International Journal of Research Publication and Reviews, Vol 3, Issue 8, pp 1418-1423, August 2022

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

An intelligent Identification System for Insects using Image Processing with Neural Network

Khald M Hassen wane[1], Ibrahim abdlahafiez Amar Alnogga[2], Ashrf daw A samlghy[3]

Higher Institute of Sciences and Technology-Sokna-Aljufra, Libya[1]
Sirte University , Libya [2]
High Institute of science and technology / Tripoli , Libya[3]

A B S T R A C T

In the agrarian area the primary test is the recognition of bugs, hence powerful and wise frameworks must be intended to battle the pervasion while limiting the utilization of pesticides. In this paper a shrewd insect's ID framework was fostered that can perceive 6 kinds of most normal insects that the paddy fields experience the ill effects of. There are two primary stages in this paper. In the principal stage, the bug's pictures are handled involving different picture handling strategy to identify the mathematical states of bugs that will be utilized to recognize various bugs In this stage, the pictures are smoothed utilizing middle channel and afterward fragmented utilizing vigilant edge recognition. The next phase is the recognition phase where a back propagation neural network is trained and then tested on a large number of processed images till it converges and learns the geometric shape of each insect, the results show a high efficiency and recognition rate of 88% of the system in classifying the different 6 types of insects.

Keywords:Intelligent systems, identification, geometric shapes, pattern averaging, back propagation neural network, canny edge detection.

1. Introduction

Agribusiness field is one of the main considerations that are connected with social security and monetary turn of events. Nonetheless, a few hundred unique types of bugs are viewed as related with put away grains and their items, and bugs that assault our stores of cereal food varieties comprise one of the most serious dangers to our progress. It is assessed that bugs obliterate 5%~10% of the world creation of cereals. As a rule, the visual technique, which is broadly utilized all over the planet, relies fundamentally upon visual review and examination with standard pictures of bugs. This approach is profoundly abstract and requires extensive preparation and involvement in bugs to accomplish reliable outcomes. In view of organic chemistry and biophysics strategies, the exploratory techniques are tedious, dreary, and are not appropriate for routine use.

To address these difficulties, we have embraced the mathematical based highlights in grouping pictures of paddy field bug bothers. The essential benefit of this approach is that it is invariant to changes in posture and scale as long as the highlights can be dependably recognized. Moreover, with a suitable decision of classifier, for example, backpropagation brain classifier, not all elements should be distinguished to accomplish high order exactness. Consequently, regardless of whether a few highlights are impeded or neglect to be distinguished, the technique can in any case succeed

The main aim of this approach is to classify different types of insects based on their geometric features extracted using pattern averaging. The classification is handled using a backpropagation neural network due to its simplicity and efficiency in such applications. using different image processing techniques, the images were processed, in order to adjust the image edges and make them ready for pattern averaging. The images were rescaled to two

* *Corresponding author.*
E-mail address: mangiment.alhraba@gmail.com

sizes for simulation and testing purposes. Therefore, backpropagation neural networks were used. it has 1024 input neurons since is fed by images of size 32*32.

2. METHODOLOGY

In this paper, an intelligent pest insect's recognition system was developed. image is classified into one of the 6 types of insects (Praying Mantids, Red Bug, aphids, spider, caterpillars, Grasshopper). In the image processing stage, the images are processed using many techniques such as conversion to grayscale, filtering using median filter, segmentation using canny edge detection, and image cropping, then the images are ready to be fed to the new phase which is the neural network.

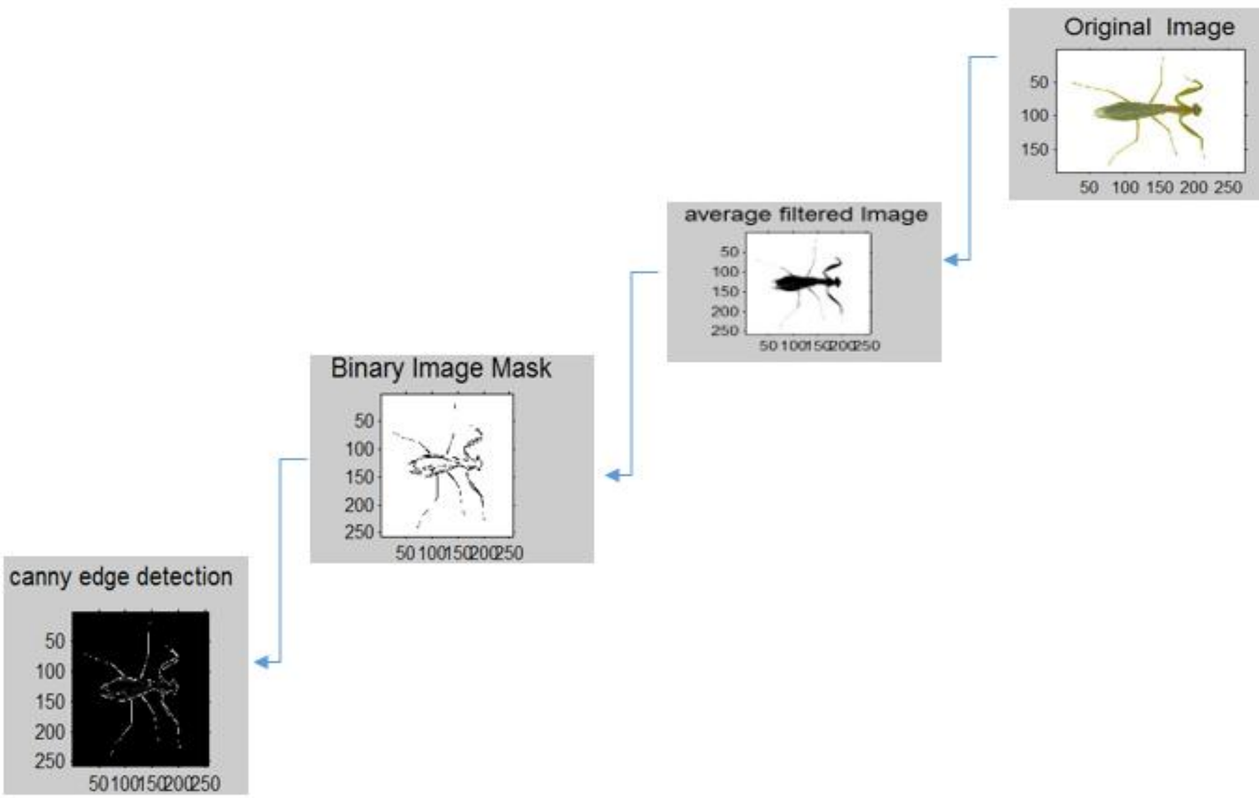

Figure 1. the proposed system

2.1 Dataset

Because of the inaccessibility of one source pictures of bugs, the bug's pictures were gathered from various site for bug's characterization. The pictures were gotten all in various size attributable to the way that a portion of these pictures were superior to others in goal and nature of pictures. Table.1 shows the number of total images used for the training phase of the designed system

Table 1: Database images

Type of insects	*Number of images*
Praying Mantids	*35*
Red Bug	*36*
Caterpillars	*45*
Spiders	*46*
Grosshoppers	*50*
aphids	*24*
Total	*236*

1. **Grayscale conversion**:

The pictures were first changed over from RGB to grayscale in which this transformation is finished utilizing the radiance strategy. This strategy is a more refined variant of the typical technique. It likewise midpoints the upsides of the picture framework, yet it shapes a weighted normal to represent human discernment since people are more delicate to green than different varieties, hence; green is weighted most vigorously.

Figure2 grayscale Caterpillars image

2. **Image smoothing using average filtering**

Smoothing, so called blurring, is an image processing technique used in order to reduce the noise in an image to produce less pixelated and clearer image. average filtering is windowed channel of direct class, that smoothes signal (picture). The channel fills in as low-pass one. The fundamental thought behind channel is for any component of the sign (picture) take a typical across its area. To comprehend how that is made practically speaking, let us start with window thought

3. **Canny edged based Segmentation**

Segmentation can be defined as grouping of the image parts into many regions. The goal of such image processing operation is to represent some meaningful and needed areas of the image, such as tumors, faces etc…

In other words, the segmentation is the grouping of interesting regions of the image into foreground regions of interest and background regions to be ignored using some techniques such as tresholding, which is done by setting a threshold value. Thus, the pixel values that are lower than the threshold are considered as 0's (black or background), while the pixel values higher than the threshold are considered as 1's (white or foreground).

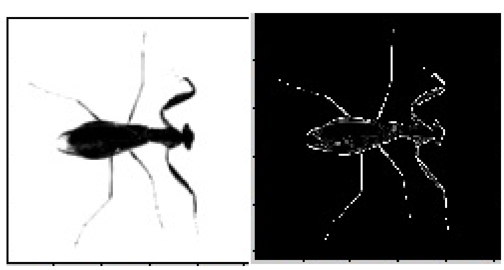

Figure.3 canny edge detection

4. **Features extraction and rescaling using pattern averaging**

After the segmentation process using the canny edge detection, the images size should be reduced in order to be fed to the neural network. To reduce the size of images while keeping the useful and needed features extracted by the previously used methods, we used patter averaging. This technique is defined as the averaging of the defined segments of the image by selecting a window of 4*4 segments that are averaged. Therefore, each studied pixel is then the average of the 16 neighbor's pixels in the selected window. Thus, we come up with a rescaled image with the same features and properties of the original one for the purposes of fast processing and easy computing.

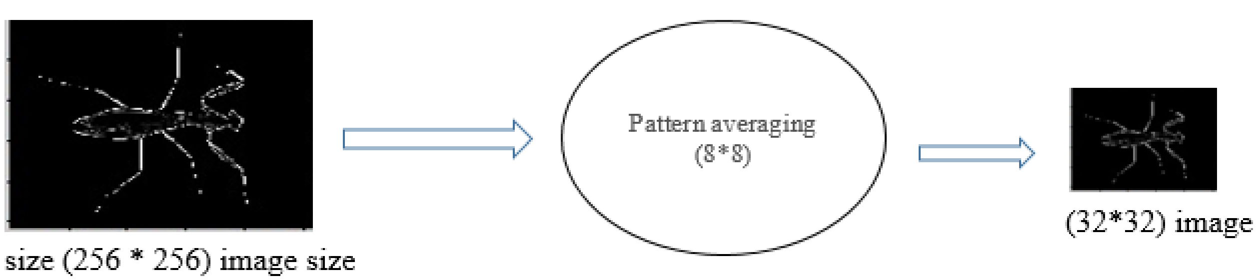

Figure.4 processed rescaled images.

3. The recognition phase

During this phase, the images of the different insects are classified into 8 classes using a supervised neural network. We used backpropagation neural networks due to its simplicity and the sufficient number of images. We used 236 images. The system was trained on 120 images for the6 different types of insects. The input layer of the BPNN network consists of 1024 neurons since each image is rescaled to 32*32 bitmap using pattern averaging. The hidden layer consists of 20 neurons, while the output layer has 6 neurons since we have only 6 output.

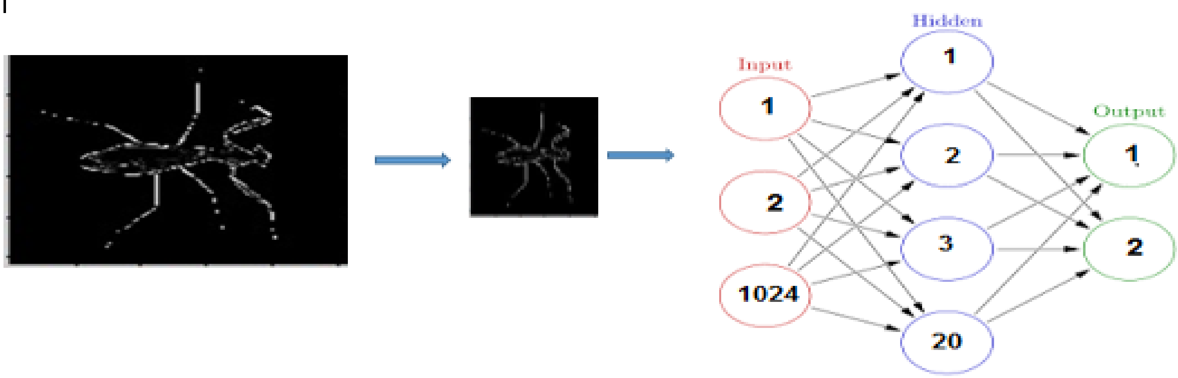

Figure.5BPNN

Table1.system parameters

Parameters	Value
Number of neurons in input layer	1024
Number of neurons in output layer	6
Number of neurons in hidden layer	20
Maximum Iteration number	5000
Learning rate	0.001
Momentum rate	0.4
Error	0.001

3.1 The system training

The network was simulated and trained on Matlab software and tools. We used eight different set of images of six insects.

Figure.6BPNN performance

.

4. Result & discussion

In this paper, an intelligent insect's identification system was developed. The system is based on both image processing and neural network classification. A large number of images of 6different types of insects were collected from different databases. These images were used for training and later for testing the network. The system comprised of image processing phase where the images are processed and then some features are extracted using pattern averaging technique.

Table.2 system result

	BPNN
Classification rate during training	92%
Classification rate during testing	88%

5. Conclusion

In this paper, an intelligent was developed with a back propagation neural network. In this system we classify 6 types of insects. The methodology of the developed system contains two stages, the first stage image processing technique which a varies image processing techniques where used like image filtering, canny edge detection, feature extraction. In the second stage, classification stage, in which back peopagation neural network was used to classify the image's insects, there were 236 images for the insects, the system trained by 120 images and tested by 116, the recognition rate was 92% during training and 88% during testing.

REFERENCES

N. Larios, H. Deng, W. Zhang, M. Sarpola, J. Yuen, R. Paasch, A. Moldenke, D. A. Lytle, S. R. Correa, E. N. Mortensen, L. G. Shapiro, and T. G. Dietterich, "Automated insect identification through concatenated histograms of local appearance features: feature vector generation and region detection for deformable objects," Machine Vision and Applications, Springer, vol. 19, issue. 2, pp. 105-123, 2008.

R. G. Mundada and V. V. Gohokar, "Detection and classification of pests in greenhouse using image processing," IOSR Journal of Electronics and Communication Engineering, vol. 5, pp. 57-63, 2013.

Resource Manual on Integrated Production and Pest Management (IPPM) in Rice, World Education (INGO) Philippines, Inc., 2005, ch. 6, pp. 113-115.

Sampling insect pests, their damage and beneficial organisms Philippine rice self-sufficiency plan (PRSSP). [Online]. Available: http://pinoyrkb.com/main/resources/publications-and-figures/rice-science-for-decisionmakers/doc_download/517-sampling-insect-pests

F. A. Carino, P. E. Kenmore, and V. A. Dyck, "A FARMCOP suction sampler for hoppers and predators in flooded rice fields," The International Rice Research Newsletter, vol. 4, ch. 5, pp. 21-22, 1979.

Segmentation and Automatic Identification of Pests on Plants using Image Processing" Third International Conference Computing Communication & Networking Technologies (ICCCNT), 26-28 July 2012.

Denker, J., Schwartz, D., Wittner, B., Solla, S. A., Howard, R., Jackel, L., and Hopfield, J. (1987). Large Automatic Learning, Rule Extraction and General-ization. Complex Systems, 1:877-922.

Denker, J. S., Gardner, W. R., Graf, H. P., Henderson, D., Howard, R. E., Hub-bard, W., Jackel, L. D., Baird, H. S., and Guyon, I. (1989). Neural Network Recognizer for Hand-Written Zip Code Digits. In Touretzky, D., editor, Neu-ral Information Processing Systems, volume 1, pages 323-331, Denver, 1988. Morgan Kaufmann.

Fukushima, K. and Miyake, S. (1982). Neocognitron: A new algorithm for pattern recognition tolerant of deformations and shifts in position. Pattern Recognition, 15:455-469.

Le Cun, Y. (1989). Generalization and Network Design Strategies. In Pfeifer, R., Schreter, Z., Fogelman, F., and Steels, L., editors, Connectionism in Perspec-tive, Zurich, Switzerland. Elsevier.

R.Radha and Bijee Lakshman, "Retinal Image Analysis Using Morphological Process and Clustering Technique". Signal & Image Processing: An International Journal (SIPIJ) Vol.4, No.6, December 2013.