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Image Processing in Optical Coherence Tomography

using Matlab

University of Silesia 2011

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PREFACE

Dear Readers, the book you have in your hands is a summary of research carried out at the Department of Computer Biomedical Systems, Institute of Computer Science, University of Silesia in Katowice in cooperation with the team of Prof. Edward Wylęgała, D.Sc., M.D. This cooperation resulted in the creation of methods for ophthalmologists support in OCT images automated analysis. These methods, like the application developed on their basis, are used during routine examinations carried out in hospital.

The monograph comprises proposals of new and also of known algorithms, modified by authors, for image analysis and processing, presented on the basis of example of Matlab environment with Image Processing tools. The results are not only obtained fully automatically, but also repeatable, providing doctors with quantitative information on the degree of pathology occurring in the patient. In this case the anterior and posterior eye segment is analysed, e.g. the measurement of the filtration angle or individual layers thickness.

To introduce the Readers to subtleties related to the implementation of selected fragments of algorithms, the notation of some of them in the Matlab environment has been given. The presented source code is shown only in the form of example of implementable selected algorithm. In no way we impose here the method of resolution on the Reader and we only provide the confirmation of a possibility of its practical implementation.

The book is addressed both to ophthalmologists willing to expand their knowledge in the field of automated eye measurements and also primarily to IT specialists, Ph.D. students and students involved in the development of applications designed for automation of measurements for the needs of medicine.

This book is available free of charge in an electronic version. The authors agree to disseminate, duplicate and use in any way free of charge this book. A commercial use of algorithms and images presented is protected by law.

The authors thank cordially Prof. Edward Wylęgała, D.Sc., M.D. and his team for the provided images and valuable guidance and consultations.

5 SUMMARY

The considerations presented confirm the thesis that it is possible to develop a fully automated IT tool assisting doctor's work. The algorithms presented in fragments provide a foundation for their further modifications and profiling for a specific OCT instrument. These modifications should comprise not only the selection of algorithm parameters but also a change of spatial or colour resolution. It is not excluded that a correction of function responsible for reading a DICOM image will be possible. All the corrections mentioned already constitute a marginal contribution as compared with development and testing of a specific solution – what has been presented in this monograph. However, it is necessary to remember that the field of image analysis and processing has been developing very dynamically and with time better and faster, than presented here, methods for OCT images analysis and processing will be appearing. Despite that the authors hope that this monograph will be helpful to Readers not only during developing applications assisting doctors in OCT images diagnostics, but also will provide a basis to develop new original algorithms.

The most recent version of the monograph will be always available for downloading from the site http://robert.frk.pl under 'books' bookmark.

In addition, examples of algorithms presented in this monograph including test images are displayed on this site.