

Reconstruction of Inner Worm Passage of *Quercus Mongolica* Seeds

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ABSTRACT

This paper takes *Quercus mongolica* as an example, in order to determine the position of insects inside the *Quercus mongolica* seed. The seeds of *Quercus mongolica* were cut at a certain thickness to obtain an internal cross-sectional image of the seeds. In this paper, Canny and Hough algorithm are used to perform edge detection and line detection on unprocessed images, and determine the coordinate origin of the study area so that all study areas are in the same coordinate range. In order to obtain the position information of the insect path, based on the RGB principle, this paper designs a screening algorithm for the pixel points in the study area, and obtains the position information of the insect track. In order to observe the insect path more intuitively, this paper establishes a three-dimensional data model, and uses MATLAB to draw a three-dimensional structure diagram of the position information of the insect path, and shields the interference items such as seed germ to obtain a more accurate movement track of the insect.

Keywords— *Quercus Mongolica*, Canny Edge Detection, Hough Line Detection, RGB Screening Algorithm, Image Segmentation Model, Worm

I. INTRODUCTION

In recent years, due to the destruction of the forest ecological environment, the *Quercus mongolica* forest pests are more serious, affecting the natural regeneration process of the *Quercus mongolica* forest. In this paper, we find a rationalization solution for the Mongolian forest pests and establish a model of the position information of the insects inside the seeds. The *Quercus mongolica* seed was cut at a thickness of 0.1 mm to obtain an internal cross-sectional image of the seed. For coordinate unification and distance measurement, reduce the computational trouble, give the marked points A and B, and the actual distance measured between the two points of AB should be 20 mm. Involving the batch processing problem of photos, it is difficult to carry out detailed research in the case of device jitter and area acquisition too large, so it is necessary to batch cut and position the image size and position so that all research areas are in the same Within a coordinate range. It is necessary to establish a suitable model, determine the two sides of the study area, and then determine the coordinate origin of the study area. According to the coordinate origin,

select the appropriate study area, and then batch-cut the study area of all images. On the basis of the above, the program is written by MATLAB software, according to the actual distance of points A and B, the image is divided into 200×200, so that each picture is divided into 40,000 pixel blocks, and a suitable model is established to perform the pixel block. Screen to determine the location of the worm. The MATLAB program is written to establish a 3D model of the insect tract, and the interference factor is judged by observing the 3D model of the wormhole, thereby shielding and optimizing.

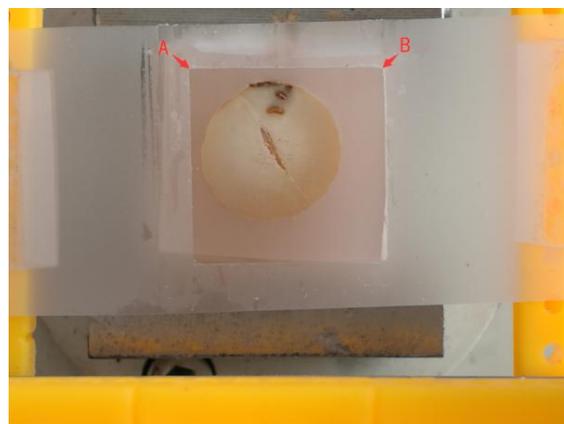


Figure 1: Internal cross-sectional image of the seed (untreated)



Figure 2: Internal cross-sectional image of the seed (after processing)

II. MODEL ESTABLISHMENT AND SOLUTION

2.1.1 Model 1 Establishment

First, the image is processed for observation. The `rgb2gray` function is used to grayscale the image, so that the edge of the image research area is more obvious, and then the appropriate algorithm is used for edge detection. Here we use the Canny algorithm.

In order to minimize the effect of noise on the edge detection results, noise must be filtered out to prevent false detection caused by noise. To smooth the image, a Gaussian filter is used to convolve with the image, which smoothes the image to reduce the apparent noise effects on the edge detector. The generating equation for a Gaussian filter kernel of size $(2k+1) * (2k+1)$ is given by:

$$H_{ij} = \frac{1}{2\pi\sigma^2} \exp\left(-\frac{(i - (k + 1))^2 - (j - (k + 1))^2}{2\sigma^2}\right)$$

$$1 \leq i, j \leq (2k+1) \tag{1}$$

The edges in the image can point in all directions, so the Canny algorithm uses four operators to detect horizontal, vertical, and diagonal edges in the image. The edge detection operator returns the first derivative value in the horizontal G_x and vertical G_y directions, thereby determining the gradient G and the direction θ of the pixel.

$$G = \sqrt{G_x^2 + G_y^2}, \tag{2}$$

$$\theta = \arctan \frac{G_y}{G_x} \tag{3}$$

Where G is the gradient strength, θ is the gradient direction, and \arctan is the inverse tangent function

Then use Hough algorithm to determine the upper line: The basic principle of Hough transform is to use the duality of points and lines to change the given curve of the original image space into a point of the parameter space through the curve expression. This translates the detection problem of a given curve in the original image into a peak problem in finding the parameter space. That is, the detection of the overall characteristics is converted into the detection of local characteristics. Using the Hough function to detect the upper line and the left line of the study area to determine the coordinates of A. By taking the point of Figure 1, we obtain the pixel distance between AB, and finally use the coordinates of point A and the distance of AB. Batch cropping images.

2.1.2 Solution of Model 1

By using the Canny algorithm and constantly adjusting the threshold, we obtained an area of significant edge research, as shown in Figure 3:



Figure 3: Canny edge detection map



Figure 4: Hough line detection

The Hough line detection is used to obtain the boundary line between the upper side and the left side of the study area, as shown in Figure 4, thereby determining the coordinates of point A.

Through the taking point of Figure 3, we get the distance between the marked points A and B as 800 pixels, and then use the `Imcrop` function to cut:

```
pic_1 = imcrop(image,[x,y,799,799])
```

The cropped image we got is shown in Figure 1 and Figure 2.

2.2.1 Model 2 Establishment

To determine the position information of the worm tract in the study area, it is necessary to have obvious differences. By observing, we find that the color characteristics of the worm tract are different from other positions, so we use RGB to build a model to screen the wormPixel position.

Take a representative picture of the difference between the color characteristics of the insect and non-insect position. Use Photoshop software to RGB the insect and non-insect parts, and get the RGB range and non-insect path of the insect position. The RGB range, then use MATLAB to write the program, judge, obtain the position information of the pixel points in line with the RGB range of the insect channel and store it.

However, after calculation, the pixels in the study area are high. If each pixel is filtered by the above program,

the amount of data is too large and the operation time is too long. Therefore, we need to reduce the resolution of the study area.

On the basis of the first question (the study area is 800*800 pixels resolution, and the actual distance of AB point is 20 mm), and the thickness is 0.1 mm, we will make each picture 200*200. Splitting, each picture is divided into 40,000 pixel small blocks, each small block has a resolution of 4*4 pixels, which indirectly reduces the research area to a resolution of 200*200.

Next, we just need to determine which small blocks of pixels are on the insect track and record the position information of these small pieces of pixels. Since each pixel has 16 pixels, and considering that some small pixels are at the junction of the insect and the non-insect, we determine that if more than half of the pixels of a pixel are RGB in the worm Within the RGB range of the location, we consider the pixel block to be in the insect track and record the location information of the pixel block.

2.2.2 Solution of Model 2

We use Photoshop to color the RGB of ten images. Since the lower the value of RGB, the darker the color, we only need to take the highest value of RGB position (Table 1) and The lowest value of the position of the insect (Table 2) the data obtained is as follows:

TABLE I

| | | | | | |
|----|-----|-----|-----|-----|-----|
| 序号 | 1 | 2 | 3 | 4 | 5 |
| R | 145 | 142 | 139 | 135 | 138 |
| G | 104 | 96 | 93 | 105 | 115 |
| B | 75 | 79 | 68 | 74 | 78 |
| 序号 | 6 | 7 | 8 | 9 | 10 |
| R | 134 | 139 | 136 | 135 | 133 |
| G | 108 | 114 | 119 | 113 | 113 |
| B | 73 | 76 | 74 | 74 | 79 |

TABLE II

| | | | | | |
|----|-----|-----|-----|-----|-----|
| 序号 | 1 | 2 | 3 | 4 | 5 |
| R | 143 | 142 | 141 | 146 | 168 |
| G | 74 | 80 | 96 | 110 | 125 |
| B | 90 | 86 | 67 | 85 | 74 |
| 序号 | 6 | 7 | 8 | 9 | 10 |
| R | 140 | 151 | 148 | 153 | 160 |
| G | 131 | 128 | 136 | 140 | 137 |
| B | 85 | 87 | 79 | 98 | 85 |

Since the color of the germ position is darker and the RGB values are lower, we use the integrity of the position information of the RGB values. Therefore, the value of the upper limit of the RGB value determined by us is relatively high. Finally, when optimizing, the part of the germ is removed. location information. In summary, the

value range of R is determined to be $R < 140$, the range of G is $G < 120$, and the range of B is $B < 80$.

Divide the study area into 40,000 pixel blocks and store them in the cell array, and then extract the R, G, and B values of the elements in the cell array. Determine the R, G, and B values and store the matching locations. The location information of the pixel block.

Then merge them in the form of an array, construct a two-dimensional array K, and then give the z-axis information that meets the conditional small block, and add it to K to make it into a three-dimensional array, and put each loop the obtained K is saved in F and stored in the file. After optimizing it, it is stored in the file. We get the data about the position information of the insect path to indicate the position of the insect path.

2.3.1 Model 3 Establishment

According to the data obtained by Model 2, we draw the data in a three-dimensional image, and can intuitively obtain the three-dimensional structure of the insect track. However, because the value of RGB in question 2 is slightly higher, there may be position information of the germ. And the emergence of other interference information.

By visually observing the 3D structure diagram, we use MATLAB to write programs to remove germ position information and other interference information for optimization.

2.3.2 Solution of Model 3

The initial data obtained by the model 2 is subjected to 3D composition, with A as the coordinate origin and AB as the y-axis, and the following figure is obtained:

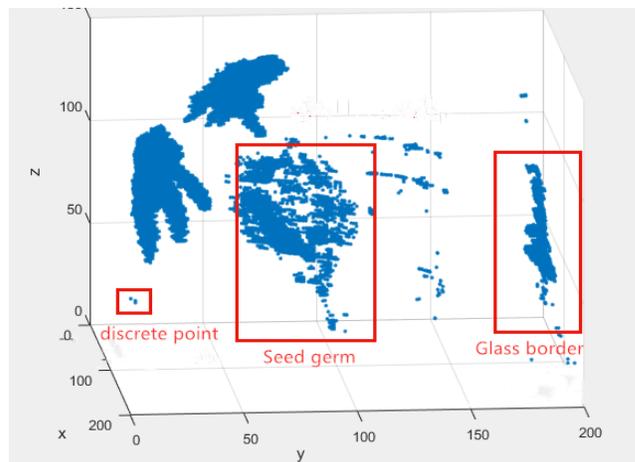


Figure 5: 3D structure of the wormhole

By observing we can find the interference of germ position information, the interference of glass border and seed boundary and the interference of individual discrete points; remove the interference of glass frame and seed

germ by using find function; then remove the individual points of the image the position information of the germ. So we got the optimized information on the position of the insect and stored it in the file, as well as the final 3D structure of the insect (A is the coordinate origin and AB is the y axis).

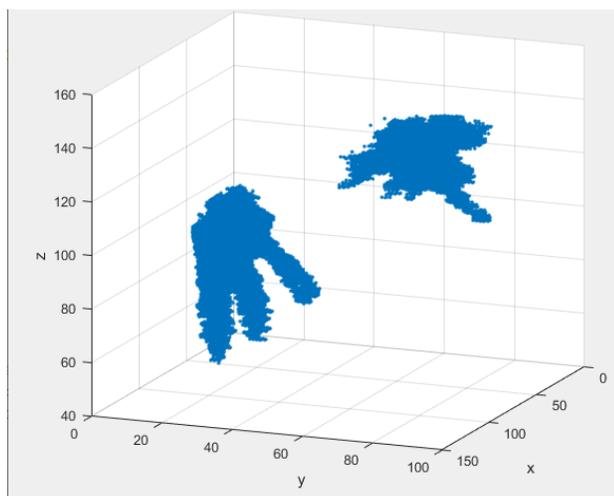


Figure 6: Location information obtained after RGB optimization

III. CONCLUSION

The Canny and Hough algorithms can accurately determine the coordinate origin of the study area. The RGB

design screening algorithm accurately identifies the pictures with large color differences, which greatly reduces the complexity of the optimization program and facilitates further research. The established image segmentation model reduces the amount of data processing, optimizes the computational efficiency of the RGB filtering algorithm, reduces the program running time, and increases the practicability of the program. This paper adopts a more reasonable method to describe the position information of insects, which can reflect the harm of insects to seeds with more comprehensive information. Using it to simulate the algorithm, it has a certain method to resist the pests, which helps people to innovate the resistance to forest pests.

REFERENCES

- [1] Yan Gou. (2008). Principle of gray color correction in digital photo color processing. *Journal of Chengdu University*, 5, 121-123.
- [2] Lulu Tang, Qican Zhang, & Song Hu. (2011). An adaptive threshold canny edge detection algorithm. *Opto-Electronic Engineering*, 38(5), 127-132.
- [3] Baoding Fu, Jianchang Yuan, & Caixia Guo. (2005). Cotton impurity recognition algorithm based on RGB color model. *Beijing Textile Journal*, 26(5), 48-51.
- [4] Huairan Yan & Musheng Yang. (2015). Line extraction algorithm based on improved hough transform. *Infrared Technology*, 37(11), 970-975.