Diabetic retinopathy screening with computational support

Adrienne Csutak¹, Balint Antal², Istvan Lazar², Tunde Peto³, Zsolt Torok⁴, Attila Biro⁵, Andras Hajdu²

University of Debrecen, Medical and Health Science Center, Faculty of Medicine, Departments of Ophthalmology¹ and Faculty of Informatics², Hungary; Moorfields Eye Hospital, United Kingdom³; Dekut NPO⁴, Hungary; 3T Research Ltd⁵, Hungary.

**Background:** Diabetes mellitus manifests itself in different ways in the eye, such as diabetic retinopathy (DR) which is the most common cause of blindness in the developed world. Many patients retain normal eyesight or experience a minimal reduction even in the presence of a sight-threatening disease. Hence, screening for DR is mandatory.

**Purpose:** To develop an ensemble-based automatic DR screening system to gain computational support.

**Methods:** As microaneurysm (MA) is an important indicator and the earliest hallmark of DR, it requires exceptional attention. However, other features (lesions, anatomical parts, etc.) can be also considered. All these components have been assembled in an ensemble-learning based framework. Our system has been tested on 1200 images of the Messidor database.

**Results:** The images were classified by the MA detector with 95% sensitivity, 51% specificity, and 76% accuracy. By including other features, we reached 89% sensitivity, 82% specificity, 85% accuracy.

**Conclusions:** MA detection is a key component in automatic DR screening, and our system has good sensitivity/specificity values for this step. This method has been proven to be very effective in the Retinopathy Online Challenge, where it is currently ranked as first. Adding other features led to further improvement.

This work was supported in part by NKTH, TECH08-2, Hungary DRSCREEN project.