Multispectral analysis of colour deficiency tests and modelling of cones influence on test perception

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Visual stimuli for colour deficiency tests are designed either for trichromatic computer controlled CRT or LCD displays and projectors, or by means of print technologies. Nevertheless, the standard characteristics of these tests fail, thus not allowing to diagnose unambiguously the degree of different colour deficiency. We use multispectral colour analysis scanning the image by use of tuneable liquid crystal LC filters (***Nuance II*** spectral imaging system) to obtain measurable quantities of different colour deficiency tests. Different Ishihara plates from Rabkin polychromatic colour deficiency test book (PSM) were analyzed. Spectral images were taken in the range of 420 to 720 nm with the 10 nm step under the typical widely available light sources (halogen, luminiscent). The difference between the L and M cone signals is the basic perception source for the protan and deutan tests. The changes in the signals and spectral sensitivities of these cone types have the greatest impact on the perception of the colour. Hystograms of the image pixels chromatic coordinates (x,y) of the CIE colour space were analysed taking into account colour deficiency confusion lines. We propose the value of cross-correlation of the processed grey scale images in LMS colour space with a high contrast test object on white background for characterizing of the test ability to diagnose a definite level of a specified colour deficiency.