Scotoma classification with artificial neural networks*

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1 Objective

Developing a computer system for automated scotoma classification using artificial neural networks.

2 Methods

This study is based on 2337 perimetric test sets of the Tuebingen Automated Perimeter (TAP). All pathologic perimetric test sets (RE: 967; LE: 1012) are classified into 16 scotoma subgroups depending on the type of visual field defect (VFD). The TAP uses a threshold-oriented, slightly supra-liminal strategy, leading to high test point density. The 30^{o} test grid of the central visual field contains 191 test locations with centripetal condensation. The depth of a defect is indicated by 6 different luminance classes. These measured luminance classes are presented to a neural network with 191 input units as input data. The output layer contains a) 2 output units to discriminate normal from pathologic patterns, b) 17 output units, one for each scotoma subgroup plus one additional for normal findings. The corresponding output unit is set to 1, while all others are set to 0. Initially 1337 data sets are used to train the network with the learning algorithm standard-backpropagation. After training the classification accuracy is tested with the remaining 1000 data sets, that are unknown to the network.

3 Results

We reach a classification accuracy of RE: 99.1%; LE: 99.1% for the discrimination of normal from pathologic patterns. The results for scotoma classification are RE: 95.1%; LE: 96.1%.

4 Conclusion

Neural networks classify scotoma subgroups with high accuracy >95%. This method may lead to an automated scotoma classification.

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