Method

2. Horizontal Defect

For horizontal defect, we can find line/lines in the picture. If we average all the columns, we can see an edge in the image.

So, we use derivative method to find the edge. First, we use 5x5 median filter followed by 5x5 averaging filter. Before differentiating the image, it should be averaged every 100 columns, for a 512x512 image, the averaged image will be 512x413.Then we can differentiate the image by convolution with a gradient operator [-1;1]. At last, we smooth the image with 1x9 averaging mask to get a difference image.

For both ramp edge and roof edge, its position should be near the peak value of the first derivate. So we set a threshold with magnitude of half of the peak value. If the peak value is positive, all pixels higher than threshold are set to 1, others are set to zero. If the peak value is negative, all pixels lower than threshold are set to 1, others are set to zero. Finally, we resize the image to 512x512.

3. Vertical defect

First, we transpose the image at first, making the image looks like having horizontal defect in it. Then we can use the method used in horizontal defect. At last, transpose it again and we can get the final result.

Note that because the edge is more visible than horizontal defect, we average every 50 columns, instead of 100 columns in previous method, and the threshold is 0.3 of the peak value now.

Result

Horizon.png

1. original image. (b) edge in the picture. (c) difference image. (d) result after segmentation.

Vertical.png

1. original image. (b) edges in the picture. (c) difference image. (d) result after segmentation.

Conclusion

There are some images’ edge haven’t been visualized correctly, which have many wrong edges in it. However, changing the threshold make wrong edges being removed. That’s because the threshold is same to all images, but it should be adjust between different images. Maybe we can decide threshold by the image’s standard deviation or other statistical method.

Wrong.png

(a)original image. (b) segmentation image with threshold=0.5 of the peak value. (c) with threshold=0.7 of the peak value.