Prof. Ewaryst Tkacz, Ph.D., D.Sc., (Eng.)   Zabrze, May, 29th 2017

Silesian University of Technology

Faculty of Biomedical Engineering

Department of Biosensors and Biomedical

Signals Processing

Roosevelt'a Street 40-40a

41-800 Zabrze, Poland

Review

(of Ph.D. thesis elaborated by Ms. Alejandra Consejo, M.Sc., under supervision of both Prof. D. Robert Iskander, Ph.D., D.Sc. (Principle supervisor) and Hema Radhakrishnan, Ph.D. (Co-supervisor) entitled: "The anterior eye surface: age, accommodation and contact lens wear")

Introduction

Last decade can be definitely characterized, from the certain point of view, by the rapid growing of processing of different kinds of data. Among many kinds of data, there is a significant part, which belongs to biological/biomedical data. It is relatively easy to find out the reason of the mentioned above fact. With no doubts, the reason is in enormous development of both software and hardware applications in many measuring processes.

Taking into account mentioned above, it is necessary to clearly emphasize, that the subject of the presented to review Ph.D. thesis is far more than just actual. It appears that it will have a lasting effect on the evolution of the art such as measuring processes in biomedicine.

Statistics

The submitted to review and estimation thesis has 146 pages divided into 6 chapters and is ended up with a summary. Except that, the part including bibliography is added and it counts 192 positions, which can be treated as very extensive elaboration. The other features of the nicely elaborated thesis are satisfied as well, i.e. the thesis is equipped with lists of abbreviations and

symbols, figures and tables. Therefore, from the pure editorial point of view, I have no doubts that presented elaboration has been performed by well qualified scientific worker with high capabilities giving a very clear impression to the reader. The first chapter entitled: "The anterior eye surface" is devoted to the presentation of the introductory literature review related to the topic of the thesis. It is focused on the individual description of the main components of the anterior eye surface: the cornea, the limbus and the sclera. Chapter two entitled: "The measuring device: The Eye Surface Profiler (ESP)" presents or better constitutes the first part of the methodology. It delivers an overview of the state of the art in corneal topographers and examines precisely and deeply the principles of operation of the corneo-scleral topographer applied as the principal measuring device along the whole dissertation. The Chapter 3 entitled: "Algorithms for limbus demarcation" can be considered as a second part of the methodology section described previously. It presents two basic models for corneo-scleral transition demarcation from 3-dimentional height data. Following that the Chapter 4 comes, entitled: "Mean shape of the human limbus", where the Author starts to present the beginning of the results of her investigations. For the first time, the mean shape of the topographical limbus in normal human eyes is presented. Then in the Chapter 5 entitled: "Scleral changes with accommodation" studies in depth how the scleral shape is affected during accommodation. Taking results from the part of research it further assesses differences in this phenomenon between age groups and between different refractive power groups. Finally the Chapter 6 comes entitled: "Limbal changes after short-term soft contact lens wear". All the mentioned above chapters are followed by a Summary with concluding remarks. The introductory part of the dissertation is ended up with the nice formulation of the aim the whole work and it sound like follows: "… The aim of this work is to accurately describe the shape of the anterior eye surface and study how it changes under certain conditions, such as ageing, accommodation and contact lens wear…"

Substantive part of thesis

The presented dissertation is edited with the clear signs of professionalism. Every Chapter excluding the first one starts with the shaded rectangle informing the reader about it's purpose, presented inside methods, obtained results and adds at the end conclusions coming out from the particular chapter. This is an unusual approach, which personally I like a lot, as starting to read

the particular chapter the reader obtains a kind of impression what are the problems, which are supposed to be sorted out in the particular part of thesis. Inside each Chapter there are rectangles with enlarged fonts emphasizing the most important results obtained inside according to the Author. It helps a lot to concentrate attention on that particular formulation and allows to neglect a little bit the rest as less important. Another new thing, which is worth to underline is a grey-shaded rectangle with dashes line around summarizing "…what was known…" and "…what this contribution adds…". For example the Chapter 2 is ended up with: "… Measurement of the topography of the anterior eye is limited in devices, which covering range is restricted to the corneal region…" – that is something what everybody dealing with that subject knows. However the contribution of Ms. Alejandra Consejo research allows to conclude that "… The ESP is a non-contact, repeatable and trustable device that allows accurately measuring the 3-dimensional anterior eye surface topography to a range beyond 18 mm chord…". Each particular Chapter ends up with a list of most suitable references, where own positions are included as well.

The described way of research presentation, gives the reader a very clear image concerning influence of presented to the review thesis in the scientific discipline. There is no single doubt what was done and what was achieved reaching the main aim of the presented dissertation. Personally I have to say, with sufficient emphasis, that the area of Ms. Consejo research is extremely difficult, as currently available technology involved in the generally speaking eyes measuring processes is on extremely high level. Having many times my eyes checked I would really consider if anything can be improved. The presented dissertation proves however, that a lot of work still can be done. So I would like to express the wish that Author of this dissertation will continue that research with great scientific achievements in the future.

Conclusions

Taking into account previously mentioned facts, it has to be clearly and emphatically said that both the main objective as well as all the sub-goals have been reached producing satisfactory results.

Therefore my final conclusion is that Ms. Alejandra Consejo fulfilled with oversize usual requirements concerning the quality of elaborated Ph.D. dissertation. Fortunately, the reviewer

has been equipped with information concerning the list of dissertation author's publications. All 5 publications are indexed on WoS database and I hope very soon the bibliometric parameters such as citations and h-index will increase significantly. At the level of application to obtain a Ph.D. degree the scientific achievements of Ms. Alejandra Consejo are far more than just sufficient.

The only possible conclusion, in the light of all the above mentioned facts is to vote "for" granting to Ms. Consejo the Ph.D. degree and this is my recommendation. Additionally, using the privilege of the reviewer, the board responsible for Ph.D. granting procedure may consider to grant mentioned Ph.D. degree with distinction.