Colour and luminance contrast in depth perception

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Perception of depth is based on different mechanisms and various cues, that help to detect absolute and relative distances between objects and observer. The present report are devoted to studies of depth perception of different colour pair objects - two moving bars of one colour (red, green, blue or yellow) that are placed in front of a display of the same or another colour of various saturation. Two LEDs mounted at ends of PMMA bars illuminate from inside the surface of bars up to luminance 100 cd/m^2. Pshychometric curves are built, and the perception threshold σ is determined from Lorentz sigmoidal fit. The threshold σ depends on the luminance level of the background and bars, and on their contrast (either luminance and/or colour). For the case of an uniform background the basic depth perception mechanism is the binocular parallax. The bar relative displacement amplitude (up to 3 cm) causes the image size deviation up to 0.6%, and the monocular cues would contribute in the depth perception. Experiments performed monocularly confirm a negligible contribution of the size effect in the total perception threshold. Comparing the colour contrast and luminance contrast contribution in present conditions the following conclusions can be made. Taking as a reference the isoluminant conditions (same luminance of 40cd/m^2 of green bars and red background), the depth perception threshold can be halved increasing the bar luminance to 100cd/m^2. Diminishing the bar luminance toward zero the colour contrast decreases and in opposite, the luminance contrast increases. Within this range the measurements have strong dispersion; however for final monochromatic conditions (large area of red background and dark bars) the detection threshold does not differ significantly from the isoluminant case. Introducing the need of fully stereovision fusion of visual scene – using a textured monochromatic background instead of uniform one leads to small changes in the depth perception threshold, however dispersion of results decreases significantly. Results for red-green and yellow-blue pairs are explained on basis of stimuli induced activity within noisy neural environment.