Dalton's Jungle: A computer game for testing children's color vision

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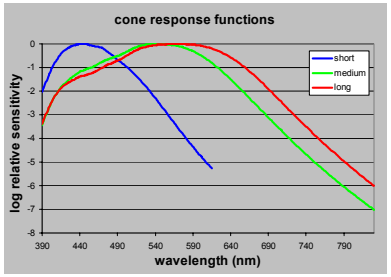
Abstract: Anomalies of color vision affect approximately ten percent of the male population and a smaller percentage of females. With recent advances in desktop publishing and printing, color is now commonly used in K-12 teaching materials. Therefore it is becoming increasingly important to identify children with color-anomalous vision so appropriate accommodations can be made. Existing tests such as the Ishihara plates and the Farnsworth D-15 test are both expensive to acquire and difficult to administer to the pediatric population. To address these issues we have developed a PC-based computer game called Dalton's Jungle that can assess color-anomalies in children's vision. The goal of the game is to find animal patterns that are hidden in images of jungle-like foliage. The colors of both the animals and the foliage are chosen to fall along dichromatic confusion lines in the CIE u,v uniform chromaticity space. In each round of the game, chromaticity differences between the animal and foliage patterns increase over time, allowing direct measurement of discrimination thresholds. Thus the game can assess both the form and degree of color anomalies in vision. Performance is summarized in both tabular and graphical reports and can be referenced to age-based norms.

motivation:

- ~1 in 11 males and a smaller percentage of females are color "blind"
- use of color is becoming increasingly common in K-12 teaching materials
- need to identify children with color vision problems so appropriate accommodations can be made

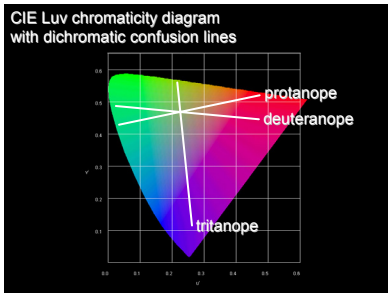
color vision fundamentals:

- three classes of cones
- broadband response profiles
- trichromatic color space
- many possible primaries
  - RGB, CIE XYZ, Lab, Luv
- CIE spaces organized by luminance, chromaticity
- Lab, Luv – perceptually uniform color differences



color "blindness":

- three types: protanopia, deuteranopia, tritanopia
- related to photopigment anomalies
- chromaticity differences along particular lines in color space (dichromatic confusion lines) are indistinguishable



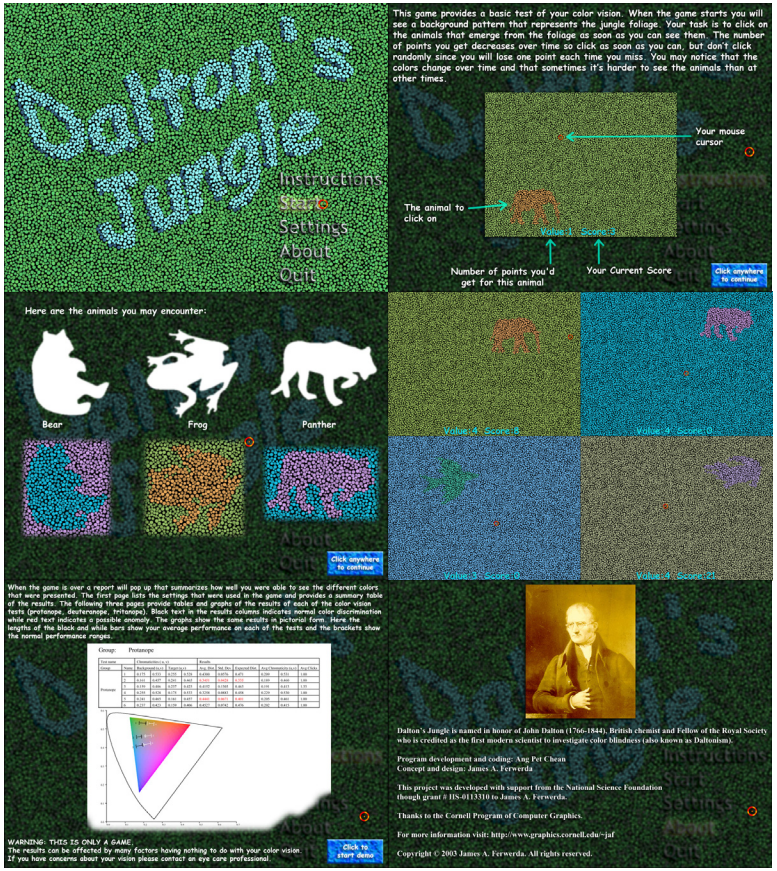
existing color tests:

- Ishihara pseudo-isochromatic plates
- Farnsworth-Munsell 100 hues, D15 tests
- expensive
- difficult to administer, especially to a pediatric population

goal: to develop a new method to test children for color-anomalous vision

Dalton's Jungle:

- computer game to test children's color vision
- player's task is to find animals that emerge out of the jungle foliage
- color differences increase over time along dichromatic confusion lines
- lines change from turn to turn to assess different anomalies



Impact:

- new method for testing children's color vision
- enjoyable game context, standard PC platform
- summary report, results can be normed to population of interest

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