بسم الله الرحمن الرحيم

شبكة المعلومـــــات الجامعية

التوثيق الالكتروني والميكروفيلم

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الالكتروني والميكروفيلم

﴿ قـــســـم ﴾

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأفلام قد اعدت دون آية تغيرات

يجب أن

تحفظ هذه الأفلام بعيداً عن الغبار

في درجة حرارة من 15 – 20 مئوية ورطوبة نسبية من 20-40 %

To be kept away from dust in dry cool place of
15 – 25c and relative humidity 20-40 %

بعض الوثائق الأصلية تالفة

بالرسالة صفحات

لم ترد بالأصـــل

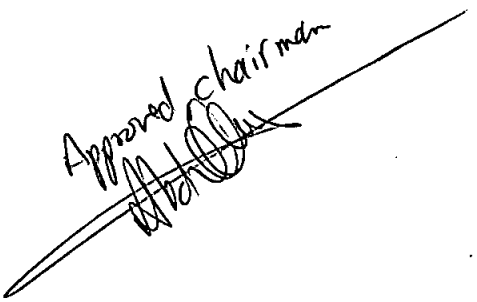
AUTOMATED RETINAL VASCULATURE TRACKING IN GRAY-SCALE & COLOR DIGITAL FUNDUS IMAGES

By

Islam Abdul-Azeem Fouad Abdul-Kader

B. Sc. of Systems & Biomedical Engineering
Faculty of Engineering
Cairo University

A Thesis
Submitted to the Faculty of Engineering at Cairo University
In Partial Fulfillment of the Requirements for the Degree of
MASTER OF SCIENCE
In Systems & Biomedical Engineering



FACULTY OF ENGINEERING, CAIRO UNIVERSITTY
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ABSTRACT

Some of the most common blinding conditions are caused by choroidal neovascularization (CNV). The relevant conditions include diabetic retinopathy and age-related macular degeneration. At present, the only proven modality of effective treatment is the application of laser energy to the CNV to cauterize the vessels. The key to effective and lasting treatment is the identification of the full extent of the CNV, complete cauterization of the CNV by accurately aiming an appropriate amount of optical energy while ensuring that healthy tissue is not cauterized. Despite the superiority of laser treatment over other available methods, serious problems remain. The current rate of success of this procedure is less than 50% for eradication of the CNV following one treatment session with a recurrence and/or persistence rate of about 50%. The latter condition requires re-treatment. Each re-treatment, in turn, has a 50% failure rate. The visual recovery declines with each successive treatment. Indeed, several studies indicate that incomplete treatment was associated with poorer prognosis than no treatment.

Because the eye and hence the retina is a moving object, a motion tracking method is required to update the position of laser shots according to the movements of the retina. A new computer-controlled instrument was developed in an attempt to minimize the above-mentioned failure rate.

In this work, we designed many of the feature extraction and detection of motion parameters algorithms that may be required in the process of retinal vasculature tracking.

Many extraction techniques were applied to discern the retinal blood vessels tree and determine the positions of laser shots in a reference frame. A comparison between the used algorithms in retinal image extraction was done. We first used the difference operators in the blood vessel tree extraction as Sobel, Prewitt, Roberts and Canny operator that gives the best results in a comparison to the other three operators. Then, we used the image statistics by DBDED, which stands for "Decision Based Directional Edge Detector", but, it could not detect all edges completely and to obtain the boundaries of small blood vessels, more edges will appear. Also, we tried to

extract the core of the blood vessel tree by matching the image with a Gaussian filter that produces good results. The retinal image extraction using the morphological methods is also tried by both the morphological gradient and morphological reconstruction that give acceptable results.

The blood vessel tree is well extracted using deformable models, in which a grid of seed contours over the whole image is initiated and allowed to deform by splitting and/or merging according to preset criteria until the whole vessel tree is extracted. This procedure extracts the boundaries of the full extent of the blood vessel tree.

Faster extraction can be obtained for subsequent images by automatic registration to compensate for eye movement and saccades. Registration techniques were applied and the results of each were compared to estimate the best one.

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