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TWO TESTS USED FOR DISPLAY INTERFACE DESIGN: DYNAMIC VISUAL ACUITY AND
CHROMATIC CONTRAST SENSITIVITY

Abstract

Interface design of display equipment is according to some basic discernibility of visual system such as visual acuity and contrast sensitivity. However, traditional static visual acuity and black and white contrast sensitivity are not enough. What's more, astronauts' visual function may change in orbit. The missing dynamic visual acuity and chromatic contrast sensitivity characteristics of human eye ought to be important for the designment of modern display device, especially for astronauts' in orbit. We developed a dynamic visual acuity test software based on Windows 8 system to measure dynamic visual acuity of different movement speed and different movement direction. Automatic distance detection using the front camera was to ensure the accuracy of the test. Chromatic contrast sensitivity indicates the ability of the human eye to recognize the stripe in different width with sinusoidal color change. Our test was based on RGB color space which could be used for display equipment evaluation conveniently. There were two parts in generating test method of chromatic contrast sensitivity. One was generating image of color grating used for discrimination and the other one was measuring threshold of discrimination using method of limits in psychology. After development of testing methods, in order to verify the reliability and validity of the test method and obtain data of different people, a dynamic visual acuity and chromatic contrast sensitivity measurement of 12 normal subjects and 16 abnormal subjects somehow similar to astronauts in orbit whose intraocular pressure of both eyes were more than 20 mmHg was conducted. Twelve normal subjects tested twice and data of two test including dynamic visual acuity and chromatic contrast sensitivity threshold in three core colors with ten spatial frequencies was obtained. Pearson correlation test was conducted between two test results and significant correlations were found of corresponding result. What's more, the correlation coefficient were greater than 0.8. A comparison was made between test results of normal and abnormal subjects. The dynamic visual acuity of normal subjects was 0.77, while that of subjects with abnormal intraocular pressure was 0.52. Threshold of abnormal subjects at all spatial frequencies were higher compared to normal subjects obviously and the difference of red color was relatively small. Dynamic visual acuity test and chromatic contrast sensitivity test we developed which were useful for design and evaluate of display interface were stable and effective. Ergonomics standard for display interface or equipment should pay close attention to both normal and astronauts' demand and features.