Peridata Tutorial and Workshop
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INTRODUCTION

This Peridata Tutorial will help you to start using the software. It is written in English to reach a broader audience. The tutorial includes three files:

- Peridata_tutorial_workshop_Zeyen_2012.pdf
- Peridata_tutorial_cases_Zeyen_2012.phf
- Peridata_tutorial_cases_Zeyen_2012.phd

Open 'Peridata_tutorial_cases_Zeyen_2012.**phf**' on any computer with Peridata installed. From there on follow the instructions below. This course consists of two parts: first, an overview of the software and second, 12 case reports covering the most frequently encountered decision making.

This course will take ± 1 hour, but you can stop at any point and resume later on. At the end of this course you should feel comfortable using Peridata.

In the text below you will also find general comments highlighted in yellow. You will help me and other users by sending feed-back to thierry.zeyen@uzleuven.be.

Good luck!

Thierry Zeyen

- **PERIDATA (VERSION 3.0.18)** is a software program to archive and facilitate the analysis of automated perimetries from Humphrey, Octopus, Oculus (Twinfield and Centerfield), Medmont (M700), Rodenstock (Peristat) and Heidelberg (Edge) perimeters. This software program can be used individually or linked to an electronic chart (e.g. Softalmo, Optisoft, IFA, KWS or others).

- Open the file 'Peridata_tutorial_cases_Zeyen_2012.phf' on any computer where Peridata is installed. This will open automatically the **EXAMINATION LIST** of the patients included in this course.
The EXAMINATION LIST shows the Name, Birthdate, Eye, Examination date and time, and Exam Type (instrument and program used). Notes: use 24° programs (Octopus G1/G2 or HFA 24-2 SITA standard) instead of 30° programs for glaucoma. Use 10° programs (Octopus M1/M2 or Humphrey 10-2) (see case report 2) and/or stimulus V (see case report 12) in advanced glaucoma. Goldmann 4/V is a good supplement to 10° programs. Always use the same instrument to follow-up a patient. If possible, use the same instrument as the referring ophthalmologist. If it is the first time, use the instrument with which you need the weakest correction. Humphrey and Octopus 900 = nearby correction; Octopus 1-2-3 and Octopus 300 = distance correction. Use the spherical equivalent if the cylinder < 3D. Avoid 'ring scotomas' by putting the lens holder close to the patient's eye and using the furthest groove if only

Search the patient's name with Ctrl+F, type 'RO ..' and Enter 'ROT, RAC'. This will open all the Visual Fields (VFs) of this patient and highlight them in the Examination list. Individual VFs of a patient can also be selected: see case report 6.
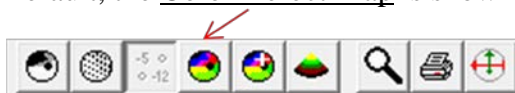
- The left window shows the **SERIES** of VFs. Default, the <u>Color Defect Map</u> is shown.

- Alternative displays are shown when browsing over the icons (above) at the top of the Series window: Single display, L/R, Trend display (important icon that will be used systematically in the case reports), General data (useful for looking at the program, strategy, correction used etc.), Thresholds, Interpolated Grey scale, Probability maps and Color Defect Map PLUS. Double click the most recent VF of the RE (28-07-2008 at the bottom right).

- The right window shows now the selected single VF (**SINGLE ANALYSIS**).
    1. Default, the <u>Color Defect Map</u> is shown.

    2. Alternative displays are shown when browsing over the icons (above) at the top of the Single Analysis window: Interpolated Grey Scale, Probability Map, Defect Depth/Total Deviation, Color Defect Map PLUS, Hill of vision, Zoom, Print or Quality Indicator (i.e. Reliability indices). By clicking on and off the Quality Indicator icon you can toggle between two views: the Graphical Quality Indicator and the Quality values.
    3. Use the **Context Help** Icon in the top bar whenever necessary by clicking this icon and then any of the other icons or windows. Try this for the Quality Indicator icon. The limits of the circle represent the following values: ↑ FP 20%, → Fixation loss 30%, and ↓ FN 40%. <mark>Note: a VF can be reliable despite a high % of fixation losses provided FP (False Positive), FN (False Negative), gaze tracking (Humphrey) and/or video fixation monitoring are normal.</mark>
    4. Print outs of VF's are seldom used but can be sent as a report.
    5. Indices in the lower right window (see also context help → Single Analysis window → global indices): PSD (Humphrey) is used as default. Octopus style indices can be selected for all the patients: click the show examination list icon in the top bar → Extra → Options → General → Octopus style indices. The conversion formula is: $PSD = \sqrt{LV}$ or $LV = PSD^2$. <mark>Notes: normal values of VF indices. MD (Mean Deviation for Humphrey [-] and Mean Defect for Octopus [+]): between +2 dB and -2 dB. PSD (Pattern Standard Deviation for Humphrey): < 2 dB. LV (Loss Variance for Octopus): <6 dB². MD is used to stage glaucomatous functional loss (Hodapp classification): early loss < 6dB, moderate loss 6-12 dB, advanced loss > 12dB (visual impairment > 20 dB).</mark> The new Peridata index FD (Functional Defect) reflects the deviation from normal of the functional performance of the examined visual field area. The higher the %, the higher the damage (e.g. a loss of 6dB of MD corresponds to a FD of -50% and a loss of 12dB of MD corresponds to a FD of -75% and is 0% in a normal VF. FES (Functional Equivalent Score) is 0% in a normal VF. <mark>Notes: the new Humphrey indices VFI</mark>

6. L/R analysis: will be shown in case report 10

- The most important tool of Peridata is the **TREND DISPLAY**.

1. Open Trend Display (3rd icon from the left in the Series window)

2. Click Context Help on the Change icon (5th icon from the left in the Trend Analysis window).

3. A point wise regression (PWR) analysis of the Defect Depth will be performed after minimum 3 consecutive examinations (involving the same test locations) with the same machine. It doesn't matter which VF is selected in the Series window when looking at trend analysis.
4. Change is the easiest way to look at point wise regression analysis and is chosen default; the GATT and GATT Change icons are alternatives. Those are graphical representations of the point wise regression analysis with or without defects depths (seen in the Change analysis): a horizontal bar ('minus') means worsening, a vertical bar ('plus') improvement, and a checker board means stability.
5. **Definition of clinically (# statistically) significant change: cluster of min 2 contiguous test locations with ≥ 5 dB change (p>95% = red triangle) in the PWR analysis OR 1 test location with ≥ 10 dB change (p>95% = red triangle) in the PWR analysis, in min 3 consecutive VFs (i.e. remaining after excluding the last 2 VFs).** *See fig. and ref. * page 8.*
6. The Trend Analysis window also displays the regression analysis of MD and FD (i.e. the MD loss in dB/Year or FD in %/Year). On the right side are the interpolated Grey Scale representations of the series of visual fields. You can exclude or include VFs in the regression analysis by double clicking one or more of those Grey Scales (see fig. page 8). Clicking the Automated exclusion icon in the Trend Analysis window will automatically exclude non-reliable fields. You can re-include all the VFs by clicking the Include all exams icon .
7. **Intellitext** can be used for additional analysis.
8. Close this patient with Ctrl+W.

Case Reports: 12 case reports are presented covering the most common decision making. Re-open the Examination list by clicking the 3rd (green) icon in the top bar (Peridata_course_Zeyen_2012.phf). Ctrl+F, type 'CAP' and Enter 'CAP, BRI'.

1. **CAP, BRI**: *limited number of test locations analysed; stable since change in medical therapy.*

   Click the Trend Display icon (3rd icon from the left in the Series window) for the RE. Trend display shows a limited number of test locations analysed. The 1st VF of

this patient examined only a limited number of test locations (this can be visualised in the Color Defect Map in the Series window on the left, after scrolling up to the 1st VF [missing test locations in the periphery]). Exclude this 1st VF (10-07-2001) by double clicking it in the Grey scale representation of the Trend Analysis window in the right window. Now, all the test locations are displayed. Note: regression analysis will only be performed for test locations common to *all* selected fields. Progression (see definition page 3, point 5) can be seen RE (after excluding the two most recent VFs [07-01-2010 and 20-05-2010]). But are the VFs stable since 27-04-2004 (important change in medical therapy)? Re-include the last 2 VFs and exclude the 4 VFs from 2001 and 2002 → VFs are stable since 27-04-2004. Notes: always adapt your statistical analysis to the clinical context. Screening programs (i.e. less than 4 stages [e.g. 2 stages = 32 test locations] for Octopus, and SITA Fast for Humphrey) are OK to follow-up a patient as long as the VFs remain normal. As soon as the VF becomes abnormal → follow-up with 4 stages (59 test locations) for Octopus or SITA standard for Humphrey. Ctrl+W

2. **DIL, ELI**: *patient with progressive unilateral glaucoma LE.*

Re-open the Examination list by clicking the 3rd (green) icon in the top bar 📁.
Ctrl+F, type 'DI ..' and Enter 'DIL, ELI'.

RE: normal (double click the last VF) and stable (click Trend Display icon 📊).
LE: look at the series of VFs of the LE in the Series window. Click the VF of 06-11-2000 and then on the Trend Display icon. 'Not enough data' appears! Only one 24° VF was tested and you need at least 3 VFs of the same program (or involving the same test locations) to have a trend analysis. Click any of the other 10° VFs LE and perform a trend analysis: progression is clear; even after excluding the first 10 or the last 8 VFs! Ctrl+W

3. **HEE, ELI**: *monophthalmic patient with advanced and progressive NTG glaucoma and macular splitting.*

Re-open the Examination list by clicking the 3rd (green) icon in the top bar 📁.
Ctrl+F, type 'HE ..' and Enter 'HEE, ELI'.
Perform a trend analysis of the (monophthalmic) LE by clicking the Trend Display icon in the Series window. Progression is obvious concentrically. Regression analysis of MD shows a statistically significant loss of 0.5 dB/Year. Progression is also obvious when looking at GATT.
Macular splitting of the 4 paramacular test locations. Double click the last VF (15-09-2005) in the Series window and click the Grey Scale icon in the Single analysis window 👁 to look at the thresholds. There are 2 contiguous paramacular test locations with a threshold of < 5 dB (horizontally superior). Note: macular splitting (to be confirmed on 10-2) increases the risk for 'whipe out' (i.e. irreversible loss of min. 2 Snellen lines of visual acuity) immediately after trabeculectomy.
Click the Color Defect Map in the Single analysis window 🔴. Compare the single analysis of this VF (15-09-2005) with that of 27-10-2004 by toggling between the two fields in the Series window. The MD is getting worse but the PSD is paradoxally improving. Note: the tipping point for PSD (or LV) 'improving' paradoxically is when MD reaches 20 dB. At -20 dB, the hill of vision is so decreased that the (absolute) scotoma can only become 'less deep'. Ctrl+W

4. **TIM, EME**: *stable RE; suspicion of glaucoma progression LE.*

Re-open the Examination list by clicking the 3rd (green) icon in the top bar ⬚.
Ctrl+F, type 'TIM' and Enter 'TIM, EME'.
Perform a trend analysis of the RE. The VFs are stable (only 1 test location with a statistically significant PWR loss of 6 dB). However, some VFs are not reliable: you can spot them by looking at the yellow icons in the Grey scale display at the right side of the Trend analysis window. If you exclude all the unreliable VFs by clicking the Automatic exclusion icon in the Trend Analysis window ⬚, you will see that this abnormal test location disappears.
Perform a trend analysis of the LE by clicking one of the VFs of the LE in the Series window (and then the Trend Display icon in this window). Exclude the unreliable VFs by clicking the Automatic exclusion icon in the Trend Analysis window. There is a suspicion of progression in the nasal VF 'coming and going' when excluding the last two VFs. However, note that the regression analysis of MD remains stable since 10 years. This patient should not be treated aggressively at this point.
Ctrl+W

5. **CAL, LEO:** *stable VFs since trabeculectomy RE.*

Re-open the Examination list by clicking the 3rd (green) icon in the top bar ⬚.
Ctrl+F, type 'CA ..' and Enter 'CAL, LEO'.
Perform a trend analysis RE by clicking one of the VFs of the RE in the Series window and then the Trend Display icon in this window. Trend analysis shows progression inferiorly. However, a trabeculectomy was performed on 14-04-1999 and you want to know if the VFs are stable since then. Exclude the 3 VFs before 14-04-1999 by double clicking them in the Grey scale window on the right in the Trend Analysis window → the VFs are stable since the trabeculectomy. Ctrl+W

6. **THI, JEA:** *progression LE and stable VFs since trabeculectomy RE.*

Re-open the Examination list by clicking the 3rd (green) icon in the top bar ⬚.
Ctrl+F, type 'TH ..' and Enter 'THI, JEA'.
Perform first a trend analysis of the **LE** (by clicking one of the VFs of the LE in the Series window and then the Trend Display icon in this window). There is progression visible (also after excluding the unreliable VFs by clicking the Automated exclusion icon ⬚), especially on the regression analysis of MD (0.7 dB/Y). This would potentially add a further MD loss of 3.5 dB after 5 years, implying that he would have, 5 years later, a MD of -9.5 dB (instead of -6 dB in 2005). Since this is his best eye, a change in therapy is advisable, despite his age (86). Note: do look at rates of MD progression (dB/Year) when looking at trend analysis and interpret the rates taking into account the age and the other eye of the patient.
Perform now a trend analysis of RE. Progression is seen but this patient underwent a trabeculectomy 2000. To know if the VFs remained stable after 2000, select the VFs after 2000: click the icon 'Show examination list' in the top bar of the software ⬚ → deselect the VFs by clicking in the red color → scroll down and select (the 5) VF's RE after 2000 with Ctrl+Left mouse click → Ctrl+Alt+Show → OK → click the Trend display icon in the Series window → the VFs LE are stable after 2000 (the 'unreliable' VF of 18-07-2003 does not need to be excluded since this VF shows only fixation loss on the Heijl-Krakau method but was reliable otherwise (see note page 2, point 3). Ctrl+W

7. **AER, JUL**: *unreliable 'happy trigger' (super normal last VF) + learning curve RE.*

Re-open the Examination list by clicking the 3rd (green) icon in the top bar . Ctrl+F, type 'AE ..' and Enter 'AER, JUL'.

Single analysis of last VF RE (23-01-2004). This VF shows all the characteristics of a (unreliable) super normal VF ('happy trigger'). Toggling on-and-off the Quality indicator icon (right icon in the Single Analysis) shows a FP rate of 33%. Furthermore, the MD, the PSD and the Bebié curve (see context help → Series window → Cumulative Defect Curve [Bebié curve]) are super normal. Finally, the probability plots (clicking the Probability icon in the Single Analysis window) identify abnormal test locations in the Pattern Deviation probability plot (black squares in the bottom right plot) that are not present in the Total Deviation probability plot (on the left). This is a major sign of unreliability. Look now at the first VF RE (10-05-2001) after scrolling up in the Series window: this is an example of a learning curve where the following VFs are much better. This first VF RE should be excluded in the analysis. After excluding the first (learning curve) and last (unreliable) VFs, trend analysis shows no progression. Ctrl+W

8. **VER,JUL**: *learning curve and effect of cataract operation RE + LE.*

Re-open the Examination list by clicking the 3rd (green) icon in the top bar . Ctrl+F, type 'VER' and Enter 'VER, JUL'.

Scroll up in the Series window and observe the bilateral learning curve until 14-05-2003, and the drastic improvement after the cataract operation after May 2003. Observe the 'improvement' on trend analysis (RE or LE) that disappears after excluding the first 4 VFs. Ctrl+W

9. **PAU, DIR**: *not enough data!*

Re-open the Examination list by clicking the 3rd (green) icon in the top bar . Ctrl+F, type 'PAU' and Enter 'PAU, DIR'.

Normal VF of both eyes. Click the VFs of 05-11-2003 and perform a trend analysis analysis by clicking the Trend Display icon in the Series window: 'Not enough data' appears! This is because this is the only Humphrey VF and you need min. 3 VFs with the same machine involving the same test locations to calculate a trend analysis. Humphrey VFs can be differentiated from Octopus in the Series by the symbol of the blind spot: a dark oval for Humphrey and grey rectangle for Octopus. This can be confirmed by clicking the General Data (info) icon in the Series window . Ctrl+W

10. **VAN AER, PIE**: *pre-existing neurological bi-nasal defect in a glaucoma patient.*

Re-open the Examination list by clicking the 3rd (green) icon in the top bar . Ctrl+F, type 'VAN' and Enter 'VAN AER, PIE'.

Clicking the L/R display in the Series windows and then the Binocular Analysis icon in the Left-Right Analysis window , will confirm that this defect is heteronymous and therefore not impeding a driver's licence. Binocular Analysis can be evaluated in Peridata via the Series windows → L/R Display icon → Binocular Analysis icon in the Left-Right Analysis window. This allows for looking at the existence of scotomas in the binocular central VF. However, the window on the right displays defect depths (not thresholds). To assess 'absolute binocular scotomas' for driver licences, the next step is to click the Threshold icon in the same window . An 'absolute binocular scotoma' the central 20° or 30° is defined as: min. 3 contiguous test locations with a sensitivity <10 dB *in the integrated VF*. An easy

Perform a trend analysis after double clicking any VF in the Series window (to exit the L/R display). Trend analysis shows stable VFs in the RE and possible progression infero-temporally in the LE. Ctrl+W

11. **BUI,JAN**: *homonymous neurological defect + glaucoma progression LE.*

Re-open the Examination list by clicking the 3rd (green) icon in the top bar 📂.
Ctrl+F, type 'BU ..' and Enter 'BUI, JAN'.
Browsing in the Series window will reveal a neurological homonymous defect appearing on 28-04-1998. Trend analysis of either eye will show this progression. In order to know if the patient's glaucoma remained stable, you need to exclude in the Trend Analysis window the first two VFs (08-11-1996 and 10-10-1997) preceding the CVA. There is a suspicion of progression RE infero-nasally but this is not confirmed after excluding the last but one VF (06-11-2002) and the trend analysis of MD remains stable. The LE shows progression on the regression analysis of MD; there is a strong suspicion of progression infero-temporally, paracentrally and superiorly but, after excluding the last but one VF (06-11-2002), the scotomas are confirmed in the same areas (infero-temporally and superiorly) although not on exactly the same test locations. Ctrl+W

12. **TIE,FRA**: *switch to stimulus V in advanced glaucomatous defects.*

Re-open the Examination list by clicking the 3rd (green) icon in the top bar 📂.
Ctrl+F, type 'TIE' and Enter 'TIE, FRA'.
This is a monophthalmic patient with advanced glaucoma. The last VFs in the Series window show 'No normal values'. Clicking the General Data icon in this window [i] will reveal that stimulus V was used for these 10° VFs. Between 26-04-2001 and 27-10-2005 the test was performed with stimulus III. However, trend analysis of those tests is relatively worthless because there are too few test locations tested. In those cases it is advisable to use stimulus V although a statistical analysis for this stimulus is not yet available. Meanwhile, you can look at the thresholds by double clicking the VF in the Series window and then clicking the Grey scale icon in the Single Analysis window ⚫. Alternatively (and much easier), you can look at the series of grey scales by clicking one of the fields with 'No normal values' in the Series window and then clicking the Trend Display icon 📊. Close Peridata

SUMMARY

1. **Exclude unreliable VFs**
2. **Look at rates of MD progression with trend analysis**
3. **Interpret (MD) progression taking the age and the other eye into account**
4. **Look at clusters of point wise regression analysis that are confirmed at least twice**
5. **Exclude VFs according to the clinical information (antecedents, new medication, operation ...)**

* Clinically significant Change (derived from Gardiner & Crabb. Examination of different pointwise linear regression methods for determining visual field progression. IOVS 2002; 43: 1400-7)
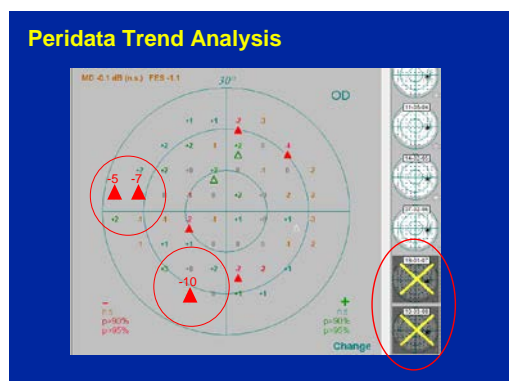
A cluster of min 2 contiguous test locations with ≥ 5 dB change (p>95% = red triangle) in the point wise regression (PWR) analysis OR 1 test location with ≥ 10 dB change (p>95% = red triangle) in the PWR analysis, in min 3 consecutive VFs (i.e. remaining after excluding the last 2 VFs).