Experiment session duration effect on chromatic sensitivity threshold

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Dynamic stimuli

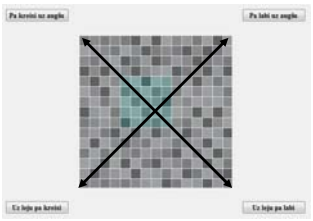

Figure 1. Dynamic test field preview. Chromatic sensitivity measurements can be done in one of the six directions which overlap with protan, deutan and tritan colour vision deficit confusion lines. Measurements with different stimuli can be carried out by one as well by few at once.

Test stimuli background consists of 15 by 15 square box which includes coloured stimuli 5 by 5 squares. Squares in test stimuli are illuminated in one of five brightness levels – 40, 67, 88, 105, 121 cd/m^2. Test stimuli moves diagonally from one edge of test field to another. Patient's task is to detect direction of coloured stimuli in one of the four possible directions. In case patient answers correctly coloured stimuli colour difference is reduced till chromatic sensitivity in specific chromatic directionn reached. In scope of current research few drawbacks connected with quality of stimuli are fixed.

Analysis of dynamic stimuli

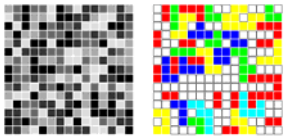

Figure 2. Image to the left test field generated using random function. Image to the right test field processed by using recursive algorithm. Squares coloured in red are artefact figures consisting of two squares with equal luminance level, consequently green figures are artefacts consisting of tree squares, blue consisting of four squares, yellow 5 squares, cyan 6 squares.

To create test stimuli random function is used which allows artefact figures (aggregations consisting of one luminance level) to emerge. In order to avoid these formations recursive algorithm is designed to detect artefact figures and take appropriate steps to dissolve them without affecting initial balance (**see figure 2**). To calculate probabilities of chance to emerge specific size of artefact figure in particular case might be quite complicated task. In order to over come this problem we used power methods ,i.e., for each test field size 15x15, 20x20, 25x25, 30x30 for each count of luminance levels – 3,4,5,6 ten million test fields were generated and analysed (160 million test fields were analysed). It has been found that in case we decrease number of luminance levels whatever test field size is odds of emerging artefact figures are larger as well as odds of emerging larger size figures (**see figure 3**), however odds of emerging artefact figures are independent of test field size (**see figure 4**).

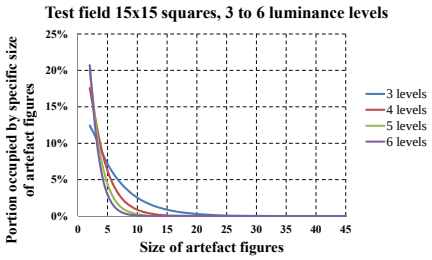

Figure 3. Odds of emerging specific size of artefact figure depending of number of luminance levels.

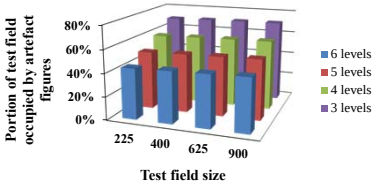

Figure 4. Overall odds of emerging artefact figures depending from test field size and number of luminance levels.

Static stimuli

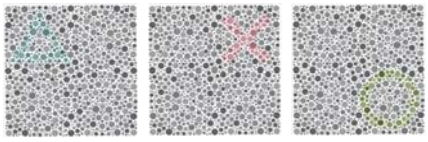

Figure 5. Examples of static stimuli.

Static stimuli is created by digitalising HRR colour vision test plates. Application designed in scope of this research allows automatically create large variety of test stimuli (**see figure 5**). Three test stimuli triangle, cross or circle can be presented in one of four quadrants with colour difference stated by psychophysical functions running testing procedure.

Results

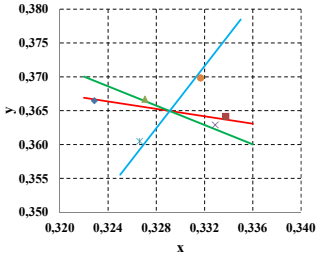

Figure 6. Results of chromatic sensitivity measurements

First experiment sessions with patients without colour vision deficits shows that computerized colour vison tests work as expected however, it is necessary to carry out addition measurements to verify whether long experiment sessions affect our ability to distinguish coloured and achromatic stimuli, as well it necessary to find out if we are capable of adapting not only on specific colour stimuli but as well on specific type of tasks.

Acknowledgement: This study is supported by ESF project No.2013/0021/1DP/1.1.1.2.0/13/APIA/VIAA/001.