Volume 5, Issue 3, March 2015 ISSN: 2277 128X
International Journal of Advanced Research in Computer Science and Software Engineering
Research Paper
Available online at: www.ijarcsse.com

Texture and Quality Enhancement of Plants visual Images Using Genetic Algorithm

[1]Nitin Gupta, [2]Randhir Singh, [3]Parveen Lehana
[1,2]Dept. ECE, Sri Sai College of Engineering and Technology, Pathankot, Punjab India
[3]Dept. of Physics and Electronics, University of Jammu, Jammu, India.

Abstract— Image contents play a vital role in various images. But during image acquisition the details of an image may not be visible and may not be revealed due to some natural or artificial effects. To reveal and enhance the contents of an image, Image enhancement techniques are required. Most of the enhancement techniques require interactive procedures to obtain satisfactory results and thus are not suitable for large solution space. In some applications, automatic adjustment of the parameters is desired and Genetic Algorithm (GA) is best suited for these types of applications. Texture has great significance in digital image processing. Textures are believed to be a rich source of visual information. Textures are complex visual patterns composed of sub patterns or entities that have features like brightness, color, slope and size, etc. In this paper, GA is designed for images which provides better enhancement.. The algorithm was effective as the brightness of the image got enhanced with the successive iterations as compared to the unprocessed input image. The investigation showed that the proposed method enhances the contents of the image and the quality of the image is also improved with the successive iterations. It may be observed from the images that after enhancement more details of the texture structure is prominently highlighted by the GA which may be further used for automatic identification of plants and quality assessment in agriculture.

Keywords— Texture enhancement, Contrast enhancement, Visual images, Genetic algorithm, Mutation.

I. INTRODUCTION

Image enhancement plays an important role in digital image processing [1] .Image Enhancement techniques are required to efficiently extract the features of image which can improve or enhance the contents of an image [2]. Image Enhancement refers to attenuation or sharpening of image features such as boundaries, edges or contrast to make the processed image more useful for analysis. Image Enhancement transforms images to provide better representation of the hidden details. It is a vital tool for researchers in a wide variety of fields including (but not limited to) remote sensing, forensics, medical imaging, atmospheric sciences, art studies, etc [3]. Texture is important feature considered in an image processing and computer vision field that characterizes the surface and structure of a given object or region. Basically, an image is a combination of pixels and texture is defined as an entity having group of mutually related pixels within an image. This group of pixels is also termed as texture primitives or texture elements (texels) [4]. Textures are complex visual patterns which are composed of entities or sub patterns and have characteristics like brightness, color, slope and size, etc. Thus texture can be regarded as a similarity grouping in an image [5].

Textures are a pattern of non-uniform spatial distribution of differing image intensities, which focus mainly on the individual pixels that make up an image. Texture is defined by quantifying the spatial relationship between materials in an image [6]. Image texture has a number of apparent qualities which play an important role in describing texture. Following properties are playing an important role in texture analysis: uniformity, regularity, density, linearity, directionality, direction, coarseness, roughness, phase and frequency [7].

In this paper, the effect of Genetic algorithm (GA) on the enhancement of the texture and quality of plants visual images has been investigated. The details of GA have been presented in the next section. The methodology adopted for the investigations are discussed in Section III. The results and discussions are presented in Section IV followed by conclusion in Section V

II. GENETIC ALGORITHM

The Darwin theory of natural evolution, particularly the "survival of the fittest" principle, and the mechanisms of natural genetics are the basis for the GA optimization techniques. The GA imitates natural selection to identify the maximum / minimum of some objective function in a search space. GA is theoretically and empirically proven to provide a robust search in the complex solution space [8]. They are computationally simple yet powerful in their search for improvement. Their main attractive characteristic is their ability to deal efficiently with hard combination search problems, where the parallel exploration of the search space eliminates to a large extent the possibility of getting stuck in local extreme [9].

Genetic algorithm is started with a set of solutions called population. A solution is represented by a chromosome. The population size is preserved throughout each generation. At each generation, fitness of each chromosome is evaluated, and then chromosomes for the next generation are probabilistically selected according to their fitness values. Some of the selected chromosomes randomly mate and produce offspring. When producing offspring, crossover and mutation randomly occurs. Because chromosomes with high fitness values have high probability of being selected, chromosomes of the new generation may have higher average fitness value than those of the old generation. The process of evolution is repeated until the end condition is satisfied. The solutions in genetic algorithms are called chromosomes or strings. GAs have been successfully applied to a wide variety of problems, because of their simplicity, global perspective, and inherent parallel processing [10, 11].

Genetic algorithms (GAs) may contain a chromosome, a gene, and set of population, fitness, fitness function, breeding, mutation and selection. Genetic algorithms (GAs) begin with a set of solutions represented by chromosomes, called population. Solutions from one population are taken and used to form a new population, which is motivated by the possibility that the new population will be better than the old one. Further, solutions are selected according to their fitness to form new solutions, that is, offspring's. The above process is repeated until some condition is satisfied. Algorithmically, the basic genetic algorithm (GAs) is outlined as below:

Step I [Start] Generate random population of chromosomes, that is, suitable solutions for the problem.

Step II [Fitness] Evaluate the fitness of each chromosome in the population.

Step III [New population] Create a new population by repeating following steps until the new population is complete.

a) [Selection] Select two parent chromosomes from a population according to their fitness. Better the fitness, the bigger chance to be selected to be the parent.

b) [Crossover] with a crossover probability, cross over the parents to form new offspring, that is, children. If no crossover was performed, offspring is the exact copy of parents.

c) [Mutation] with a mutation probability, mutate new offspring at each locus.

d) [Accepting] Place new offspring in the new population.

Step IV [Replace] Use new generated population for a further run of the algorithm.

Step V [Test] If the end condition is satisfied, stop, and return the best solution in current population.

Step VI [Loop] Go to step 2. The genetic algorithms performance is largely influenced by crossover and mutation operators.[12].The Flow chart representation of genetic algorithms (GAs) is shown in Fig.1.

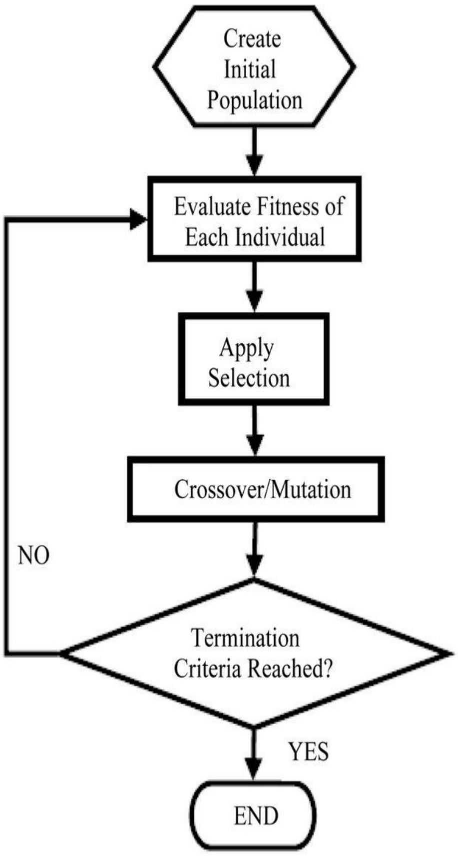

Fig. 1. Flow chart of GA

III. METHODOLOGY

The visual images of plants were digitally recorded in normal light conditions with different orientations. Four plants chrysanthemum, erect clematis, lettuce and arugula having different textures were selected.. For each plant nine visible images were taken using by fixing the camera at a distance of three feet from the plants. The enhancement of images was carried out using GA. The genes of the algorithm were composed of four intensity ranges and two modification factors leading to a total of 10 genes per DNA. A total of 10 DNA were initially taken. The initial values of the genes were randomly initialed. The investigations were carried out by varying the number of iterations. The processed images were analyzed for quality and conclusion was drawn for finding optimal parameters.

IV. RESULTS AND DISCUSSIONS

The experiment was conducted on Visual image. The investigations were carried out for iteration numbers 1to 1000 for the input images. Fig. 2 shows the unprocessed input images and the corresponding processed enhanced images at different values of iteration numbers 1, 50,100, 150, 200, 300, 500, 700, and 1000 respectively. From Fig.2, it can be observed that the enhancement in the texture of the image increases with the successive iterations up to 200th iterations. The image texture becomes to stabilize or after 200 iterations and there is hardly any change in the brightness of the image. Therefore, 200 iterations are chosen as the stopping criterion for the proposed algorithm. . Fig. 3 shows the variation of image quality as a function of iteration number. From Fig. 3 it can be observed that for the visual image the average quality improves from 0.26 to 0.29 up to 200 iterations and after that it remains constant It may be observed from the images that after enhancement more details of the texture structure is prominently highlighted by the GA which may be further used for automatic identification of plants and quality assessment in agriculture.

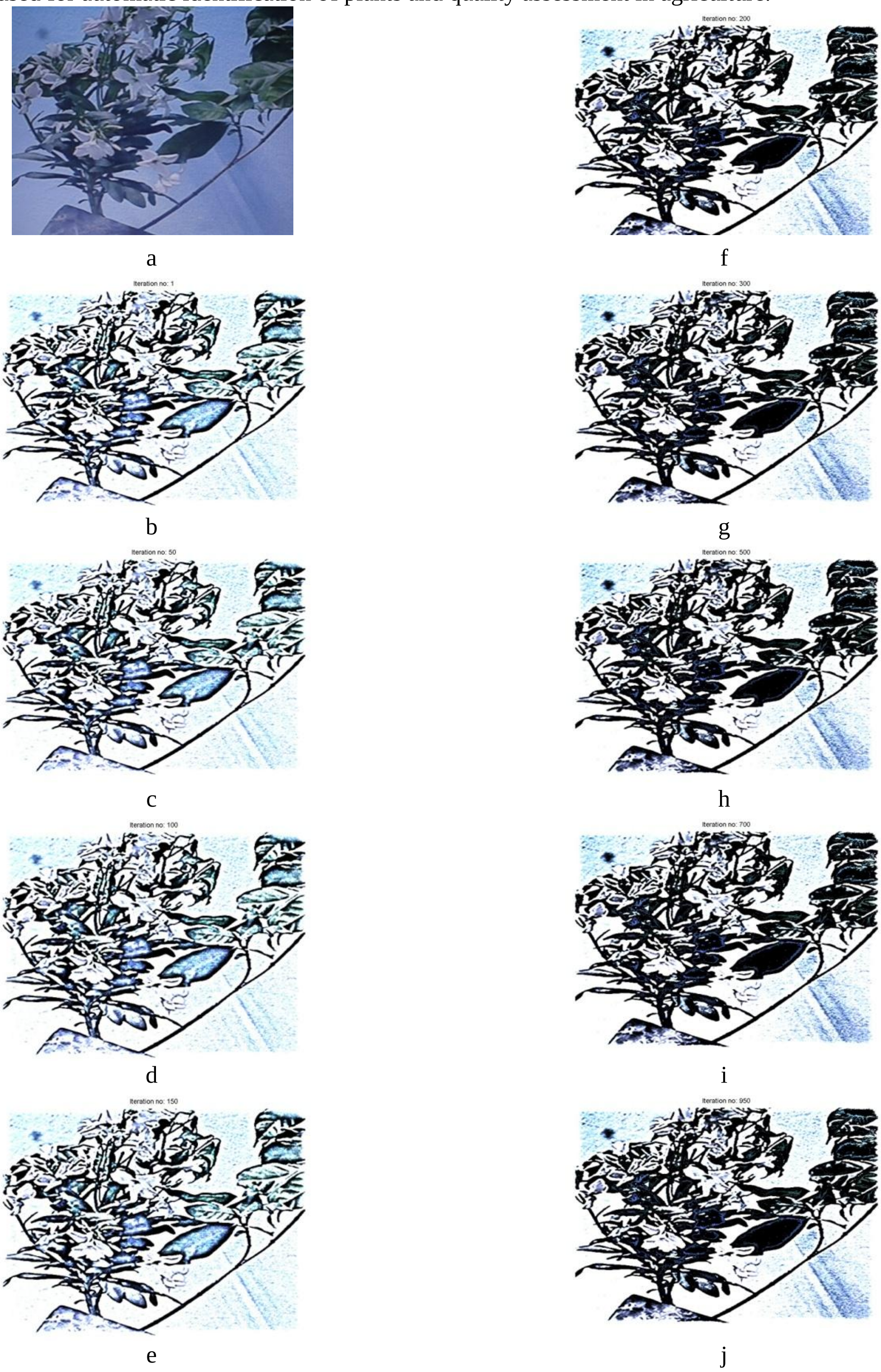

Fig. 2**.** Original visual and processed images at different iteration levels (a) unprocessed visual, (b) iteration no. 1, (c) iteration no. 50, (d) iteration no. 100, (e) iteration no. 150, (f) iteration no. 200, (g) iteration no. 300, (h) iteration no. 500, (i) iteration no. 700, (j) iteration no. 1000

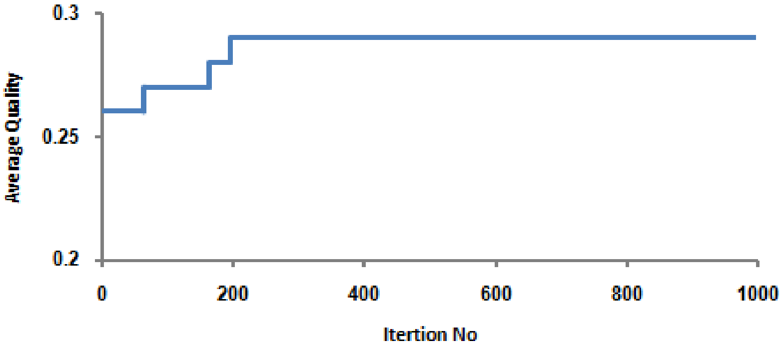

Fig 3. Shows the variation of image quality as a function of iteration number for processed visual input images shown in Fig. 2.

IV. CONCLUSIONS

It was observed that GA can be used as a very prominent unbiased optimization method for texture enhancement; it constantly gains popularity in image processing. Experimental results showed that the GA performed well and provided good results for visual images. The method is automatic, object oriented and robust. The investigation further showed that the processed visual images of the plants were enhanced in Quality and brightness during the successive iterations. There are different iteration levels for visual images.

REFERENCES

[1] Er. M. Kaur Er. K. Jain and Er V. Lather, "Study of Image Enhancement Techniques: A Review," International Journal of Advanced Research in Computer Science and Software Engineering, vol. 3, 2013, pp. 846.

[2] Dharmistha and D.Vishwakarma, "Genetic Algorithm Based Weights Optimization of Artificial Neural Networks," International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol. 1, No. 3, 2012, pp. 206-211..

[3] S.S Alamri, N.V Kalyankar, and S.D Khamitkar, "Linear and Non-Linear Contrast Enhancement Image," International Journal of Computer Science and Network Security, Vol. 10, No. 2, 2010, pp. 139-143.

[4] V. Metre and J. Ghorpade, "An Overview of the Research on Texture Based Plant Leaf Classification," International Journal of Computer Science and Network, Vol 2, Issue 3, 2013, pp.2277.

[5] A. Materka and M. Strzelecki," Texture Analysis Methods A Review," Technical University of Lodz, Institute of Electronics, COST B11 report, Brussels, 1998, pp 11.

[6] Prof. M. Kumar, M. Kamble, S. Pawar, P.Patil and N. Bonde, "Survey on Techniques for Plant Leaf Classification", International Journal of Modern Engineering Research (IJMER), Vol 1, Issue 2, pp-538-544.

[7] M. Tuceryan and A.K. Jian, "Chapter 2.1: Texture Analysis", "The Handbook of Pattern Recognition and Computer Vision", 2nd Edition, 1998, pp.207-248..

[8] Yu, Ming, "Image segmentation using genetic algorithm and morphological operations" 1998

[9] L. Davis, The handbook of Genetic Algorithms. Van Nostrand Reingold, New York, 1991.

[10] M.Kumar. Husian, Naveen, Upreti and D. Gupta,"Genetic Algorithm: Review and Application ," International Journal of Information Technology and Knowledge Management Vol 2, 2010, pp. 451.

[11] V.W. Lee, H.Kim, "Genetic Algorithm Implementation in Python", Electronics and Telecommunications Research Institute.

[12] R.Malhotra, N.SinghandY.Singh,"GeneticAlgorithms: Concepts, Design for Optimization of Process Controllers."Vol.4, No2, 2011