1. Introducing

In order to solve industrial problems, we need to mark the defect region. If it can be clearly marked, it has a good application in industry. We analyze the following five defects, void, horizontal defect, vertical defect, edge defect, particle.

1. Method
2. Void

First, we removed the noise by using Gaussian filter (Fig. 1(b)) and median filter (Fig. 1(c)). Gaussian filter is used to reduce image noise and reduce detail, because the defects are obvious. Then, it seems that it also has some noise. So, we use median filter to remove extreme value. After using the filters, the image has been smoothed.

We want to find threshold between normal region and defect region. We construct a histogram of pixel intensity distribution. To determine the threshold, we smooth the curve of histogram. By looking at the histogram, there are two peaks that were regular part and void. Then, we find the local minimal point between two peaks. (histogram.png) To prevent finding the end value, the 20% beginning and end value were deleted. By doing so, we can find the threshold to distinguish void region and normal region (Fig. 1(d)).

1. Edge

We can see obvious feature on the images, so we find the boundary. To remove the noise and extreme value, we use median filter (Fig. 2(b)). we use Canny edge detector and larger value of standard deviation of the Gaussian filter (Fig. 2(c)). Then we dilation the boundary with a 3x3 matrix of ones to make the boundary more visually obvious (Fig. 2(d)).

1. Particle

We can find there is a dark region in the middle of image. We also can find there are many speckles around the image. In this category, we will mark this two effects. First, we also remove the noise by using median filter. (Fig. 3(b)) And then to find the speckle in this image. we defined the mean of the image be the threshold (Fig. 3(c)), then the speckle was showed. In the other, if we want to show the dark region, we find the local minimal point between two peaks. It can clearly mark dark region in the middle. (Fig. 3(d)).

1. Result

Void.png(Fig.1)

Void.png(Fig.4)

Edge.png(Fig.2)

Particle.png(Fig.3)

1. Discuss

Segmentation of Void can’t really mark effect region. (Fig.4) It has many reason. Pictures are classified in Void looks as Normal. In this case, we cannot make segmentation under algorithm. And the other reason is that our algorithm that find threshold is not well. We should spend more time to optimize the method much better.

In the category of Edge, to find the boundary, we had tried Sobel and Laplacian of Gaussian. Compare to Canny, it can find more accurate boundary.

In the condition of Particle, there are many defect. In this reason, we use two algorithms to make segmentation. We think there should be a better way to make it once.