

Jorunal working document based on MedIA reviews
March 20, 2014

Reviewer 1

ci

^{ci} *Fab: Ignore this reviewer*

- Manuscript Rating Question(s): Scale [1-5]
- The paper is of enough importance to warrant publication in MedIA 2
- The paper is technically sound 2
- The paper describes original work 3
- The work is of interest to the MedIA audience 3
- The paper contains material which might well be omitted 2
- The paper makes adequate references? 2
- The abstract is an adequate digest of the work reported 2
- The introduction gives the background of the work 2
- The summary and conclusions adequate 3
- The authors explain clearly what they have done 2
- The authors explain clearly why what they did was worth doing 3
- The order of presentation is satisfactory 3
- The English is satisfactory 2
- If there are color figures included, are they helpful/necessary? 2
- If there is a video, is it helpful/necessary? N/A

Comments

1. The paper is very poorly written. There are too many typos and grammatical errors that make the paper very difficult to comprehend.
2. Many terminologies are described and utilized wrongly and unsuitably.
3. Many important articles are missing.

Reviewer 2

- Manuscript Rating Question(s): Scale [1-5]
- The paper is of enough importance to warrant publication in MedIA 3
- The paper is technically sound 2
- The paper describes original work N/A
- The work is of interest to the MedIA audience 3
- The paper contains material which might well be omitted 2
- The paper makes adequate references? 2
- The abstract is an adequate digest of the work reported 2
- The introduction gives the background of the work 3
- The summary and conclusions adequate 3
- The authors explain clearly what they have done 3
- The authors explain clearly why what they did was worth doing 3
- The order of presentation is satisfactory 2

- The English is satisfactory 3
- If there are color figures included, are they helpful/necessary? 3
- If there is a video, is it helpful/necessary? N/A

Abstract

This paper reviewed prevailing segmentation algorithms of breast lesions from Ultrasound images. The selected topic attracts me at first, but my enthusiasm rapidly reduced for the following reasons. First the authors failed to persuade me the novelty of this paper in comparison with other existing review papers ^{c1}(H. D. Cheng 2010, Jalalian 2013), and, more importantly, I fail to see ^{c2}the potential benefit this paper would contribute to the relative community. Second, the paper is way too redundant and poorly organized, which would bring plenty of burdens for the reader to follow.

^{c1} *sik*: These two surveys are set as detection, segmentation, classification. Jalalian is a replication of Cheng2010 with 3years update.

^{c2} *Fab*: Obtaining the results on a common database has added value

General comment

1. What kind of the audience did the authors try to target? In my opinion, a survey paper should far beyond the summarization of the journal papers. Instead, the authors need to share their professional interpretation of the development in this area (i.e., segmentation in breast ultrasound image) at a relatively high level, rather than paying unnecessary attention to technical details. In the meantime, I would appreciate the authors ^{c3}to cover the basic knowledge background, state of the art, ^{c4}and existing challenges, which would potentially make this paper beneficial to researchers at different skill level. I recommend the authors to refer to Tobias Heimann et al. 2009 Medical Image Analysis paper for writing reference.
2. This paper lacks novelty. There are already papers published about general review of ultrasound image segmentation (e.g., J. A. Noble 2006, ^{c5}J. A. Noble 2010, ^{c6}K. Saini 2010, etc.), and specifically focused on implementation in breast (H. D. Cheng 2010, Jalalian 2013). I have no doubt there are lots of developments recently, but the authors failed to convince me why another survey paper is needed again now? Especially when I notice a lot of overlaps between this paper and other existing survey papers. I highly suggest the authors consider the last survey paper (H. D. Cheng 2010, Jalalian 2013) as the baseline, and ^{c7}justify/highlight the value/contribution of this draft. Also, maybe focus on the more recent works, that brought the breakthrough to this field, is a good start point.
3. This paper is way too redundant and disorganized which not

^{c3} *sik*: a review of how ultrasound images look like and the problems that they offer (like shadowing) with image examples might be handy. Similarly to what we did for the section 1.3.2 Elements degrading BUS images, of my thesis

^{c4} *sik*: when presenting the image degradations

^{c5} *sik*: it differed from our goal

^{c6} *sik*: I was not aware of this one, but it looks really similar to Noble2006. I have not gone deeply through it yet.

^{c7} *sik*: we should clearly state it

only wears down the readers' patients but also confuses them. For instance, the reviewed methodologies were shown in Figure 2, ^{c8} which is neat and clear, but then the excessive 20 pages introduction seems chaotic I would suggest the authors find a smart way to demonstrate and connect these algorithms, e.g., using the figure or table to review the information. In addition, for method section, the "Features" section sounds like a fragment in comparison with other sections, better structure is needed here. Same problem exists for "Segmentation Assessment" section: ^{c9} I agree that it is worth to review the assessment algorithms, as well as the inter- and intra- grader observation, but for ^{c10} "the inter- and intra-grader observation" would be more appropriate to show up in the introduction part. Therefore, restructure and reorganization are necessary. Section1 and section2 are overlapped. Choose one way to categorize all the works and discuss all the works the authors surveyed within one consistent categorization.

^{c8} *sik*: This figure can be improved by using the figure of the Thesis presentation and use it to drive the text.

sik
change methods summary figure

^{c9} *Fab*: keeping it was the right thing.

^{c10} *sik*: the inter- intra observer experiment can be placed at the introduction to describe how challenging images are, maybe reporting some statistics about which images are more easy or difficult and link it to the US artifacts, which by the end is what the methodologies would be challenged with

Detailed comment

1. I would suggest the authors delete Figure 1 since it is pretty obvious what the authors intend to demonstrate.
2. For the fully-guided algorithm, only one recent paper falls into this category. In addition, there is no segmentation evaluation result for it as shown in Table 1. I would suggest deleting it.
3. Figure 8 is very interesting effort to show, however, it solely represented results already published, which shows no extra value of showing it again.
4. Lots of reference citations show up twice within the context.
5. Reference Pons, G. 2013 should be titled "Evaluating Lesion Segmentation on Breast Sonography as Related to Lesion Type."

Reviewer 3

- Manuscript Rating Question(s): Scale [1-5]
- The paper is of enough importance to warrant publication in MedIA 5
- The paper is technically sound 3
- The paper describes original work 4
- The work is of interest to the MedIA audience 4
- The paper contains material which might well be omitted 4
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- The abstract is an adequate digest of the work reported 1
- The introduction gives the background of the work 3
- The summary and conclusions adequate 2
- The authors explain clearly what they have done 2

- The authors explain clearly why what they did was worth doing 3
- The order of presentation is satisfactory 4
- The English is satisfactory 2
- If there are color figures included, are they helpful/necessary? 2
- If there is a video, is it helpful/necessary? N/A

Comments

This paper gives a comprehensive categorized overview of different techniques for lesion segmentation in breast ultrasound images, and in addition it also gives a review of different evaluation methods to evaluate the performance of these segmentation algorithms.

Lesion segmentation in ultrasound images is gaining importance as the use of ultrasound imaging for breast cancer screening is increasing due to breast density laws and awareness. New ultrasound screening options such as 3D breast ultrasound are increasing the need for computer assistance and thus as a consequence automated lesion segmentation. Therefore I believe that the review article ^{c1}is of value to the readers of MedIA. Whether this warrants a 62 page overview is debatable. The authors might consider shortening the paper in some areas.

The grammar and use of the English language at some points needs improvement. This is especially true for the abstract, e.g.:

- "the success of treatment contributing to its early detection through screening" perhaps should read something like "success of treatment can be attributed to".
- "the most discriminative signs for diagnose are subject to..." -> "...signs for diagnosis are subject..."
- "Therefore, the importance to develop segmentation procedures to properly delineate lesions in breast US images in order to improve Computer Aided Diagnosis (CAD) systems." -> Probably should be something like "Therefore it is important to".

Also there seems to be something going wrong with the citations. There are often double names present e.g. "Hong et al. Hong et al. [2005]".

What seems to be missing for a review paper is the inclusion criteria for the papers added to the review. ^{c2}How were the papers selected that are being discussed. Is this a comprehensive list, is this at random? I think the search strategy should be documented..

^{c1} *sik*: which journal are we targeting, MedIA again?

use english suggestions of reviewer 3

write suited for the referencing format needed for the target conference

^{c2} *sik*: It can be documented using Heimann2009 as example which is not that different of what we did. Heimann snippet can be found at the here as a inline todo

To ensure comprehensive coverage, we have screened all publications included in IEEE Transactions on Medical Imaging and Medical Image Analysis during the last 10 years for articles related to shape models. In addition, we have included a large number of articles from other international journals, but also numerous conference and workshop papers which present good ideas, but which have not been published in any journal yet. Our main source of references was the Internet; we have searched for the terms shape model and statistical model on PubMed, IEEE-Xplore, Citeseer and Google. We have also followed the references encountered in papers from these sites, until we had collected a comprehensive library of more than 400 articles on the topic. In case we encountered several papers from one author about the same subject, we generally picked the most detailed one for this review.

^{c3}In believe that some essential methods are missing such as cell-based contour grouping by ^{c4}Cheng et al, Radiology, 2010 Jun; spiral-scanning based dynamic programming used in a CADx paper by ^{c5}Tan et al. TMI, 2012 May;31(5) and a clustering method such as ^{c6}Shan et al. MP, 2012 Sep(9).

In my opinion the paper would greatly benefit from a better explanation of the problems encountered when dealing with lesion segmentation in ultrasound images, and why some methods are better suited than others. The authors mention "strong noise natural of US imaging" and "presence of strong US artifacts", but don't further explain how these make the task of lesion segmentation more difficult. It would be good if the authors would mention for example the ^{c1}posterior shadowing that often results from lesions, and how this affects lesion segmentation.

I think that the authors could remove the link that they try to make between the semi-automatic methods and CADE initialization in their paper. All semi-automatic methods requiring some seed point could probably be made auto-guided, by using CADE to provide the seed point. Perhaps a categorization based on the extent of user-interaction could be considered (e.g. 1 seed point, 1 point inside 1 point outside the lesion, a bounding box, an initial contour).

It would be nice to read in the conclusion what the strengths and weaknesses are of the described methods and what the current trends are, which problems need to be solved, and where we can expect improvements in the near future.

^{c3} sik: I dont agree on this one, at least with the examples the reviewer give, but what can I say.

^{c4} sik: I missed that one, but is one of the 100 remakes this people does, its predecessor method was in the survey

^{c5} sik: This one looks promising but its in 3D which we completely skipped

^{c6} sik: we got this one on the pull, but we skipped for bad. Maybe I should had to do so.

^{c1} sik: If we start with the images appearance and problems then we can draw this sort of conclusions, the problem is that no author give this information. So unless we have segmentations to discuss and exemplify I have no idea how to address it.

TODO

Todo list

change methods summary figure	3
use english suggestions of reviewer 3	4
write suited for the referencing format needed for the target conference	4
To ensure comprehensive coverage, we have screened all publications included in IEEE Transactions on Medical Imaging and Medical Image Analysis during the last 10 years for articles related to shape models. In addition, we have included a large number of articles from other international journals, but also numerous conference and workshop papers which present good ideas, but which have not been published in any journal yet. Our main source of references was the Internet; we have searched for the terms shape model and statistical model on PubMed, IEEE-Xplore, Citeseer and Google. We have also followed the references encountered in papers from these sites, until we had collected a comprehensive library of more than 400 articles on the topic. In case we encountered several papers from one author about the same subject, we generally picked the most detailed one for this review.	4