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Prediction of Volcano Hotspots using an Improved Third Term Optical Back Propagation Algorithm

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Abstract: Remote detecting is basic of on account of their pressurized need because of the examination of regular perils. Volcanoes and their hotspot are recognized by using system is used to recognize in the form of satellite pictures, and the pictures are proposed. Initially; the shading space of picture taken by the shading space of satellite is compare with plain picture to change over. After this procedure the picture will be portioned to distinguish the volcanoes hotspot. So as to recognize the hotspot of the volcano by using the Third Term Optical Back Propagation (OBP) algorithm is utilized by the artificial neural network (ANN). An improved Optical Back propagation (OBP) algorithm for training single hidden layer feed forward neural network with third term is proposed. The proposed representation will be developed by using of MATLAB.

Keywords **–** , Remote sensing, Satellite Images and Volcano, Artificial Neural Network (ANN), Optical Back Propagation (RBP).

I. INTRODUCTION

The unstable development of remote detecting innovation, web and mixed media frameworks postures extraordinary test in taking care of enormous measure of information. Progression in the field of Remote Sensing has gone to a degree of taking the geospatial precision to couple of centimeters. Among the different risks, the Volcanoes are awesome peril which may hurt the nature and additionally the living things. Here, the recognizable proof of volcanoes and their hotspot ID are vital to secure the living things. Consequently, the present examination is used to recognize the volcanoes and their hotspot from the satellite pictures. Thusly to defeat the aforementioned issues we are going to recognize the hotspot of fountain of liquid magma utilizing the Artificial Neural Network (ANN) which utilizes Resilient (RBP) Algorithm. At to start with, the shading space of the satellite picture will be changed over to another shading space to recognize the substance of the picture unmistakably. At that point picture will be portioned to distinguish the connection, standard deviation and entropy. The proposed component will be produced with the guide of the stage MATLAB.sensing digital image processing becomes an important tool.

II. RELATED RESEARCHES: A REVIEW

A handful of researches are available and some of them are listed below. Mirnalinee Dinesh et al. Debases Chakra borty et al.have discussed That the high-resolution satellite images requires substantial amendment in the conventional .

III. ARTIFICIAL NEURAL NETWORK

An Artificial Neural Network (ANN) is the structure consists of human brain turned neurons of entities. NNs are imitated of nervous system. Frequently just called a nervous system. Is a numerical model enlivened by natural neural systems. A neural system comprises of an interconnected gathering of fake neurons acquire a yield. Handling may be extremely straightforward, (for example, summing the inputs), or very mind boggling (a hub may contain another system). The complex personality true neurons are exceptionally elsewhere display neurons. Essentially comprise of input duplicated by weights after that processed the numerical capacity on decides enactment and neuron and counterfeit. The thought of the back engendering calculation is to decrease the blunder.

The planning of ANN is shown in fig (1) below i1, 1_2 are the input values and Y_K is the output value with H_1, H_2, H_3……H_N is the buried layer values.

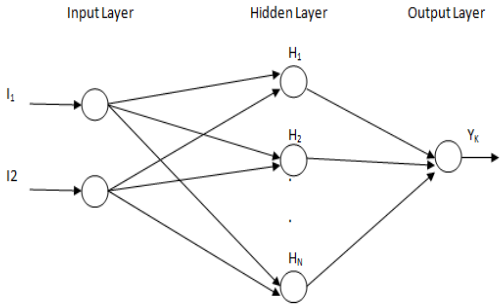

Fig (1): Schematic representation of ANN

The statistical diagram for the ANN find output weight age of each node fig (2).

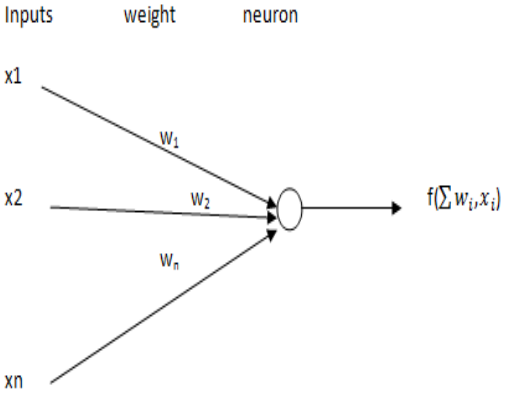

Fig (2): Mathematical representation of Artificial Neural Network

IV. Improved Third Term Optical Back Propagation Algorithm

$T = \{X_i, O_i\}_{i=1}^{M}$ where X_i is the input vector

$X_i = (x_1; \square, x_n)^T$ to input nodes.

$$h_k = \sum_{i=1} v_{ik} X_i, \quad k = 1, 2, \ldots, q$$

$$h_k^o = f(\text{net}^h_k) = (1 + e^{-net_{hk}})^{-1}$$

$$\text{net}^o_j = \sum_{k=1}^{q} w_{kj} * h_k^o, \quad j = 1, 2, \ldots, p$$

$$O_j = f(\text{net}^o_j) = (1 + e^{-\text{net}_{oj}})^{-1}$$

$$New\delta_j^o = (1 + e^{(T_i - O_j)_k}) * f'(net^o_j), \text{ if } (T_j - O_j) \geq 0$$

$$New\delta_j^o = -(1 + e^{(T_i - O_j)_k}) * f'(net^o_j),$$

$$New\delta_k^h = f'(net_k^h) * \sum_{j=1}^{p} New\delta_j^o * w_{kj}^o, \quad k = 1, 2, \ldots q$$

$$W(t+1) = W(t) + \alpha * New\delta^o_j * h_k^o + \beta * W(t-1) + v * New\delta^o_j$$

$$V(t+1) = V(t) + \alpha * New\delta_k^h * X_i + \beta * V(t-1) + v * New\delta_k^h$$

$$E = \frac{1}{M} \sum_{i=1}^{M} \frac{1}{2} \sum_{j=1}^{} (T_j^i - O_j^i)^T (T_j^i - O_j^i),$$

(p = Number of output neurons, M = Number of patterns)

reaches its minimum set value E = 0.1 or 0.01 or 0.001.

V. Image Recognition using Improved Third Term Optical Back Propagation Algorithm

In this area, an instrument which will be used to recognize the volcanoes and their hotspot from the satellite pictures is proposed. At first, the shading space of the satellite picture will be changed over to another shading space to distinguish the substance of the picture plainly. After this procedure, the picture will be sectioned to distinguish the spring of gushing lava's hotspot. With a specific end goal to recognize the hotspot of spring of gushing lava, the Artificial Neural Network (ANN) is used. The neural system data can comprise of pixels or estimations in pictures and the yield can contain pixels, choices, names, and so on. In this paper the neural system utilizes 8 inputs and 1 neuron in its yield layer with 20 neurons in the shrouded layer to recognize the pictures. The database comprises of typical satellite pictures and well of lava pictures. For the picture acknowledgment, concentrate on the parameters of every picture in the database. The six parameters utilized under this study are mean, fluctuation, contrast, homogeneity, vitality and relationship.

These parameters can be found out using the formulas below:

$$\text{Mean } (\sigma_M) = \sum_{i,j} \frac{x(i,j)}{n}$$

Variance $(\sigma_V) = \sum_{i,j} \frac{x(i,j)^2}{n}$

Contrast $(\sigma_c) = \sum_{i,j} |i-j|^2 x(i,j)$

Homogeneity $(\sigma_H) = \sum_{i,j} \frac{x(i,j)}{1+|i-j|}$

Energy $(\sigma_E) = \sum_{i,j} x(i,j)^2$

Correlation $(\sigma_C) = \sum_{i,j} \frac{\{(i-\sigma_{M(i)})(j-\sigma_{M(j)})x(i,j)\}}{\sigma_{v(i)}\sigma_{V(j)}}$

Standard deviation $(\sigma_{SD}) = \sqrt{\frac{\sum_{i,j}(x(i,j)-\mu)^2}{n}}$

Entropy $(\sigma_{EP}) = \sum_{i,j}\{x(i,j) log_2(\frac{1}{x(i,j)})\}$

Where as $x_{i,j} \rightarrow$ is the intensity of pixels i, j and n is the no. of pixels

At that point the system is prepared on fountain of liquid magma pictures and set an edge esteem for occurrence. In the event that a normal of the parameter estimations of a picture in the neural system is more noteworthy than or equivalent to the limit esteem then the picture is well of lava picture other else not. At that point to recognize the red spotted region from the fountain of liquid magma picture force check procedure must be finished. This is performed utilizing the RGB shading representation of a picture. Every shading in the pixel has its own particular force esteem though in this fountain of liquid magma picture representation Red (R), Green (G) and Blue (B) has its power esteem as 250, 10and 10 individually. In the event that the fountain of liquid magma picture aggregates R esteem as more prominent than or equivalent to 250, G and B as under 10, the picture is recognized as red spotted spring of gushing lava picture generally not. The stream outline representation for the above procedure is appeared in the fig (3).

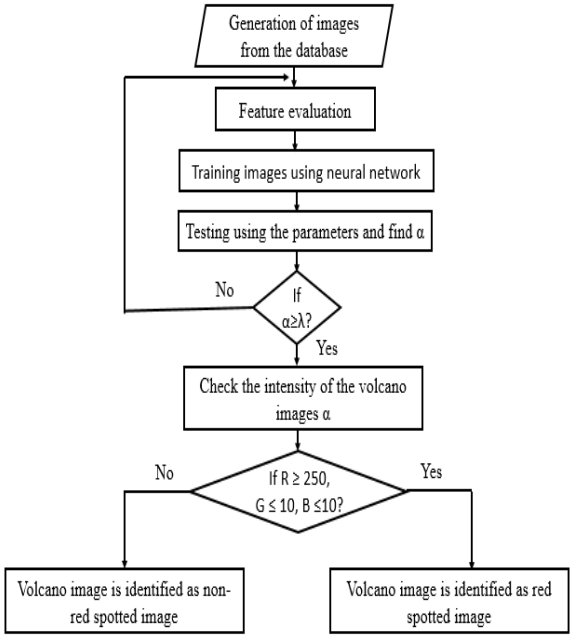

Fig (3): Flow chart representation of image segmentation using ANN

VI. EXPERIMENTAL RESULTS

The preparation of ANN is finished by MATLAB programming. So as to prepare neural system, chose elements were assessed; this assessment was important to counteract non-uniform learning, in which the weight connected with a few components merge speedier than others. At first, the shading space of the satellite picture will be changed over to another shading space to recognize the substance of the picture obviously. After this procedure, the picture will be fragmented to distinguish the spring of gushing lava's hotspot. After division a haphazardly picked test was separated into preparing, cross approval and testing datasets. The preparation information set was exhibited to the system for learning. Cross-approval is utilized to quantify the preparation execution amid preparing or quit preparing if important.

Testing information set is comprising of 100 satellite pictures in which 50 fountain of liquid magma and 50 non well of lava pictures. Testing is done under the assessment of affectability and specificity values. These qualities are among the terms genuine positive (TP), genuine negative (TN), false positive (FP), false negative (FN) (V.V.Joseph Rajapandian and N. Gunaseeli, Oct 2007). The genuine positive, genuine negative, false positive and false negative qualities for the distinctive datasets is appeared in the table underneath

	False Positive (FP)	False Negative (FN)	True Positive (TP)	True Negative (TN)
Data set	04	06	44	46

Table 1: True positive, true negative, false positive and false negative value

VII.DISCUSSION

Considering the qualities in the Table (1), affectability, specificity, precision, positive expectation worth, negative forecast esteem, false positive rate, false disclosure rate and Matthews' connection coefficient can be figured out. Affectability is characterized as the capacity to recognize the spring of gushing lava pictures and it is 88%. The specificity, the capacity to recognize accurately the non-well of lava pictures which yields 92%. Exactness is the right picture acknowledgment which is found as 90%. The false positive rate, which is perceived as a mistake, has aftereffect of 10%. Positive prescient quality which is the extent of the positive results has been distinguished as 89.79%. The negative expectation esteem, the extent of negative results, has the quality 88.23%. The false revelation rate which is the distinguishing proof of false results and it is 10.2%. The Matthew's relationship coefficient has been utilized for the recognizable proof of the outcomes, which hold its worth from the scope of -1 to +1. The quality +1 closes as a right recognizable proof and the other way around. The estimation of Mathew's relationship is found as +0.78.

VIII. CONCLUSION

We have displayed a component to recognize the fountain of liquid magma hotspot pictures utilizing Resilient Back Propagation Algorithm (RBP). The preparation and testing of the dataset satellite pictures is experienced utilizing cross-approval and grouping capacity (affectability and specificity measures) individually. Results displayed in this paper demonstrate that red seen in the spring of voluble lava pictures is naturally famed utilizing Resilient Back Propagation (RBP). exactitude is delayed to 89%, Cascade stage neural system can be utilized to construct the strictness later on work.

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