Image Processing Using Correlation Base With Genetic Algorithm (GA) For Determining Rice Disease

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ABSTRACT

Mobile technology that is much-loved today is a smartphone. This is due to the ability and intelligence of these mobile devices in helping human life. One area of life that can use mobile devices to help get things done is the world of agriculture. In the agricultural world, one of the problems faced is determining the quality of agricultural crops, especially rice crops. Sometimes it is difficult to see the quality of the rice crop. The disease in rice suffered is one of the main factors to inhibit the production and quality of rice harvest. It takes a long time to detect rice diseases using traditional diagnostic approaches, so farmers often lost the best time to prevent and treat disease. The introduction of rice disease by image is an important research topic in the field of computer vision, where the main task is to find an effective way to represent the sick rice image. In this study, based on image processing techniques and pattern recognition methods, the method of introducing rice disease is proposed. The color transformation structure for RGB input (Red, Green and Blue) is designed first and then the RGB model is converted to HSI (Hue, Saturation and Intensity), YUV and gray models. Thebackgroundwasremovedbasedonaspecific threshold value, and then the disease spot image was segmented with region growing algorithm (RGA). Thirty-eight classifying features of color, texture and shape were extracted from each spot image. To reduce the dimensions of the feature space and improve the accuracy of the most valuable feature rice disease identification is selected by combining genetic algorithms (GA) and selection of correlation-based features (CFS). In order to try to overcome the problem, made a mobile-based applications that can determine the quality of the plant by doing image processing on plants that want to know the quality

Keyword: ***Rice Disease, Disease Leaf Recognition, Regional Growth Algorithm (RGA), Genetic Algorithm And Feature-Based Correlation Selection (GA-CFS), Mobile Device.***

1. Introduction

The world of information technology is experiencing a very rapid development, almost in all aspects of life. Human tendency to solve the problem quickly and easily trigger mobile technology to grow quickly too. Until now has many mobile devices that are owned by the community all circles, ranging from children to adults. Mobile technology that is much-loved today is a smartphone. This is due to the ability and intelligence of these mobile devices in helping human life. One area of life that can use mobile devices to help get things done is the world of agriculture. In the agricultural world, one of the problems faced is determining the quality of agricultural crops, especially rice crops. Sometimes it is difficult to see with the quality of the rice crop. In order to try to overcome the problem, made a mobile-based applications that can determine the quality of the plant by doing image processing (image processing) on plants that want to know the quality. The method used is Artificial Neural Network.

2. Research Method

We are also currently only detect 4 types of disease of rice plants only, that is, a. Brown leaf spots (war spots).

Figure 1. Brown leaf spots (war spots).

Figure 2. Leaf spots Cercospora This disease is caused by the fungus Cercospora oryzae Miyake.

Figure 3. Rice blight (kresek) This disease is caused by bacteria Xanthomonas compestris.

Figure 4. Blast This disease is caused by the fungus Pyricularia oryzae Cav.

We hope we can detect more and more disease dan using more virietas rice plant in the future.

3. Discussion.

a. Rice plant Image Processing

The initial stages of digital image processing in this application is the image capture that will be used as sample data in the program, after which the sample data is processed in image processing in the form of croping, graying, bacground removal, de maise. After the next step is to do image segmentation, after the image in the segmentation of the image will be in the form of color extraction features, shape features, and texture feature. after completion then enter the next process that is feature selection by using algorithm algorithm and CFS algorithm. After that done the process of recognation to determine the results to be received.

The following are the steps performed by the system.

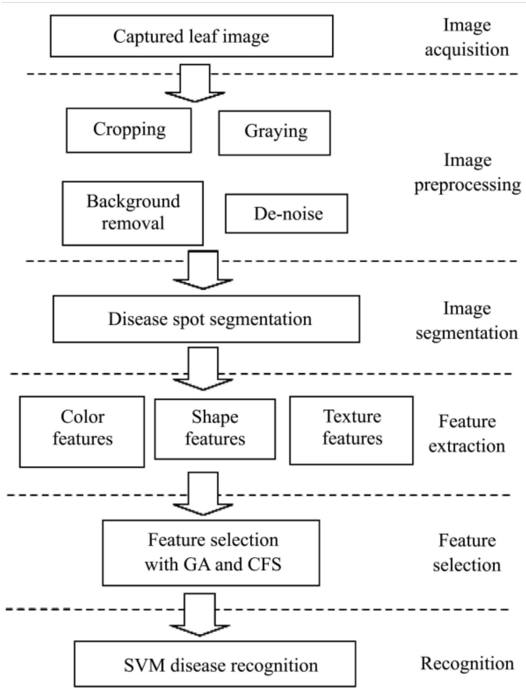

Figure 5. System Design

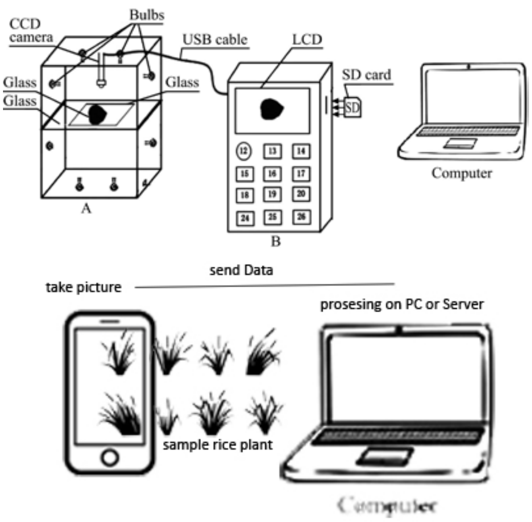

Figure 6. Image capturing.

b. Color feature extraction

The color of the image can be expressed by the R, G, B, r, g, b models in the RGB model and the H, I, S models in HSI (hue, intensity, saturation) etc. The HSI color model is a popular model because it is based on human perception. The color features of the rice plant disease were extracted using the RGB model and the HSI model cooperatively. In the RGB model, R, G, B represent the brightness values of red, green and blue respectively. The RGB model is normalized as an RGB model to reduce errors caused by differences in light intensity under different circumstances. Color features can be extracted from spots in various color spaces including RGB and HSI. These features include mean, correlation, deviation, energy in RGB and HSI space. In this study, nine parameter values of r mean R, G, B, r, g, b, H, I and S were extracted from each spot image. To further identify the color features that can differentiate the various diseases, we also use statistical characteristics of five statistical parameters, namely variance, slope, peak value, energy and H-entropy H, The formula is as follows.

$$b_K = 1/\delta^3 \sum_{b=1} (b-\bar{b})^3 p(b)$$

$$\delta^2 = \sum_{b=1} (b-\bar{b})^2 p(b)$$

$$b_F = 1/\delta^4 \sum_{b=1} (b-\bar{b})^4 p(b) - 3$$

$$b_N = \sum_{b=1} [p(b)]^2$$

$$b_E = \sum_{b=1} p(b) \lg[p(b)]$$

c. Feature feature extraction

The shape is one of the most important features for the spot image of infected rice plant disease. Can be seen from the disease of rice plants that form various types of disease vary widely. After illicit leaf edge extraction and spot image segmentation, the edge and extent of the target disease area are obtained and then the characteristic form of the disease can be extracted. It is not very suitable to use the absolute value of the classification feature as proof of classification, and otherwise the relative value of the classification features should be considered. The description of the form can be derived from the outline of the disease, through which, the geometric features of the four relative values, ie the circle of the SCIR selected disease spot region, SECC eccentricity, SCOM form complexity and SFAC form parameters are calculated and they can be treated as a characteristic feature of the disease. The formula is as following,

$$S_{CIR} = R_{incricle} / R_{excricle}$$

$$S_{ECC} = Length_{long} / Length_{short}$$

$$S_{COM} = (Perimeter)^2 / Area$$

$$S_{FAC} = 4\pi Area / (Perimeter)^2$$

Where, Rincricle is a marked disease spot radius; The circle is the radius of the point of the disease is limited; Long Length is the length of the long axis of the disease; Lengthshort is the short axis of disease length; The perimeter is the perimeter of the site of the disease and Area is the plane of the disease The circle is the ratio of radius and radius are restricted. The eccentricity is the ratio of the long axis of the disease area and the short axis to illustrate the regional cohesiveness, ie the more fat the form of the disease, the greater its eccentricity. The complexity of the shape describes the perimeter of the unit area, the complexity of the region, the degree of dispersion, that is, the greater the value, the more complex the form of the target. The shape parameter describes the proximity to the rotation and the parameter value ranges from 0 to 1, that is, under the same area conditions, if the boundary of the disease area is round and smooth, the shortest perimeter and its value is 1. The more deflected from the rotation of the configuration where the disease is, the smaller its value and its proximity to round is 1 and the other case is less than 1.

d. Extraction texture feature

The texture of the apple leaf tissue that hurts is usually different from that of healthy. The co-occurrence color texture feature can be extracted through a spatial gray level dependence matrix (SGDM), which is a statistical way of describing the shape statistically.

sampling in a way in which certain gray

levels occur in relation to other gray levels. SGDM can measure the probability that pixels at a given gray level will occur at different distances and orientations from pixel pixels that have a certain gray level. The matrix is represented by the function p (i, j, d, θ), where I represent the gray level of location (x, y), and j represents the gray level of pixels at a distance d from the location in the orientation angle θ. After converting the RGB spot image to gray, the four gray co-matrix matrices are generated from four directional, two-way, 0º, 45º, 90º and 135º images. In the calculation of gray co-occurrence matrix, the texture feature will be different from the distance parameter variation d. Different texture features will inevitably cause changes in the texture description. Therefore, it is important to determine the optimal value of the distance parameter d. If the distance parameter is too large, the pixel information between the gray levels will disappear and there will be some gray scales that can not be extracted. If the distance parameter is too small, there will be overlap with the text feature and the calculation load is high. Based on a comprehensive balance sheet, we set the distance parameter value d to 20 pixels. Five characteristics of statistical texture, contrast of TCON disease area, TCOR correlation, TENE energy, TINV inertia moment and entropy TENT are extracted with p (i, j, d, θ) of each matrix, as follows. Thus, 20 texture features form a texture feature vector.

$$T_{CON} = \sum_{i=0}^{L-1}\sum_{j=0}^{L-1}(i-j)^2 p(i,j,d,\theta)$$

$$T_{COR} = \sum_{i=0}^{L-1}\sum_{j=0}^{L-1}\frac{(i-\mu_x)(j-\mu_y)p(i,j,d,\theta)}{\sigma_x\sigma_y}$$

$$T_{ENE} = \sum_{i=0}^{L-1}\sum_{j=0}^{L-1}p^2(i,j,d,\theta)$$

$$T_{LVN} = \sum_{i=0}^{L-1}\sum_{j=0}^{L-1}\frac{p(i,j,d,\theta)}{1+(i-j)^2}$$

$$T_{ENT} = -\sum_{i=0}^{L-1}\sum_{j=0}^{L-1}p(i,j,d,\theta)\log[p(i,j,d,\theta)]$$

Where, μx and μy are mean values; σx and σy are variance; p (i, j) is a normalized gray co-occurrence matrix; i and j represent the pixel gray value; represents the pixel gray value; L is the gray level of the image. Physical significance is indicated by a formula that can be referred for reference.

4. Conclusion.

Genetic model of the algorithm that was built in this study using 10 parameter estimator, that is the intensity of red, R, green (G), blue (B), color value, R, G, B, (saturation), and intensity for the introduction of rice disease into normal groups, war spots, cercospora spots, leaf blight, or blast. In this paper the data and results are still a hypothesis (prejudice) because the research has not been done.

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