

A criticism to the thesis titled „Analysis of Iteratively Reconstructed CT Data: Novel Methods for Measuring Image Quality“ authored by Petr Walek

The objective of this work was to analyze the quality of selected iterative reconstruction methods from CT data. The inspected methods included in particular the two approaches: iDose and IMR. The topic of the thesis is topical and definitely deserves the attention.

Comments to the text

The text is written in English, however contains many systematic typos and grammar mistakes. The mixture of Czech and English language can be found in the text. Some plots are too small and illegible. It seems that the text was created by merging the individual conference/journal paper together. As a result, the individual chapters use different math notations which is a bit confusing. It might be better, easier and less error prone if the thesis was just a collection of commented papers. The text might be also markedly improved by some proof-reading service. Despite of these shortcoming, the text is comprehensible and explanatory.

The structure of the text is logical and introduces Petr Walek's research topics in a step by step manner. The text of the thesis is dominated by the two chapters: „Data preprocessing“ and „Evaluation of noise properties of data reconstructed by iDose method“, which I understand to be the main contributions of Petr Walek to the field of biomedical signal processing. These two chapters are written in a exhausting way and clearly explain the author's ideas. On the other hand, the chapter one, that should cover the state of the art is very short and would deserve more attention. The first part of this chapter (pp 16-23) resembles rather the motivation and introduction to the given field. The survey of the current reconstruction methods is squeezed into two pages (pp 24-25) only. I am missing the explanation of whether other methods are working well/better/worse compared to each other and to the inspected iDose and IMR. As a result, the thesis describes the way, how to measure the quality of the CT data if using iDose or IMR, but no comparison to the competing methods is given. Similarly to the state of the art I found the fifth chapter titled „Comparison of FBP, iDose, and IMR method by fidelity of anatomical structures reconstruction“ to be very short and brief. The pivotal part of the chapter describes the subjective evaluation of image quality. I feel that this evaluation should deserve the same attention as the analysis of noise power spectra in the previous chapter. Is this chapter supported by any of author's publications?

Questions to the text

- Explain, why the spatially adaptive windows function (SAW) brings so dramatic improvement (ten times better) of the error function SIE (segmentation introduces error) for most of the tissues?
- The sections 3.2 and 3.3 are dedicated to segmentation and segmentation correction. Have you measured the quality or accuracy of this proposal?
- Compare iDose and IMR methods to other currently available iterative methods. Discuss the advantages and disadvantages.

Comments to author's publication results

According to SCOPUS service, the author of this thesis is the main author of 2 conference papers and 1 journal paper. Further, he is also a co-author of one conference paper and two journal papers. Most of author's work was published and presented at just one international conference – WSCG and the associated journal. According to CORE2018 rank, this conference is classified as „B“, which means a good level. Nevertheless, inspecting the conference venue I have a feeling that the author has not traveled abroad for any other similar international conference yet. This fact is not crucial for assigning him the Ph.D. title but less experience caused by not visiting the other institutes in foreign countries may inhibit his progress in this future carrier.

Decision

The author of this thesis submitted the thesis together with several published conference and journal papers. Taking into account his publication results, I recognize him as a person who is able to publish his results in good-quality international conferences. Nevertheless, submitting the papers to A-rank conferences or high-quality journals would require paying more attention to comparative studies. Regarding the submitted thesis, the methodology is well described and it is the strongest part of the work, however it has a very weak state of the art. During the defense, I would like the applicant to present other iterative reconstruction methods and describe how these are evaluated. Currently, my decision whether the thesis can be accepted as the dissertation thesis is borderline.

In Brno, Oct 1, 2018

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doc. RNDr. David Svoboda, Ph.D.

*Centre for Biomedical Image Analysis
Faculty of Informatics, Masaryk University
Botanicka 68a, 602 00 Brno*