Editorial

Erik Schkommodau

Imaging is all!

DOI 10.1515/bmt-2016-0153

The human is an animal with a strong relationship to visual perception. Maybe that is the simple reason why we "believe" what we see more than what we hear.

In medicine image based diagnostics are an established part of modern treatment procedures. Especially tomographic imaging methods reproduce reality with a high density of information in a spatial reference system. Nevertheless, this high density of information includes a drawback for the data consumer. The separation of useful and negligible information is difficult. The reasons besides the mentioned density are imperfect screens, resolution limits, signal noise from different data processing steps, artifacts and background knowledge of varying levels of the user.

The articles in this special issue propose different ways to make the essential information visible. The parameter optimization of the image acquisition step itself for instance has enough degrees of freedom to improve the quality of the resulting images (Suttmeyer et al. [6]). The article by Feng et al. [1] deals with the problem of moving objects like a beating heart. The authors address the processing step after raw data acquisition and demonstrate that there is still room for improvement. Another topic concerns the huge amount of data that the end user receives. Finding the significant anatomical structure in an automated way is still the subject of research after many years. Four articles accepted this challenge and propose specialized methods to reduce the diagnostic workload for the involved physicians. Salman Al-Shaikhli et al. [3] introduce a new method based on constrained Mahalanobis distance to automatically identify liver structures in 3D. Tumor detection in the brain could be supported by a fully automatic approach developed by Salman Al-Shaikhli et al. [4]. The article describes a two-step method based on classification and segmentation using sparse coding and dictionary learning. The team of Wang et al. [7] took another way to identify brain structures by proposing a particle swarm-based approach in three different variants. The last article on this topic uses tomographic data as a basis. In 2D pictures the segmentation of lesions in the eye also needs high processing efforts [5]. Santhi et al. proposes and compares combined region growing algorithms to detect different types of lesions in the eye.

Not only algorithms can help to overcome imaging challenges the protection of the patient and personal against harm during image acquisition sessions is also the subject of ongoing research. An interesting approach concerning this topic is presented by Luo et al. [2]. The application of high dielectric material could protect the fetus of pregnant women during magnetic resonance imaging (MRI).

To summarize this overview about the imaging topic: general solutions for automatic classification or segmentation questions will not be available in the future. In fact every special diagnostic task needs its own algorithm or approach. The complexity of the proposed solutions is increasing. Multistep and combined algorithms are state of the art. The predictability of methods in an altered environment is limited. This means from my point of view that we need:

- clear and comprehensible description of solutions,
- a medical validation as close as possible to practice,
- the possibility of repetition of validations and their publication

With developing imaging hardware and computer technology we will be able to improve the imaging field into the future. I personally expect very strong driving forces and new questions from the medical big data initiatives. The fascination in the field of imaging research is already here as can be seen in the articles.

References

[1] Feng X, Xie G, Liu X, Qiu B. A kernel method for higher temporal resolution MRI using the partial separability (PS) model. Biomed Eng-Biomed Tech 2016; 61: 393–400.

[2] Luo M, Hu C, Zhuang Y, Chen W, Liu F, Xin SX. Numerical assessment of the reduction of specific absorption rate by adding high dielectric materials for fetus MRI at 3 T. Biomed Eng-Biomed Tech 2016; 61: 455–461.

[3] Salman Al-Shaikhli SD, Yang MY, Rosenhahn B. 3D automatic liver segmentation using feature-constrained Mahalanobis distance in CT images. Biomed Eng-Biomed Tech 2016; 61: 401–412.

Brought to you by | Universitaetsbibliothek Basel
Authenticated
Download Date | 4/29/19 3:38 PM

[4] Salman Al-Shaikhli SD, Yang MY, Rosenhahn B. Brain tumor classification and segmentation using sparse coding and dictionary learning. Biomed Eng-Biomed Tech 2016; 61: 413–441.
[5] Santhi D, Manimegalai D, Parvathi S, Karkuzhali S. Segmentation and classification of bright lesions to diagnose diabetic retinopathy in retinal images. Biomed Eng-Biomed Tech 2016; 61: 443–453.
[6] Suttmeyer B, Teichgräber U, Rathke H, et al. Initial experience with imaging of the lower extremity arteries in an open 1.0 Tesla MRI system using the triggered angiography non-contrast-enhanced sequence (TRANCE) compared to digital subtraction angiography (DSA). Biomed Eng-Biomed Tech 2016; 61: 383–392.
[7] Wang S, Phillips P, Yang J, Sun P, Zhang Y. Magnetic resonance brain classification by a novel binary particle swarm optimization with mutation and time-varying acceleration coefficients. Biomed Eng-Biomed Tech 2016; 61: 431–441.

***Corresponding author: Erik Schkommodau,** University of Applied Sciences Northwestern Switzerland, Institute for Medical Technologies, Gründenstrasse 40, 4132 Muttenz, Switzerland, E-mail: erik.schkommodau@fhnw.ch

Brought to you by | Universitaetsbibliothek Basel
Authenticated
Download Date | 4/29/19 3:38 PM