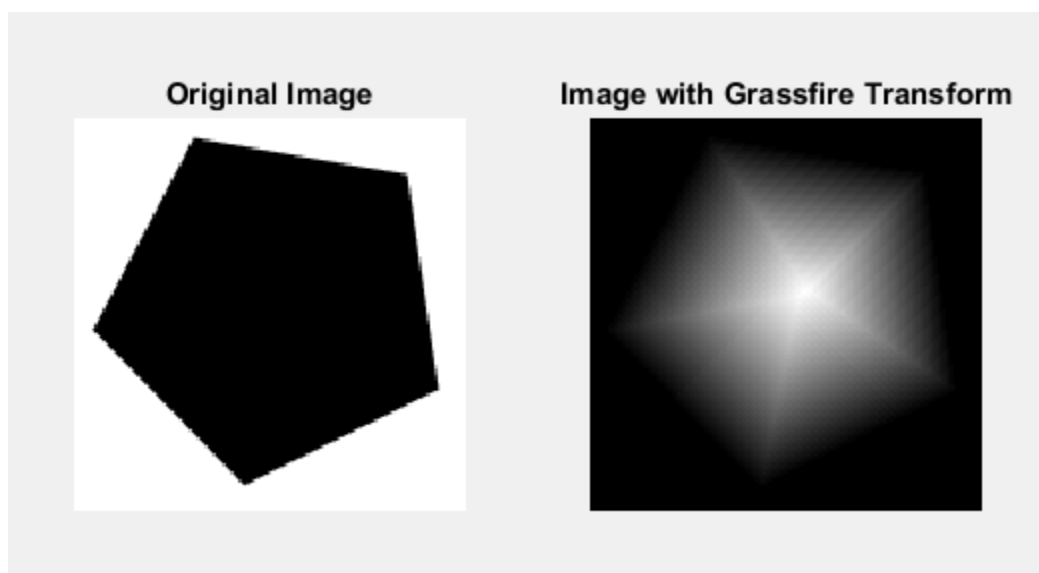Figure 4. Comparison for Test2.jpg

1.4 Discussion

I already obtain the reasonable results as shown above. I can say the grassfire algorithm is not only an easy algorithm in computer vision, but also has a lot of application. However, I also noticed that it works for simple image till now. For complex image, I need to think more about it, due to the time limitation, I may set this part as my future work.

References:

[1] Nikos Papanikolopoulos. "CSci 5561Computer Vision" *Slide1-3.*

[2] Wikipedia. *"*Grassfire transform" *https://en.wikipedia.org/wiki/Grassfire_transform*