DEVELOPMENT OF THE TÜBINGEN NEURO-OPHTHALMOLOGICAL PERIMETRIC DATABASE

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Introduction

This project is aimed at the development of a computer-based, primary neuro-ophthalmological perimetric database for research, education and patient care. It is divided into three phases:

1. The perimetric examination protocol was analyzed and optimized through computer support. Each perimetric finding is 'manually' classified by a specialist according to the type of visual field defect[1] (*e.g.*, homonymous scotomas, retinal nerve fiber bundle defects, etc.) and its reliability rating. Results of this phase have reduced the administrative effort, created a paperless digital archive and allowed faster access for scientific evaluation.

2. Perimetric results obtained before the development of the new protocols are introduced into the electronic database by scanning, digitizing and classifying the perimetric printouts (as mentioned above). Using these procedures, former automated perimetric results of more than 10,000 patients with primary neuro-ophthalmological pathologies will be implemented into the database.

3. The manual classification will be complemented assisted by an expert system[2], which is based on a neural network.

With present computer power and development tools, it is possible to rebuild the existing Tübingen perimetric archive of printouts into a computer-based database. A pilot project demonstrated that it is possible to scan and digitize automated perimetric findings. For scientific evaluation, each perimetric finding is classified according to the type of visual field defect. In addition, the final diagnosis is stored in the database.

Methods

The application is designed like a two–phase client/server model using Borland Delphi 3.0 as a developmental tool and Interbase as the database system[3-7]. The Borland Database

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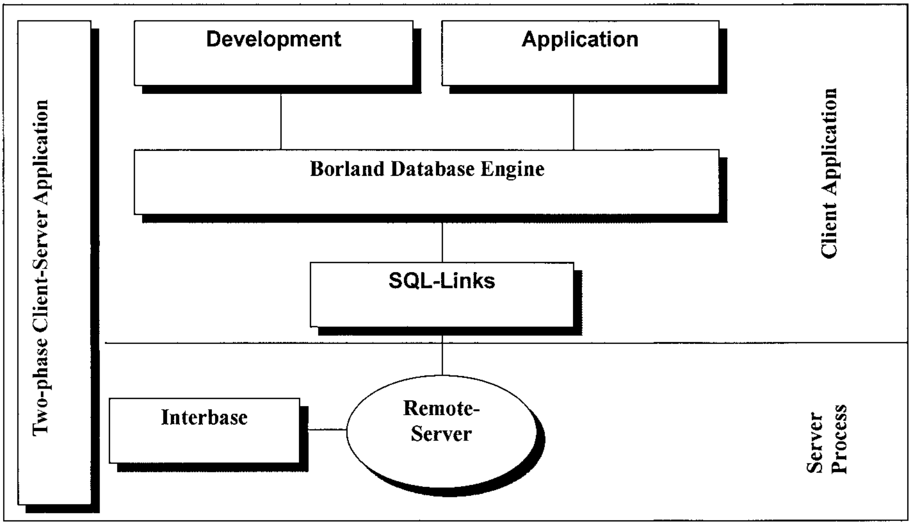

Fig. 1. Application design of the Tübingen perimetric database.

engine and the SQL links are necessary to exchange data from the client to the server and *vice versa* (Fig. 1). We use standard scan software to scan and special software for digitizing perimetric printouts to rebuild the existing perimetric archive. The computer configuration (Fig. 2) is implemented according to the project requirements.

Results

Since August 1997, only the first part of the project has been in clinical use. Between October 15, 1997 and July 15, 1998, 1727 perimetric examinations were carried out. Only results of the Tübingen Automated Perimeter (TAP), obtained with the threshold-oriented slightly supraliminal strategy (30° visual field, 191 test locations) were considered. The distribution of the visual field defect classification is shown in Figure 3. The diagnosis frequency distribution for the visual field classification 'nerve fiber bundle defect' can be seen in Figure 4.

Discussion

The expert system is especially promising since the comparatively high density of test point locations enables an exact description of the extent, form and position of scotomas. The purpose of the database is to support the ophthalmologist in the interpretation and differential diagnosis of perimetric findings.

Using the database results already in existence, we were able to test the first prototype of the expert system at the University Eye Hospital in Tübingen. The initial results of this system, with classification of straight-forward perimetric findings, look promising.

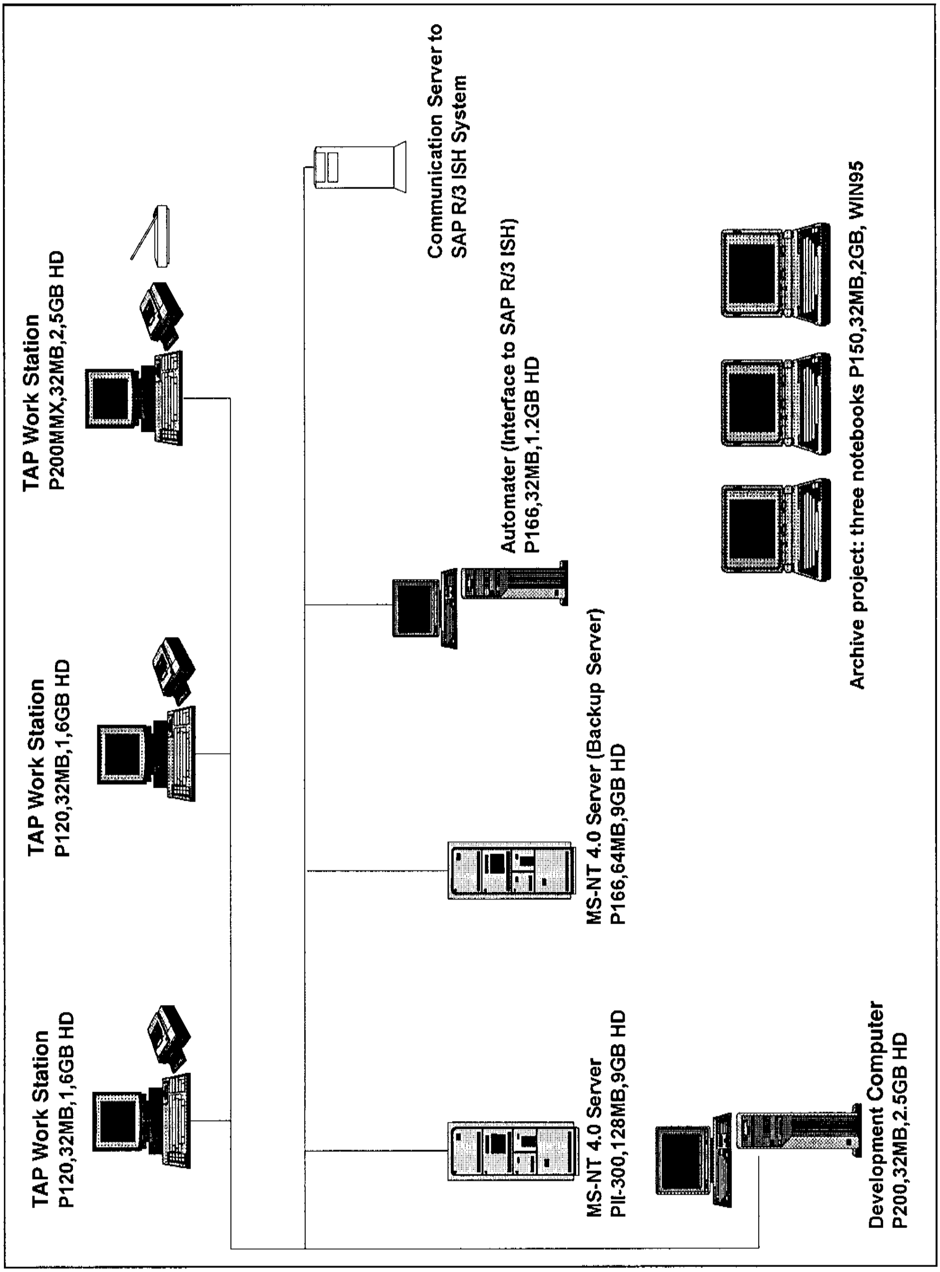

Fig. 2. Computer configuration.

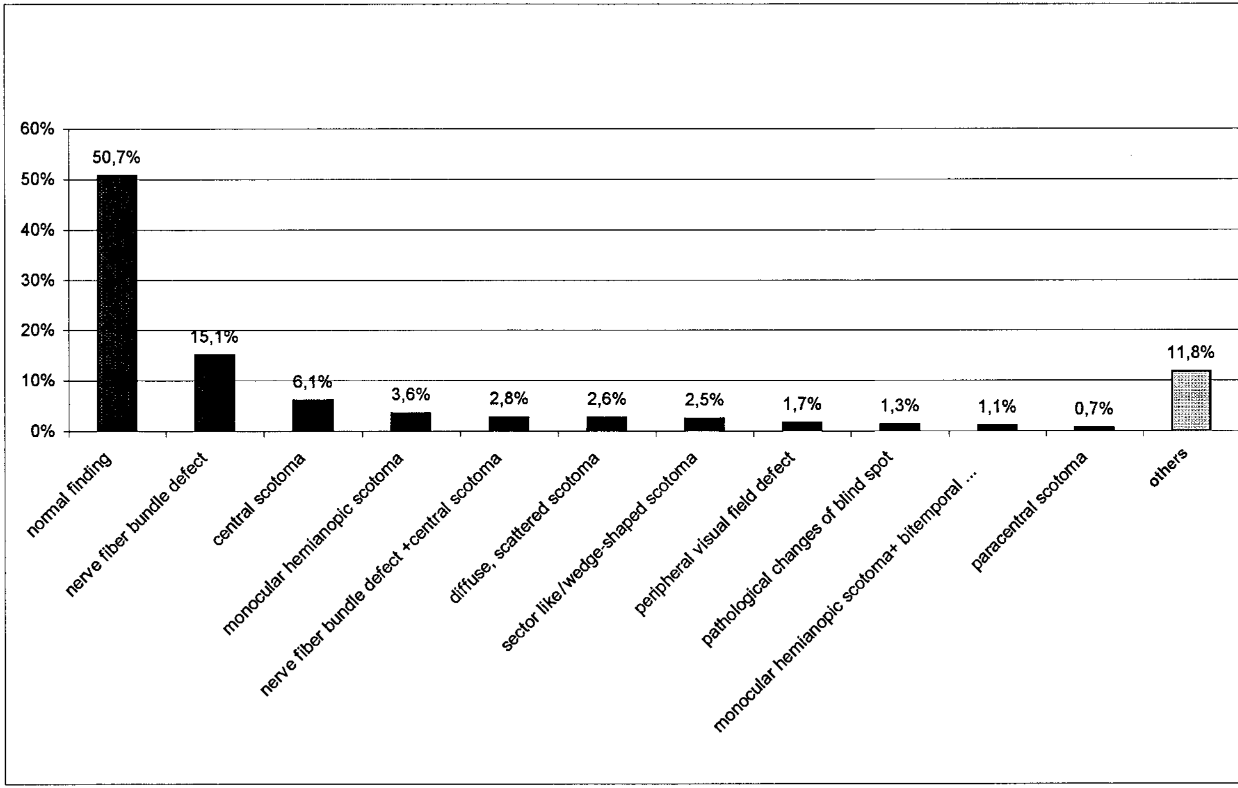

Fig. 3. Visual field classification frequency distribution (n=2605).

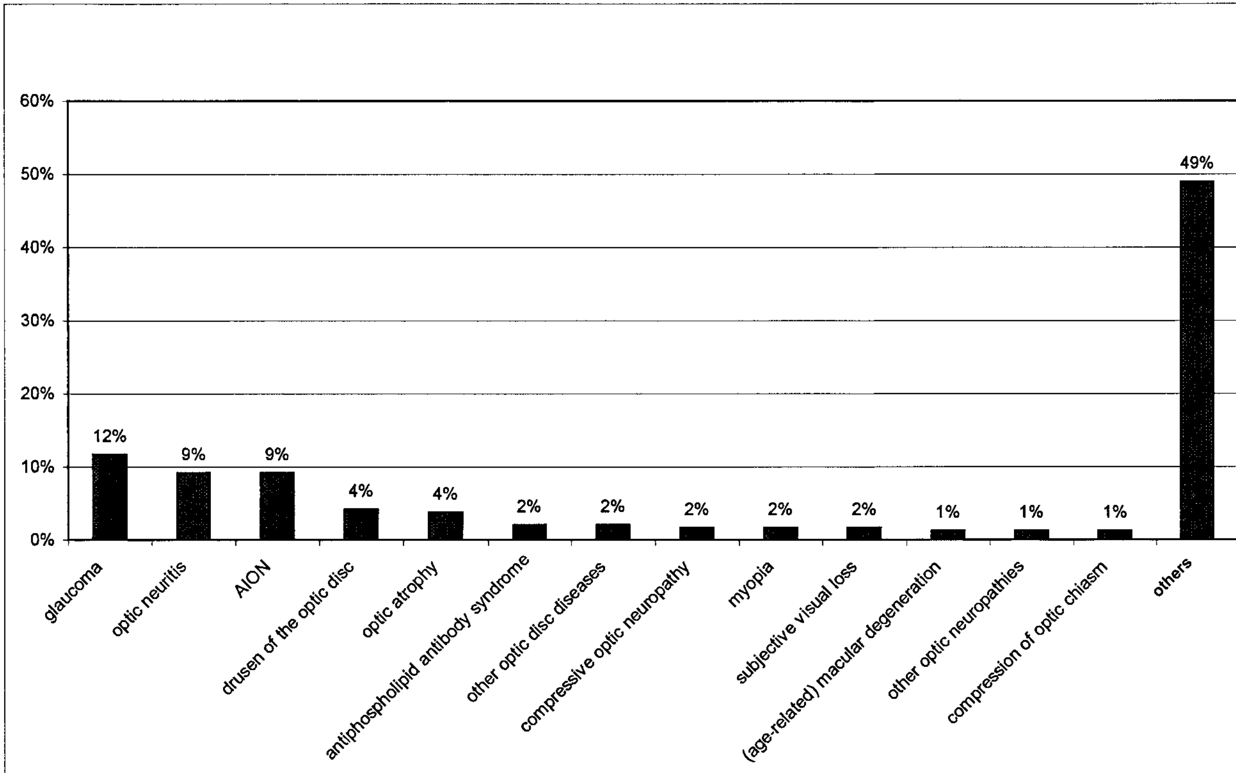

Fig. 4. Diagnosis frequency distribution for the visual field finding 'nerve fiber bundle defect'; the column 'others' represents cases with frequency values of <1% each.

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