Analysis of Automatic Detection of Tumour Lesions Images using Bee Colony Technique

Mohanad Aljanabi1, Fadhel A. Jumaa1, Jameel Kaduim Abed2, Haider Al-Hamadani3.
1Electrical Power Techniques Engineering Department, Technical College /AL- Mausaib, Al-Furat Al-Awsat Technical University Najaf, Iraq.
2Department of Medical Instrumentation Techniques Engineering, Electrical Engineering Technical College, Middle Technical University, Baghdad 1022, Iraq.
3Machines and Engineering Techniques Department, Technical College /AL- Mausaib, Al-Furat Al-Awsat Technical University Najaf, Iraq.

com.mhn@atu.edu.iq—email

Abstract. Nonstandard development of prison cell in any portion of the body is termed cancer lesions. Life duration of a tumour's lesions can be enlarged by the primary detection of cancer. This work contracts with cataloguing of images depend on factors extracted from multiresolution analysis based on bee colony technique to enhance of investigative performance and decrease of unhealthy moles demises. From now this technique system goals to improve a portion of the current approaches and new measures to make available the accurate, fast and dependable automated analysis of skin lesions. This information is then fed to several well-known algorithms to obtain a skin cancer categorization. By this method, the segmentation step can be utilized to enhance the handling of the information and create preventive approaches against harm, thus decreasing the danger of skin cancer lesions. One of the most significant stages in dermoscopy image examination is the segmentation of melanoma. The experimental results suggest that the proposed method accomplished a higher performance compared to the ground truth images supported by skin cancer lesions’ dermatology. Investigational outcomes on the skin lesions databases designate that the bee colony prototypical acquires the utmost progressive performance. The factors of the scheme are estimated with accuracy, sensitivity and specificity.

Keywords: Dermatological Imaging, ABC Technique, Tumour Lesions, Automatic Detection.

1. Introduction
The nonstandard development of tumours cells is named skin tumours which is produced in the ranges exposed to sun. Medical image processing methods can be modified to various difficulties of medical fields [1]. Though, the image processing methods has diversity of submissions. In the problem of lesions depend on unhealthy moles detection, there are quantity of methods has been debated which uses several features of the image. The bee colony-based methods are obtainable to categorize the image as melanoma or benign or suspension [2].

Detecting malignant image is extremely a stimulating problem. The skins lesions are looking in various outlines and have no detailed and analysis by ABCDEF technique but vary with the colour. Accordingly, it is required to study the outline and other features. The local fractal and texture features are applied for automatic detection of unhealthy nevi of tumours lesions by Radu, et. al., [3] accomplishing effective outcomes. Celebi M Emre et al., [4] have analysed images using together colour and texture features.

Lau et. al., [5] have completed early detection of skin lesion by DWT features which are classified using 3 layers back-propagation and auto-associative neural network accomplishing an acknowledgment Acc. of 89.9% and 80.8%. Elgamal et. al., [6] have finished automatic cancer arrangement using DWT features which are concentrated in measurement using PCA accomplishing of 95% and 97.5% depend on feed-forward back propagation artificial neural network and KNN organization. Yuan et.al., [7] have completed early detection of healthy and unhealthy moles using SVM based texture organization realizing an accuracy 70%.

Yu, Lequan, et. al., [8] has finished automated unhealthy nevi acknowledgment of AUC of 0.79. Wholly the studies from [2-8] are completed on images which are gotten from wide-ranging sources such as health labs and hospitals.

In this paper the images of different skin lesions which are to be classified can be taken from ISBI challenge [2016, 2017, 2018, 2019] [9, 10]. Table 1 represents the previous works completed on comparison methods and
years are used for different factors. The images of skin cancer need to be first evaluated for risk i.e. benign or suspensions and malignant as shown in figure.1, the block diagram hierarchy utilized to analyse and interpret a high-level, rule-based system.

| No. | Year       | Method                                      | Accuracy | Sensitivity | Specificity | No. of Images |
|-----|------------|---------------------------------------------|----------|-------------|-------------|---------------|
| 1   | Mohanad Aljanabi et.al (2019) [11]          | ABC methods, algorithms and classification | 0.98     | 0.93        | 0.91        | 2100          |
| 2   | Nazneen et.al (2018) [12]                   | Sparse coding and SVM                        | 0.83     | NA          | 0.86        | 1279          |
| 3   | Haenssle et. al (2018) [13]                 | DCNN                                         | 0.82     | 0.889       | 0.65        | 100           |
| 4   | Lequan et.al (2017) [14]                    | Fusion of soft max and SVM classifier        | 0.855    | 0.547       | 0.90        | 1250          |
| 5   | Heydy et.al (2017) [15]                     | Doll Razon method for wavelet transform of feature extraction with classification | 0.885    | NA          | 0.97        | 147           |
| 6   | Majtner, Tomas (2016) [16]                  | R-Surface and LBP features classified using SVM | 0.825    | 0.533       | 0.986       | 900           |
| 7   | Noel et.al (2015) [17]                      | ABC algorithm and SVM                         | 0.931    | 0.946       | 0.695       | 334           |

2. Method

The traditional approaches need a comprehensive physical examination by a professional dermatologist, which is time-consuming and inaccurate. So, some computer vision techniques are presented recently, which are cost-active and slightly accurate. In this study, we suggest a new automated technique for skin lesion detection and acknowledgement using bee colony technique (ABC) [18].

Analysis of unhealthy nevi reached by consuming ABCDE guidelines with ABC technique for control asymmetry depend on rotation of lesion to 2 portions horizontally and vertically then sum the number of pixels unjust between the 2 segments depend on union and intersection between then.

Automatic detection of unhealthy skin lesions by Texture Analysis [19], studies an automated technique for healthy and unhealthy nevi analysis applied on a group of databases images. The tumours gotten from the dataset and hospital are contained noise developed because of the scanners, tape objects and patient data. Accordingly, pre-processing of the tumour images wants to be completed before feature extraction. Extraction is done to acquire the physical appearance of a picture. Numerous multiresolution methods have been used to extract features from the data images. A public technique after feature extraction is organization. Data investigation that can be used to extract representations re-counting significant data modules can be completed by classification into three groups and the numbers of factors evaluation [20].

Conventional approaches of detection without utilize of new technologies are not particularly accurate, and premature detection using traditional approaches is challenging. Also, a final diagnosis wants inspection of biopsies which is invasive. So, there is a pressing need for new non-invasive technologies and methods to enhance chances of premature detection of skin cancer. The use of dermoscopy has opened a new visual technique of investigating pigmented skin lesions, thus increasing the effectiveness of clinical diagnostic tools to differentiate melanoma from other pigmented skin lesions.
The procedure of foraging begins with the scout bees being sent to find food resources in the colony surroundings in a chance distribution. This dance is crucial for the bee communication and describes the food resource direction and nectar (fitness value).

The onlooker bees select the most profitable source based on all the information revealed by the waggle dances [21]. The ABC is a computational intelligence of the procedure of estimation via natural election. The artificial bee colony algorithm is shown in the following:

**A-Movement of the Onlookers:** Calculation of the new position from equation:

\[ y_{i,j} = LB_{i,j} + r(UB_{i,j} - LB_{i,j}) \]

where \( y_k \) is an arbitrarily elected contestant solution, \( LB \) is the position of the onlooker bee, \( LB \) and \( UB \) the minimum and maximum limits are the \( j \)th length size \( r \) is the randomly chosen worker bee \((-1, 1)\).

**B-Movement of the Scouts:** The movement of the scout bees follows equation (2).

\[ Z_{i,j} = y_{i,j} + \sigma_{i,j} \cdot (y_{i,j} - y_k,j) \]

\( j \) is an arbitrary length index selected from the group, \( \sigma_{i,j} \) depend on an ordinary distribution and then the best solution is selected between the food source and their candidate solution.

**C-Movement of the Onlookers:** Probability of selecting a nectar source:

\[ P_i = \frac{FP_i}{\sum_{j=1}^{SR} F_j} \]

where \( P_i \) is the probability of choosing the \( i \)th worker bee, \( SR \) is the number of worker bees, \( F \) is the fitness value, \( y_k \) is arbitrarily selected candidate solution \((i \neq k)\).

There are numerous advantages for using the ABC procedure, good updated information to lead the honey bees and the detection of new fields by dance designing.

### 3. Results and Discussion

The aim in this technique is to study various automated segmentation algorithms to enhance the images in melanoma detection that have been utilized in other disease, breast or brain images, for example, and combined altered segmentation methods to have a better performance in segmentation section. Skin cancer segmentation using automatic detection modification depends on enhanced PSO and ABC algorithms.

The ABC algorithm has been executed for categorization of skin tumour’s as benign or malignant (healthy and unhealthy nevi). Construction of an image categorization system for premature skin lesions recognition contains different steps.

Educations on dermatological injuries depend on minor databases, which hinders the overview of ABC models. Our technique results this disadvantage using CNNs are demanded to handle super pixels as opposed to photo images. Also, we calculated the method in a modular parameters of bee colony algorithm where every step of the system (segmentation, extraction, and classification) can be usual as an external factor. So, our technique correspondingly profits from improvements on underlying factors, for example super pixel building procedures and coupled deep-learning. The influence of sensitivity and specificity may make possible a more automated, objective, and reliable analysis.

Outcomes presented that the optimal feature set has been extracted testing to reach high accuracy, sensitivity and high specificity than other obtainable approaches. It designates that more analytic data about the lesion is existing [21-24].
Figure 1. The hierarchy of the block diagram utilized in the high-level performance.

Table 2. presents the parameter values used in the proposed artificial ABC implementation. The values were decided empirically.

| Parameters | Values |
|------------|--------|
| No. of scout bees, n | 300 |
| No. of sites selected for neighborhood search, m | 20 |
| No. of best elite sites out of m selected sites, e | 3 |
|                          |        |
|--------------------------|--------|
| No. of bees recruited for best e sites, nep | 70     |
| No. of bees recruited for the other (m−e) selected sites, nsp | 30     |
| Maximum number of cycles, R               | 2000   |

For experimentation, we randomly selected fifteen melanoma skin lesion images from the PH2 database. Figure 2 shows the malignant melanoma skin lesion images designated for experimentation.

A malignant melanoma skin lesion image is "challenging" if one or more of the unwanted reasons are met such as air or oil bubbles, a low contrast between the lesion and the healthy skin, or the existence of thick and thin hairs. To carry out tests performed in this thesis, three images are randomly chosen from each of the 70 groups of fuzzy borders, low contrast, thin and thick air, inhomogeneous border, air and oil bubbles, and multi-coloured. Figure 3 presents the malignant melanoma skin lesion images chosen in each of the categories for experimentation.

Analysis images of automatic detection for tumours lesions by using ABC segmentation before and after segmentation with boundary by using median filter as shown in figure 4.

![Figure 2. Melanoma skin lesion images chosen from the various database after segmentation by using ABC technique.](image-url)
Inhomogeneous border | Thin hair | Low contrast | Air and oil Bubbles | Fuzzy border | Multicolored | Thick hair

| ![Image](image1.png) | ![Image](image2.png) | ![Image](image3.png) | ![Image](image4.png) | ![Image](image5.png) | ![Image](image6.png) | ![Image](image7.png) |

Figure 3. presents the malignant melanoma skin lesion images chosen in each of the categories for experimentation.

| ![Image](image8.png) | ![Image](image9.png) | ![Image](image10.png) | ![Image](image11.png) | ![Image](image12.png) | ![Image](image13.png) | ![Image](image14.png) |

Figure 4. Analysis images of automatic detection for tumours lesions by using ABC segmentation with a- before segmentation b-after segmentation.

4. Conclusion
This study purposes on classification of different database images using ABC technique. This image can be additional classified for detection of healthy or suspension or unhealthy nevi depend on factors extracted from multiresolution analysis based on bee colony technique to enhance of investigative performance and decrease of unhealthy moles demises. The accuracy can be also be improved using several optimization procedures [25].

Points of development were detected in the studied algorithms, and these points can bring important variances in their results. Moreover, it has been observed that pre- and post-processing stages can be added to get more accurate results, but, these additional approaches must be thoroughly analysed so that they do not cause effects that could compromise results when used in datasets other than those that were initially tested.
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