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JournalName:	**British Journal of Applied Science & Technology**
ManuscriptNumber:	**2014_BJAST_13675**
TitleoftheManuscript:	**AUTOMATED DETECTION OF BREAST CANCER'S INDICATORS IN MAMMOGRAM VIA IMAGE PROCESSING TECHNIQUES**
TypeoftheArticle	**Original ResearchArticle**

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PART1:ReviewComments

	Reviewer'scomment	**Author's comment***(if agreed with reviewer, correct the manuscript and highlight that part in the manuscript. It is mandatory that authors should write his/her feedback here)*
CompulsoryREVISION comments	1 - When describing the first stage of their methodology, the authors indicated Otsu's Method as a segmentation method. Actually, Otsu's Method is used to search a threshold in gray levels images, intending to find out the better level to binarize them. By searching the threshold, Otsu's method assumes that any image contains two classes of pixels (e.g. foreground and background) and calculates the optimum threshold separating those two classes so that their combined spread (intra-class variance) is minimal (Otsu, 1974). You can have an image totally composed by two bits (0 and 1) after applying Otsu's Method, but you cannot find its boundary (or to segment it) only with this method. The question is: How did the authors obtain the contours of the tested images? Did the authors apply some mechanism of edge detection, as Canny or Sobel methods? Anyway: it is extremely important that the authors describe their complete segmentation method. At this point, I strongly suggest the authors to study and cite the following 2 papers, related to this subject: For better understanding the Otsu's Method: **Otsu, N. (1979). A Threshold Selection Method from Gray-Level Histograms. IEEE Transactions on Systems, Man, and Cybernetics. Vol. 9, nº 1:62-66.** A segmentation method that uses Otsu's Method,	

	Mathematical Morphology (including Top Hats) and Canny edge detection (this approach seems to be very similar to the one used in the proposed authors method): **Duarte, M. A., Alvarenga, A. V., Azevedo, C. M., Calas, M. J. G., Infantosi, A. F. C., Pereira, W. C. A. (2013). Segmenting mammographic microcalcifications using a semi-automatic procedure based on Otsu's method and morphological filters. Brazilian Journal of Biomedical Engineering, vol. 29, n.4, pp. 377-388. (http://dx.doi.org/10.4322/rbeb.2013.037)** Besides them, I think it is important to read the next papers, as part of the learning process of the segmentation procedures: Arikids, N. S., Karajaliou, A., Skiadopoulos, S., Korfiatis, P., Likaki, E., Panayiotakis, G., Costaridou, L. (2010), "Size-adapted microcalcification segmentation in mammography utilizing scale-space signatures", Computerized Medical Images and Graphics, v. 34, PP. 487-493. Betal D., Roberts, N., Whitehouse, G. H. (1997), "Segmentation and numerical analysis of microcalcifications on mammograms using Mathematical morphology" British Journal of Radiology, Vol. 70, no 837, pp 903-917. Cheng, H. D., Cai, X., Chen, X., Hu, L., Lou, X. (2003), "Computer-aided detection and classification of microcalcifications in mammograms: a survey". Pattern Recognition, vol. 36, nº 12: 2967-2991. Halkiots S., Botsis, T., Rangoussi, M. (2007), "Automatic Detection of Clustered Microcalcifications in Digital	

	Mammograms Using Mathematical Morphology and Neural Networks". Signal Processing, v. 87: 1559-1568. Jalalian, A., Mashoror S. B. T., Mahmudb, H. R., Saripan, M. I. B., Ramli, A. R. B., Karasfi, B. (2013). "Computer-aided detection/diagnosis of breast cancer in mammography and ultrasound: a review". Clinical Imaging. vol. 37, nº1: 420-426. Paquerault, S., Yarusso, L. M., Papaioannou, J., Jiang, Y. (2004), "Radial gradient-based segmentation of mammographic microcalcifications: observer evaluation and effect on CAD performance". Medical Physics, v. 31, nº 9: 2648-2657. 2 - By describing the Image Enhancement using Top Hat Filtering, the authors don't refer to what kind of structure element they used in this work. Was it a box? Was it a disk? What was the size of this element? Was it used just one structure element in this work? Why this (or these) structure element was chosen? These are other points to elucidate in this work. 3 - The subtractive clustering algorithm (line 213) was not explained in the text. If the authors assumed this is a consolidated theory in the literature, they should cite at least the main researche(s) that firstly described this technique. The same occurs for the fuzzy rules. There are several fuzzy techniques in the literature and several appliances for this kind of technique. The authors used the FIS model, but didn't explain it or cited the main source for this method. 4 - Please, consider the last comment also for the GLCM feature extraction technique.	

	5 - Figure 5 shows images with so many structures besides calcifications, mass or stellate lesion. To separate these lesions from the breast contour, artifacts, lobules and so forth seems to be extremely difficult, even though the observer knows where they are. In this method, how much was it time consuming to perform this task? 6 - The authors used just three images trying to prove their method is fine. To test a method with just three images seems to be, at minimum, amateur. I don't believe the authors wanted to prove an automated detection method for breast cancers indicators with just three images. Of course, if you have three classes and three results, it would be one result for each case. What if testing a supposed fourth image, you have an output of 0.5566? Would it be a calcification or a mass? I strongly suggest more images to be testing or, if these tests were already done, I suggest including their results (tables and discussions) in the text, emphasizing the criterion used for lesions classifications. 7 - The item 4. Results and Discussion is a little bit confuse, containing a significant part of the methodology described in the item. For example: the definition of contrast, homogeneity and energy (lines 264 to 271) could be in the item 3.2.1. Also, the FIS model is briefly positioned in the discussion and it should be explained in the proposed model description. 8 - In the conclusion, the authors were not clear why the results proved the method will be useful to "assist the medical staff in the early detection and evaluation of this terminal disease". I really believe this conclusion cannot be taken considering the tests with just three images. It seems that is a lack of text after line 298 and before the last sentence, where the authors affirmed the method is	

	really useful for what it is supposed to do. In this case, after new tests, I suggest the authors briefly describe, in the conclusion, why they think the method is useful to assist doctors in the breast cancer diagnosis task, based on reliable results. 9 - There is a lack of references in the text, for some authors affirmations, as in the following cases: - Lines 35 to 40: who did describe these 3 indicators as the ones that turn possible the classification (or diagnosis) of breast cancer? - Lines 45 to 47: Some experts... Who are these experts? What are these concerns? Besides these examples, I noticed the lack of references for the authors affirmations in the lines: - Lines 66 to 70; - Lines 101 to 104; - Lines 111 to 114; - Lines 117 to 122; - Lines 124 to 126; - Lines 128 to 135; - Lines 137 to 146; - Lines 147 to 151; - Lines 191 to 195; - Lines 204 to 206; - Lines 207 to 215; - Lines 218 to 222; - Lines 224 to 225; Unless the authors performed the researches that prove these affirmations (and if this is the case, the authors should explain these affirmations), their sources should be cited and, of course, should appear in the References. 10 - The item 2 (Related Concepts) takes 3 pages of the text (27% of 11 pages) and should be summarized, since	

	it is not the central theme of the work. For example, the lines 79 to 82 bring another concept of breast cancer, already explored in the lines 66 to 68. The authors should summarize them in an unique paragraph. 11 - Finally, I also suggest a complete review of the language. Maybe, the authors could be assisted for a professional reviewer.	

Minor REVISION comments	12 - I suggest some changes in the text, intending to facilitate the reader to understand better some sentences. Examples are: - Line 11: This paper proposes... - Lines 20 to 21: The results... - Line 39: Mammogram is capable of showing at least three indicators that... (I think there are much more than three indicators for breast cancer. I will also suggest some works to the authors about it). Lines 40 to 41: ... mammalian breasts, such as mass, calcifications and the stellate lesion. Line 50: Change "One of these methods could be achieved through different image processing techniques " for: Several of these methods are based on image processing techniques. Lines 79 to 88: The authors should better organize this paragraph (punctuation and places for defining malignant and benign lesions). They started by defining cancer. After, the authors define benign lesion, followed by another characteristic of the cancer lesions. Before changing this paragraph, the authors should read the commentary 8 in this review. Line 91: Breast cancer can take years... Line 137: Instead of writing "The image used for this paper..." consider to write: The images used for testing the proposed method... Line 170: Flowchart of the Proposed Model. 13 - The citations in the text should be numbered in order of appearance and not as placed in the References, in alphabetical order. In truth, in the references, the cited articles should also appear in the same order they are presented in the text. Thus, Spratt (2008) should be numbered as the first reference, since it is the first citation in the text (line 34). In the line 34, the number should be [1] and in the References, Spratt, K. (2008)	

	should be the first article, also numbered as [1]. The authors should follow the BJAST orientation for each cited work. Besides: - Line 177: Fu et al. (2005) should be cited in the text with its correct number. - Line 194: Mohamed (2009) should be cited in the text with its correct number and should be included in the References. 14 - The text format should agree with the BJAST terms, so I would appreciate the authors made a fine review of these policies, correcting the text in this sense. Examples are in lines: - Lines 108, 137, 176, 191, 204, 270, and so forth. 15 - Lines 53 to 59 (The primary purpose... As a result of the availability of these algorithms) are completely unnecessary to be in the introduction of this work. The authors can cut them up, initializing the next paragraph as: This paper proposes an image-based... 16 - Figures should be in a context before appearing in the manuscript. Figure 2 simple shows up without an explanation. Actually, the explanation appears after the figure. I suggest a new arrangement of the lines 236 to 238, putting them before figure 2 (The original images (figure 2) were read...). 17 - Figures (pages 8 and 9) indicate images a, b & c, but tables show images 1, 2 & 3. I assumed a, b and c correspond, respectively, to 1, 2 and 3. Anyway, I suggest the authors to use just one kind of classification for the figures and its correspondence results in the tables: numbers or letters.	

Optional/Generalcomments	This work proposes a method based on image processing for automatically detect breast cancer indicators from mammograms. The authors believe the method can be used to assist radiologists, helping at improving the accuracy of breast cancer diagnosis. The theme is strongly relevant, once breast cancer is one of the main cause of women death in the world. However, the way it is right now, this work has several flaws. Some of the flaws are regarding to the text formatting, that needs some adjustments to obey the Journal rules. Unfortunately, there are flaws regarding to the methodology, that the authors should correct, if they intend to publish their work in this serious Journal. So, I indicated the manuscript to a Serious Major Revision (grade: 5.1), giving the authors a chance to rebuild the text, correcting these flaws I pointed out in the last lines.	

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